

Lackawanna River Watershed Conservation Plan

prepared by The Lackawanna River Corridor Association

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This document has been prepared by:

**Bernard McGurl, Executive Director
Arthur Popp, Project Manager
Deilsie Heath Kulesa, Administrative
Assistant
Gail Puente, Education and Outreach
Coordinator**

For the:



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1. Introduction

This plan for the conservation of the Lackawanna River and its watershed has been developed by the Lackawanna River Corridor Association in partnership with Lackawanna County and twenty-six municipalities in the Lackawanna River watershed. A companion plan for the upper Lackawanna River has been developed in partnership with the Trails Conservation Corporation, Susquehanna County and municipalities in the upper watershed, with the collaboration of the Lackawanna River Corridor Association and other agencies.

The plan describes a vision of the Lackawanna River that can be shared by all who are concerned with what a healthy river means for the residents of our watershed and for our friends and neighbors downstream.

The plan builds on the original Lackawanna River Citizens Master Plan of 1990 and the plan for the Lackawanna Heritage Valley of 1991. Following implementation of these plans, this plan examines conditions in the watershed related to the ecological health of land and water resources. The plan also examines issues related to the management of open space resources, historical and contemporary land use practices, recreation, aesthetics, public and private infrastructure along the river and its tributary streams.

This plan includes an inventory of conditions recorded on stream walks conducted by LRCA staff, volunteers and local elected officials during 1999 and 2000. Based on the inventory findings, input from public meetings and review by public officials, the plan offers recommendations for actions to be taken to develop site specific conservation and recreation projects, individual and watershed wide programs for education, resource management, and decision-making on management and infrastructure issues.

The plan has been developed with assistance from the Pennsylvania Rivers Conservation Program administered by the Pennsylvania Department of Conservation and Natural Resources. An important outcome of this plan is the petition for inclusion of the Lackawanna and its watershed on the Pennsylvania Rivers Conservation Registry. With the endorsement of agencies and municipalities, the registry of the Lackawanna entitles projects and programs of the types recommended in this plan to eligibility for implementation funds from the Commonwealth through the River Conservation Program.

The development of this plan has also been supported with funding from the United States Environmental Protection Agency Chesapeake Bay Small Watershed Grants program administered by the National Fish and Wildlife Foundation and the Scranton Area Foundation.

1.1 Executive Summary

The Lackawanna River flows nearly sixty miles through a 350-square mile watershed in four counties of northeastern Pennsylvania to its confluence with the North Branch Susquehanna River. The Lackawanna rises in a series of glacial ponds and wetland bog complexes along the borders of Susquehanna and Wayne counties in the glaciated plateau province of the Appalachian Mountains. The east and west branches of the Lackawanna confluence at Stillwater Dam, a flood control structure built by the United States Army Corps of Engineers in 1960.

After passing Stillwater Cliffs, the river enters the Lackawanna Valley flowing for forty miles in a northeast to southwest direction through Forest City, Carbondale, the Mid Valley, Scranton and the Down Valley to the confluence at Pittston. There are over sixty tributary streams to the Lackawanna rising on the Moosic and West mountains or on the Pocono Plateau where Spring Brook and Roaring Brook sub-watersheds flow through gaps in the Moosic Mountains to join the Lackawanna.

The Lackawanna Valley contains part of the northern anthracite coal field which has been extensively mined. The upper Lackawanna watershed, the Moosic and West mountain ranges, and the North Pocono Plateau areas are mostly wooded with successional forest cover. The valley between Pittston, Scranton and Carbondale is a patchwork of urban and suburban centers interspersed with abandoned coal mine sites strung out along the river and the floor of the valley with some sprawl along terraces and hillsides to about half the distance from the river to the ridge tops. The watershed has an approximate human population of 200,000 persons.

Numerous studies of water and habitat quality have been conducted during the past twenty years. According to these studies, the aquatic health of the river and tributary streams is good- to-excellent in the upper reaches of the watershed. The river maintains a moderate aquatic health down to Scranton. Downstream through Scranton to Pittston, the river's aquatic health declines precipitously. Acid mine drainage (AMD) from the Old Forge bore hole completely eliminates the aquatic habitat in the lower three miles to the confluence. Other impacts from combined sewer overflows, (CSO's) and urban storm water contribute to the decline in aquatic health.

The number of urban storm and combined sewer discharge point sources increase through Carbondale and the Mid Valley and accelerate rapidly as the river passes Interstate 81 and flows through the City of Scranton and the down valley communities of Taylor, Moosic, Old Forge and Duryea. Surface storm water flows across un-vegetated mine spoils piles and inadequate erosion control programs at many construction sites contribute to excessive particulate sedimentation which adversely affects aquatic habitat and water quality.

The stream and river survey walks conducted by the LRCA for this plan have identified endemic situations of mining and urban related impacts which contribute to water quality and habitat loss, watershed degradation, and property damages. Many smaller tributary streams lose their entire flow to the subterranean mine voids. During storm events these dry channels become raging torrents where large volumes of storm water at high velocities move significant amounts of coal wastes and urban debris which form the soil profiles along these degraded tributaries. This adds inordinate quantities of sediment and larger coal waste loads to the river further degrading the aquatic health and aesthetics of the watershed.

The inadequate and inconsistent application of land use controls or regulations protecting the valley's flood plains is evident in many river and stream reaches where adjacent property owners have deposited all types of utility trench waste, masonry building debris, vegetative debris, construction waste, tires, car parts as well as the proverbial kitchen sink. There are many areas where these fills encroach from the flood plain into the watercourse adding volumes of unstable manmade materials to the bed load of the tributaries and eventually the river. High flows often transport these materials and block bridge piers and culverts causing localized flooding and damage to adjacent properties and homes.

The Lackawanna River and its watershed are a study in contrasts, offering many examples of the adaptive and recuperative qualities of the natural world. The upper watersheds of the river and tributaries are predominantly high-quality coldwater fisheries with successional forest cover and extensive forested wetland complexes. These watersheds are nationally significant natural habitat and water resource areas. The urban/coal field areas of the watershed exhibit many degraded river and stream reaches, the lower three miles of river are a dead zone stained a bright yellow-orange with the iron oxide residue of mine drainage.

Yet even in the urban areas, the river and larger tributaries flow through wooded riparian greenways; underutilized abandoned mine properties and rail corridors provide a buffer for the river. Over the past twenty years, the river has developed into an outstanding Class-A coldwater fishery known for brown trout as well as native brook trout from Carbondale through the Mid Valley.

This fishery extends into the City of Scranton as well. The river makes a gradual transition from the cold to warm water fishery beginning at the Route 81 Bridge along the northern edge of the City of Scranton. Through Scranton to its confluence the river channel widens and its gradient becomes shallower. There are longer reaches with open embankments and diminished riparian cover.

The past fifteen years have seen a variety of enhancements to the Lackawanna watershed. The Lackawanna River Corridor Association (LRCA) was created in 1987 as a community-based non profit educational and community development organization to promote the restoration and stewardship of the river and its watershed resources by local residents, businesses and government agencies. The LRCA developed a Lackawanna River Citizens Master Plan during 1988-1990 in partnership with Lackawanna County, state and federal agencies. The Citizens Master Plan contained recommendations for a major public/private initiative to address environmental clean up of the river; protection of river-related resources; the creation of the Lackawanna River Greenway, a system of interconnected parks, trails, open space/natural areas along the river and stream corridors through the urban areas to the upper watershed ridge tops and natural areas; the creation of a public education and public involvement program to provide positive river-based environmental experiences for the public; and importantly a Lackawanna River Partnership, an assembly of river stakeholders and decision makers from the public and private sectors. The partnership would meet regularly and foster cooperative consensus-based decision-making on public policy related to management of our river resources. The partnership would also work to secure investment for infrastructure to protect the river while advancing community development goals for the watershed.

Several components of these recommendations are being implemented by local and state agencies. The overall tenor of the Citizens Master Plan is that of a holistic document advocating a multi objective management and implementation philosophy. These aspects of the plan have been more difficult to realize. The creation of a formal Lackawanna River Partnership entity has not occurred. Several models have been suggested for consideration by public officials, yet, a consensus on the scope and role of such an organization has not yet emerged. The Partnership issue is discussed and considered further in this updated river conservation plan.

The development of the river greenway park and trail system is well on the way. The Plan for the Lackawanna Heritage Valley of 1991 followed up on several recommendations from the river plan of 1990. The Heritage Plan lead to the establishment of the Lackawanna Heritage Valley Authority (LHVA) to implement a wide range of programs and projects thematically related to the physical, cultural and socio-economic heritage of the community.

The LRCA worked with the National Park Service, the U.S. Army Corps of Engineers and the Heritage Authority on a Corps-funded reconnaissance level study for a Lackawanna River Greenway in 1992-93.

The outcomes of the Greenway study have resulted in two major initiatives, one for Greenway Trail development, the Lackawanna River Heritage Trail and another for a water quality improvement program, Lackawanna River Watershed 2000.

The Lackawanna River Heritage Trail (LRHT) is being developed under the leadership of the Lackawanna Heritage Valley Authority with Pennsylvania Heritage program funding and Transportation Enhancement program funding. The LRCA is partnering with Heritage Authority on programs to acquire former railroad rights-of-way, develop recreational trail installations and an inter-municipal trail committee to manage the completed trail. In addition to abandoned rail beds, the trail is proposed to run on Corps of Engineers' flood control levees, municipal parks and along public streets where river access is not available. The Rail Trail Council of Northeast Pennsylvania (RTC) and the Trails Conservation Corporation (TCC) have acquired abandoned Delaware & Hudson and New York, Ontario & Western rail corridors along the upper Lackawanna and are developing trails and conservation projects in these areas.

The Lackawanna River Watershed 2000 (LRW 2K) program is funded through a USEPA grant, administered through the Lackawanna County Commissioners. The goals of LRW 2K are to address combined sewer overflow (CSO) problems and acid mine drainage/abandoned mine land (AMD/AML) impacts to the Lackawanna watershed.

In other areas of initial recommendations, the LRCA continues to lead a public involvement initiative and conduct education programs. Individuals and organized groups have been involved with LRCA sponsored river cleanups, trail building, tree plantings and water quality monitoring. LRCA staff have conducted numerous school presentations, educational field trips, nature hikes and public speaking engagements.

Recently, the Lackawanna has been included in the Upper Susquehanna / Lackawanna Watershed designation as an American Heritage River through the efforts of a regional coalition of municipal, congressional and watershed stakeholders. This designation is drawing increased federal and state interest in economic development, mine reclamation, water quality improvement, watershed habitat enhancement and cultural resource development.

The present Lackawanna River Conservation plan examines existing programs and assesses program accomplishments to date. The LRCA has developed a series of public involvement activities to identify issues, goals and recommendations for the future.

Citizens from across the watershed have participated at public meetings, responded to surveys, reviewed the draft plan on the LRCA's website, lrca.org and volunteered on one of nearly one-hundred stream walk surveys.

A municipal advisory committee has been formed to facilitate interaction among the twenty-six municipalities in the watershed study area. Agency personnel at municipal, county, state and private agencies have been interviewed and have reviewed and commented on the plan. Business and private property interests have also been contacted for information and comment.

The assessment of ongoing activities, previous plan recommendations, actual physical conditions and activities in the watershed, public comment and review have been synthesized to develop this plan's recommendations.

1.2 Executive Plan Recommendations

The Lackawanna River Watershed Conservation Plan of 2001 provides recommendations for public policy, programs and activities to be considered by federal, state, county and local governmental agencies, non-profit conservation and community organizations, educational and cultural institutions, business interests and property owners.

The recommendations are offered in five broad categories:

- **Organizations and partnerships**
- **Environmental quality**
- **Recreation and natural resource conservation**
- **Community Development**
- **Public involvement and education.**

1.2.1 Environmental Quality Recommendations

- **Upgrades to municipal plans and ordinances to enhance the definition and protection of natural resources, improve flexibility in subdivision design and encourage watershed best management practices (BMP's). (See Sections 11.7 and 11.9)**
- **Improvements to sewage facilities and progressive response to a reduction of total maximum daily loads (TMDL's) for all pollutant sources in the watershed. (See Sections 11.1 and 11.2)**
- **Upgrades to stormwater management facilities and ordinances to include watershed BMP's; improved regulation of minor subdivisions and earth disturbance activities. (See Section 11.7 and 11.9)**
- **Long-term mine reclamation projects, post-Watershed 2000 and Growing Greener; integration of community and economic development with mine reclamation activities to restore environmental values through infill development strategies. (See Appendix B)**

1.2.2 Recreation and Natural Resource Conservation

- **Lackawanna River Heritage Trail Alternatives are recommended in Appendix A. A complete 40-mile trail route is described.**
- **Heritage Gateways, landings and trail heads are recommended in Appendix A.**
- **Greenways and connecting trails are recommended along many tributary streams including: St. Johns Creek, Roaring Brook, Leggetts Creek, Eddy Creek, Fall Brook and Racket Brook. (See Appendix A and C)**
- **The Roaring Brook greenway includes the North Pocono rail trail and links to Nay Aug Park. (See Sections 12.2 and 12.3)**
- **A special places inventory of natural, cultural and historic resource sites has been developed with recommendations to include special protection for these sites in future public and private plans. (See Sections 6.5 and 8)**
- **Watershed special places, natural areas identified in the 1997 Lackawanna County Natural Areas Inventory and most watershed lands associated with PG&W watersheds, now Theta Company lands are recommended for acquisition or special protection and inclusion in the pending Lackawanna and Luzerne counties open space plans. (See Sections 6.5, 6.6, 7.6, 11.7, 11.9, 11.10 and Section 12)**
- **Recommendations suggest that municipal comprehensive plans and ordinances could be upgraded to define, create, and manage the development and conservation of natural areas, open space, greenways, and water resource buffers through open space conservation subdivision designs and infrastructure Best Management Practices. (See Sections 11.7, 11.9, 12 and Appendix C)**

1.2.3 Community Development

- **Following on recommendations for open space and watershed resource protection, the plan suggests ordinance upgrades as well as voluntary incorporation of conservation design and planning techniques and watershed resource Best Management Practices by property owners and developers, especially institutional developers or developers of property associated with former PG&W watershed land. (See Section 6, 11 and 12 in their entirety)**
- **The use of conservation design and watershed BMP's is recommended for incorporation into all redevelopment of abandoned mine lands. Economic redevelopment of AML sites is recommended to create new investment opportunities in the Lackawanna Valley corridor between the Pittston, Scranton and Carbondale areas. Redevelopment of these lands with Smart Growth techniques can serve to create new economic platforms and engender environmental restoration of degraded watersheds. (See Sections 6.8, 11.4 and Appendix B, Mine Reclamation Plan)**
- **The development of new investment projects which demonstrate the comprehensive synergy of open space designs, watershed BMP's, neo-traditional village developments, and business park AML reclamations is suggested. (See Section 11.4) Existing developments which have potential to demonstrate some of these principles are the Leggetts Creek greenway, a**

residential development with a mine reclamation and recreation open space component in Scranton and the Valley View Business Park, an industrial site development with a mine reclamation and open space resource component.

1.2.4 Public Involvement and Education

- The plan recommends support for new and ongoing public involvement initiatives conducted by LRCA, LHVA, Rail Trail Council, Voluntary Action Center, Senior Environmental Corps and partner agencies. New programs for youth involvement are suggested, a Lackawanna Valley Ranger Corps, for example. Some involvement projects include, trash and litter cleanups, landscape and tree plantings, trail building and maintenance, water quality monitoring. (See Sections 7 and 11).
- The plan also recommends support for the institutional advancement of the LRCA: ongoing planning, board development, training retreats. (See Section 11.8)
- The plan recommends the further enhancement and development of river and watershed information, media and educational resource materials: brochures, maps, posters, videos, power point slide shows, CD-programs and support for lrca.org. (See Section 11.8)
- Other recommendations support the expansion of environmental educational service delivery among conservation organizations, school districts and educational institutions and for adult continuing education and technical training.
- The plan recommends the creation of and support for municipal Environmental Advisory Committees and an overall municipal watershed advisory committee.
- The plan recommends the establishment of a Lackawanna Watershed Nature Center with the participation and direction of the LRCA in collaboration with other community organizations and institutions. (See Sections 11.8, 12.2, 12.3 and Appendix C)
- The plan recommends an anti-litter program, suggests partnerships with the justice system, police departments, community groups, municipalities and the county solid waste management authority to facilitate various litter and dumping control programs. (See Sections 6.9 and 11)

1.2.5 Organizations and Partnerships

- This plan reiterates a major recommendation of the 1990 Citizens Master Plan, the creation of a Lackawanna River Partnership as an entity to oversee and coordinate the implementation of the plans recommendations. The plan suggests the use of the Metropolitan Planning Organization – MPO model which has proven useful in facilitating and prioritizing transportation planning. A further integration of this concept with the watershed team approach being instituted by PA DEP through the Environmental Futures Planning Process (EFP2) is recommended. The roles, mission and responsibilities are suggested. (See Sections 5, 6, and 11)

- Other organizational recommendations include the ongoing partnership among LRCA, LHVA, Rail Trail Council and valley municipalities focused on the creation and management of the Lackawanna River Heritage Trail Greenway. Trail partnerships are suggested in down valley, North Pocono and up-valley communities as well as in metropolitan Scranton and the Abingtons to further develop localized trail linkages to the LRHT system.
- Local Environmental Advisory Committees (EAC's), a municipal watershed advisory committee and watershed coalition are recommended to coordinate and facilitate localized aspects of watershed protection and greenway open space enhancements including upgrades to municipal plans and ordinances to institutionalize the protection and management of open space watershed resources and recreation greenways. (See Sections 11, 12 and Appendix C)

1.3 Priority Recommendations

A wide number of initiatives are underway based on earlier planning work, this plan prioritizes projects and programs which advance and compliment existing work:

- The completion of the Lackawanna River Greenway system including the Lackawanna River Heritage Trail with a significant Downtown Scranton waterfront complex, acquisition of river corridor parcels for conservation purposes and the upgrade of municipal plans and ordinances to improve local conservation capacity.
- The advance of Watershed 2000 by Lackawanna County and related reclamation programs by the PA DEP – BAMR and the U.S. Army Corps of Engineers.
- The development of a Lackawanna River Partnership entity in the context of a water resource MPO integrated with the PA DEP EFP2 process. This work should focus initially on mine reclamation, improvement of partnerships with sanitary authorities, development of TMDL's and updates of the ACT 67 stormwater plan.
- Integration of watershed reclamation work and greenway development with economic development initiatives.
- Completion of regional open space planning and development of resources to conserve, acquire and manage large open space networks in the Lackawanna watershed and adjacent watersheds.
- Programs to increase the capacity of LRCA in collaboration with other agencies to develop and disseminate environmental information and education.
- Programs to increase the visibility and capacity of local non-governmental conservation organizations to reach and utilize volunteers, members and business interests in the creation of sustainable economic and ecological relationships in the region.

Near term to mid term priorities to be developed in the 5 to 10-year period for new initiatives include the following:

- **Development of a North Pocono Watershed Conservation Coalition**
- **Linkage of a Roaring Brook/North Pocono greenway and trail system to the Lackawanna River Heritage Trail and Greenway. Further utilization of the North Pocono greenway to serve as a linkage to conserved watershed parcels as part of a regional open space network.**
- **Development of special places program to acquire, conserve and manage watershed special places such as waterfalls, ravines, escarpments either in the context of a regional open space program or integrated with a nature center network.**
- **Completion of a re-authorization/reallocation program for Stillwater Dam to meet multi objective water quality, habitat and recreation outcomes.**
- **Further development of Heritage Gateways and links to the Lackawanna Heritage Trail system such as: St. Johns Creek, Leggetts Creek, Fallbrook, and Racket Brook greenways. Extension of Leggetts Creek greenway to link with a Tunkhannock greenway, linkage of a Racket Brook greenway via D&H Gravity rail incline into the D&H Transportation Heritage corridor. (See Trail Alternatives in Appendix A and Tributary Stream recommendations in Appendix C)**

1.4 Considerations for Implementation

This plan recommends that watershed municipalities adopt resolutions which endorse the general and specific recommendations in this plan. The resolutions further request the Department of Conservation and Natural Resources to include the Lackawanna River and its watershed on the Pennsylvania River Conservation Registry. Acceptance of this plan and its recommendations by the municipalities and the PA DCNR Registry will be the first step towards implementation.

Based on the status of the Lackawanna River Corridor Association, as the community watershed conservation organization for the Lackawanna watershed, the LRCA will continue its leading role as a facilitator, convener and implementation partner with watershed municipalities, community organizations, business interests, county, state and federal agencies.

Due to the comprehensive nature of this plan and its recommendations, implementation initiatives, proposals, funding and partnerships may develop with project synergies governed as much by institutional visions, interests and constraints as by watershed-based values and expectations. This plan then serves the important role of being a long-term guidance and visionary document. There are literally hundreds of projects and programs which can result from the future growth of partnerships based on a collective vision for the Lackawanna and its watershed.

This watershed conservation plan and its complimentary Upper Lackawanna Watershed Conservation Plan can thematically tie together the aspirations and visions of watershed stakeholders from all levels, across our 350-square-mile watershed in four counties and over forty municipalities.

These plans are invitations to all of our fellow citizens to affirm their community values and become more aware of their relationships with their watershed and their

neighbors across this watershed and downstream through the Susquehanna River to the great Chesapeake Bay.

2. Purpose and Vision

The Lackawanna River Corridor Association is leading this watershed-wide community planning program to build a strong shared vision of our river and its watershed resources among the more than 250,000 persons who live and work in the Lackawanna River Watershed.

Since the completion of the Lackawanna River Citizens Master Plan in 1990, the LRCA has been working with elected officials, local municipalities, county agencies, state and federal agencies, business and community groups to encourage the protection and appropriate management of the river corridor and its adjacent lands. This work has resulted in the development of new riverside parks; a program to develop a forty-mile trail along the river, the Lackawanna River Heritage Trail; the creation of the Lackawanna Valley Conservancy, a land trust which is acquiring and managing river corridor and watershed lands; the designation of a Class A fishery in twelve miles of the river; the acquisition by the Rail Trail Council of thirty-two (32) miles of abandoned D&H railroad, twenty (20) miles of which run along the upper Lackawanna.

The LRCA also conducts River Watch, a citizens water quality monitoring program, River and Trail Works, a volunteer work projects program which has helped to clean up trash, plant trees and build trails and river access sites. The LRCA also helps to facilitate a partnership among several agencies to promote mine reclamation and stream restoration projects.

This work has been driven by a vision for a renewed and revitalized Lackawanna River developed during the formation of the Citizens Master Plan for the Lackawanna River in 1989-90. The vision for the Lackawanna grew stronger with the completion of the Plan for the Lackawanna Valley in 1991. These complimentary plans and shared visions continue as the basis for the partnerships engendered by the LRCA and the Lackawanna Heritage Valley Authority (LHVA) for the cultural, educational and resource conservation programs initiated through the past ten years.

The collective experiences encountered by the LRCA and our partners in the implementation of the original recommendations of the Citizens Mater Plan have created an understanding of the challenges to the multi objective management philosophy, which has served as the foundation of the Citizens Plan.

Where a consensus was achieved and maintained, the development of the trail is a strong example, a significant level of success has been possible. Other recommendations in the Citizens Mater Plan have proven more difficult to implement. The creation of a Lackawanna River Partnership, an intergovernmental initiative to guide environmental restoration and water resource management decision-making has not been realized at the level recommended in the 1990 plan. There is a continuing dialogue among the various agencies and the LRCA which is providing some of the guidance envisioned in the Citizens Mater Plan.

The successful outcomes and remaining challenges deriving from the Citizens Mater Plan form one of the basis of analysis and recommendation in this river conservation plan. The other informational basis in this plan are the physical

reassessment of the river corridor and watershed tributaries, the involvement and input from local elected officials, property owners and interested citizens.

The new opportunities created by changes in funding, programs and policies particularly at the state government level also provide direction for local watershed decision-making as do new nongovernmental resources such as the partnerships among the LRCA, Rail Trail Council of Northeast Pennsylvania (RTC), and their land conservancy affiliates the Lackawanna Valley Conservancy (LVC) and the Trails Conservation Corporation (TCC). The development of Environmental Advisory Committees (EAC's) by local municipalities in the context of the Municipalities Planning Code may also provide opportunities for implementation and management for a variety of recommendations in this plan.

2.1 Vision

The community vision for the Lackawanna continues to be: a revitalized Lackawanna River with a water quality that sustains a viable fishery and is ultimately fishable and swimmable from its headwaters to its confluence. The vision further includes a well-balanced natural riparian corridor protecting the river and featuring an extensive and well-maintained park and trail system. The vision also looks to upland and headwaters areas of the Lackawanna watershed along tributary streams to see well-managed natural areas of healthy forests and wetlands, protected through a mix of public ownership and private conservation easements.

Our community vision also includes a view towards the decision-making and long-term management process whereby the citizens of the valley acting through the communities' institutions in government, the business and non-profit sectors maintain an active involvement insuring the sustainability of our watershed relationships. The collaboration among agencies, utilities and community interests can enhance future investments in management of our water resource infrastructure. Understandings of how informed land use practices can protect and compliment natural systems while encouraging the smart growth of our economy further expand the vision we have for the Lackawanna.

Ultimately, this community vision for the Lackawanna is our guide to maintaining a high quality of living, sustaining balanced economic and ecological relationships and excelling in the competitive global environmental of the Twenty-first Century.

2.2 Scope of Work

The scope of work for this Lackawanna River Conservation Plan includes the following elements:

- a review and reassessment of the Lackawanna River Citizens Mater Plan of 1990
- a physical assessment survey program of the main stem of the Lackawanna from the confluence to mile thirty and assessment surveys to all major tributary streams
- a series of public meetings, press releases, and media and internet contacts to elicit public comment and involvement

- **presentations and working group discussions with municipal officials and agency staff**
- **key person surveys and interviews**
- **involvement of officials, agency staff and community volunteers with the planning process**
- **compilation of physical assessment data; formation, ranking and prioritization of issues, projects, programs and recommendations by LRCA Board Members and staff with review and comment by municipal officials and the public.**

The Lackawanna River and Watershed Conservation Plan for the 21st Century is the final result of this seven-step process. We believe the plan represents the consensus vision of the citizens and elected officials of the Lackawanna Valley for the Lackawanna Watershed. The Board of Directors of the Lackawanna River Corridor Association looks forward to the growing collaboration of all watershed interests as our community works to implement the recommendations in this plan.

3. 3. The River and its Watershed

The Lackawanna River flows for nearly sixty- (60) miles through a 350-square-mile watershed in the four counties in Northeastern Pennsylvania to its confluence with the North Branch Susquehanna River at Coxton near Pittston, Pennsylvania. The Lackawanna rises in a series of glacial ponds and wetland bogs along the border areas of Wayne and Susquehanna counties in the glaciated plateau province of the Appalachian Mountains.

The source ponds and bogs lay in an arc approximately twelve miles to the northwest north and northeast of Forest City, Susquehanna County. The source ponds of the West Branch Lackawanna River are Sink Hole Swamp, Lake Romobe, Ball Lake, Hathaway Lake, Fiddle Lake, Lowe Lake and Lewis Lake. The East Branch Lackawanna River source ponds are: Bone Pond, Independent Lake, Dunns Pond, Mud Pond, Lake Lorain, and Orson Pond.

The east and west branches of flow together at Stillwater Dam, a flood control dam constructed by the U.S. Army Corps of Engineers in 1960 located one mile south of Union Dale along PA Route 171. After flowing through Stillwater Dam and Old Stillwater Lake, a water supply reservoir, the river flows through Stillwater Cliffs, the Lackawanna Water Gap, and begins its thirty-nine-mile course through the Lackawanna Valley to the North Branch confluence at Pittston.

The Lackawanna Valley is the northern-most portion of the Appalachian Ridge and Valley province. It also forms the northern half of the Lackawanna/Wyoming Syncline, a large geo-synclinal fold in the Allegheny front range which doubles back on itself to form the east and west rims of the synclinal valley.

The confluence of the Lackawanna and North Branch Susquehanna rivers occurs at the midpoint in the fifty-five-mile long Lackawanna / Wyoming Valley. The Susquehanna River enters the valley through a water gap marked by a cut in the western rim of the syncline. The cut creates an escarpment known as Campbell's Ledge, which is located three-quarters of a mile north of the river confluence.

In addition to the headwaters source ponds, several large tributary streams of the Lackawanna rise on the plateau and flow into the synclinal valley through water gaps. Leggetts Creek rises to the west near Clarks Summit and flows through Leggetts Gap also known as The Notch in the West Mountain. Rush Brook in Jermyn and Fall Brook in Carbondale also rise on the Allegheny Plateau to the west of the valley and flow through Rushbrook Gap and Fall Brook Gap in the West Mountain which is also known as the Lackawanna Range.

Roaring Brook, the Lackawanna's largest tributary rises on the Pocono Plateau along the Lackawanna, Wayne county boarder immediately west of the headwaters of the Lehigh River. Roaring Brook flows west through Cobbs Gap in the Moosic Mountains.

Stafford Meadow Brook and Spring Brook also rise on the Pocono Plateau and flow west through the Moosic Mountains into the Lackawanna Valley.

The balance of Lackawanna's tributary streams rise in springs, seeps and wetland bogs along the flanks of the West and Moosic mountain ranges.

The Lackawanna flows for thirty-nine (39) miles from Stillwater Dam passing through Forest City, Clinton Township, Vandling, Fell, Carbondale Township and City, Mayfield, Jermyn, Archbald, Jessup, Blakely, Olyphant, Throop, Dickson City, Scranton, Taylor, Old Forge, Moosic, Duryea, and Pittston where it joins the North Branch Susquehanna River.

3.1 Soils and Geology

The perennial base flow of the Lackawanna is relative to hydro-geologic interactions, soil conditions and the climatic precipitation cycles in the northern Appalachian region. The glaciated features such as the swamps, bogs, ponds and lakes at the headwaters of the river and tributary streams serve as reservoirs interrelated to regional groundwater flows. The geological conditions and soils of the Lackawanna watershed influence the quality of ground water as well as its quantity.

Much of the river's flow from the glacial wetlands and ponds is recharged from groundwater stored in deposits of glacial till (boulders, cobble stones, sand and gravel deposits) and in faults and fissures in sandstone and shale strata. The ground water is recharged by percolation of rain and snowfall from rocky less permeable soils in upland areas along the Moosic and West mountains and along the Allegheny/Pocono plateaus. Groundwater flows along the river and lower reaches of many tributary streams are also impacted by the manmade conditions of the flooded subterranean abandoned mine network which underlies the Lackawanna and Wyoming valley as well as the enormous quantities of mine refuse, overburden piles and stripping pits forming significant surface features in the valley.

The periodic glaciations that occurred during the past 500,000 years has influenced the surface hydrologic conditions and some of the stream flow patterns of the Lackawanna Valley. The presence of anthracite coal along the main portion of the Lackawanna Watershed is a much older legacy, dating back 300-million years in geologic time to the Paleozoic era. Continental drift and plate tectonics created a repetitive pattern of mountain building, rising and lowering of sea beds and the emergence and disappearance of vast Everglade-like swamps.

The vegetation of these swamps built up layers of decaying organic material or peat which was successively covered with sediments as oceans rose to submerge the swamp. After 150 to 200-million years of this repetitive process, the area of Northeast Pennsylvania was subject to the tectonic plate movements which created the Appalachian Mountains. The mountain orogeny caused tremendous physical pressures on the coal deposits of Northeast Pennsylvania driving out volatile organic compounds and increasing the carbonization of the coals. This resulted in the creation of anthracite, the hardest of all coals.

The mountain orogeny also created the unique landform which dominates the watersheds topography, the Lackawanna Syncline. The mountain building resulted in the uplifting of the Allegheny Plateau and the folding of the Ridge and Valley province. The Lackawanna syncline forms the Lackawanna and Wyoming valleys. While the valleys have separate names they are actually the southern (Wyoming) and northern (Lackawanna) portions of the syncline. The syncline is formed of convex folded rock strata similar in some ways to the bottom or trough portion of a wave. The crest portions of the wave known as anticlines have eroded away from the ridgelines on the east and west of the valley.

There is an anticline feature which lies under the base of the syncline and perpendicular to its axis. Known as the Moosic Anticline it is evident by its crest of sandstone rocks visible in the riverbed at Old Forge and at Campbell's Ledge on the ridgeline above the Lackawanna Susquehanna Confluence. This feature roughly along the Lackawanna-Luzerne County border also serves to divide the valley into its two parts.

The anthracite coals are contained in the Llewellyn formation which consists of alternate layers of sedimentary rocks: sandstone, shale, coal. The Llewellyn formation is underlain by the Pottsville, Mauch Chunk, Pocono and Catskill formations. The Pottsville contains coal, shale, sandstone and conglomerate. The Mauch Chunk is characterized by reddish sandstones and shales. The Pocono formation is composed of very dense sandstones and conglomerates. The Pocono formation outcrops along the ridge tops of the Moosic and West mountain ranges and is underlain with Catskill sandstones and shale. The Catskill formation predominates on the outer perimeter of the watershed to the Pocono Plateau in the east and the Endless Mountains / Allegheny plateau to the north and west.

Water gaps form some significant visual and topographic features and act as gateways to the valley. Some of the water gaps are:

- The Lackawanna Water Gap at Stillwater Cliffs north of Forest City, this gap is the point of entry of the upper Lackawanna River into the synclinal portion of the watershed.**
- Cobbs Gap in the Moosic Mountain allows passage of Roaring Brook from its headwaters on the Pocono Plateau to its confluence with the River in Scranton.**
- The Notch or Leggetts Gap allows passage of Leggetts Creek through the West Mountain to its confluence with the river in North Scranton.**
- Campbells Ledge or the Susquehanna Water Gap allows the passage of the North Branch Susquehanna River into the syncline Wyoming Valley just upstream of the Lackawanna River confluence.**

The geologic boundary of the Llewellyn and Pocono/Pottsville formations runs roughly at about 1500' elevation along the east and west flanks of the valley. Many of the Lackawanna tributary streams have created waterfalls, serpentine rock cuts and ravines at these geologic intersections. Some better known waterfall sites are Nay Aug Falls and Gorge on Roaring Brook in Scranton, Fallbrook in Carbondale, Panthers Bluff in Simpson and Blakely Falls on Hull Creek.

3.2 Flora and Fauna

The Lackawanna watershed supports a diverse temperate mixed forest with a variety of habitats influenced by location, elevation, soils and human impacts. The watershed provides opportunities for both northern and southern forest communities. The forest is in a secondary succession with virtually all of the native forest cut for lumber during the 19th Century.

The forest communities transition from southern with mixed oak (chestnut) to northern with maple, ash and hickory. Some representatives of arctic and boreal communities are also present due to elevation and soils.

Appalachian heath barrens along the Moosic and West mountain ranges are influenced by shallow soils and wind exposure. Scrub oak, pitch pine communities thin out to acidic rocky summit communities hosting sedges and lichens. Wetlands in the Roaring Brook and Spring Brook watersheds and in the headwaters of the Lackawanna provide habitat for some boreal forest trees such as tamarack, black spruce, and paper birch. The wetlands also contain some bogs with a variety of plants such as pitcher plant, lady's slipper, leather leaf, rhododendron, huckleberry and mountain laurel.

The watershed habitat supports a variety of game and non-game aquatic, terrestrial and avian fauna.

Common mammals are white-tale deer, black bear, raccoon, fox; mink, beaver and muskrat are numerous along the river and tributary streams. There have been several reported sightings of river otter in the Lackawanna.

The river corridor provides habitat for numerous waterfowl with mallard, black and wood ducks being the most commonly sighted ducks. Great blue heron, green backed heron, and belted kingfisher are regularly seen. Osprey, barred owl, red tail hawk, coopers hawk and sharp shinned hawk are also found in the watershed. The Lackawanna watershed is part of the Atlantic Flyway and hosts numerous migratory species with the river corridor and wetlands being important to water fowl migrations while the ridgelines of the West and Moosic ranges are important migration corridors for both raptors and neo-tropical migratory song birds.

The fishery of the Lackawanna provides a classic habitat for trout. The Lackawanna was noted historically as a fishery for brook trout. The river and its fishery habitat were nearly completely destroyed by 150-years of anthracite mining. During the past thirty years, the river has recovered and the brook trout have reestablished. The native brook trout, common to the river and many of its tributaries, have been displaced by the introduced brown trout as the indicator species in the main steam of the Lackawanna as well as the east and west branches and the larger tributary streams.

The Pennsylvania Fish and Boat Commission classifies a 12-mile reach of the Lackawanna from Lackawanna Avenue in Olyphant to Fallbrook in Carbondale as a Class "A" fishery for trout. This classification is based on a fishery study in 1992, which noted a reproducing population of brown trout and brook trout in the 12-mile reach.

According to the fishery study the river begins a transition from a predominantly coldwater fishery to a warm water fishery at the border between the Boroughs of Throop, Dickson City, and the City of Scranton, River mile 15 and the site where Interstate 81 crosses the Lackawanna.

Other fish common in the Lackawanna include a variety of darters and dace, small mouth bass, sunfish, crappies, carp and suckers.

Several studies including two conducted by the Lackawanna River Corridor Association have shown that the fishery and aquatic habitat become completely degraded in the lower three miles between the Old Forge Bore Hole and the confluence. Acid and metals loading and disposition from the borehole's 100-million

gpd acid mine drainage flow are largely responsible for the loss of fishery, aquatic habitat and water quality in the lower Lackawanna.

The Lackawanna watershed also provides habitat for a variety of amphibians such as spotted salamanders and green frogs; common reptiles are rattlesnake and snapping turtle.

A Natural Areas Inventory of Lackawanna County was completed by the Nature Conservancy's Pennsylvania Science Office in 1997. This inventory identified over forty important and relatively intact natural areas ranging in size from the 6,000-acre Moosic Mountain Barrens, a ridge top dwarf tree and acidic mountain bald community to Bear Swamp, a broadleaf conifer swamp with several species of special concern. Lackawanna County has initiated an open space study to develop management programs involving property owners, public and private conservation agencies with the long-term protection of natural habitat and open space lands.

In the upper Lackawanna watershed important natural areas have been identified in the vicinity of Mountain Mud Pond and Dunns Pond along the east branch and at Panther Bluff Creek.

3.3 Socio-Economics and Cultural History

The earliest human evidence in the Lackawanna watershed has been documented by the Frances Dorrance Chapter of the Pennsylvania Society of Archeology. A dig site at the confluence of the Lackawanna and Susquehanna has produced artifacts from the pre contact Woodlands period 800 to 1400 A.D. to the Archaic 9000 B.C. There have been other documented discoveries along the ridgelines of the valley at sites known as rock shelters. These sites provided migratory shelter for hunting gathering groups during many prehistoric periods. Careful investigation is suggested at undeveloped wooded sites along the watershed to determine any potential for archeological values.

Due to the development of towns and mining sites along the floor of the Lackawanna Valley, the integrity of most of the built-up area for archeological value has been destroyed. Horrace Holister in his seminal 1857 History of the Lackawanna Valley relates the discovery and despoliation of Lenape gravesites in the vicinity of the Tripp Homestead in Scranton. He speculates that one of the plundered graves was that of Capouse, the Lenape Chieftain visited by the Morravian Missionary, Count Zinzendorf along Capouse Meadows on the banks of the Lackawanna in 1750. Other evidence of past contact Native American presence was the discovery of a ca 1675 dugout canoe in Lake Quinn, Wayne County in 1996. This site is east of the Moosic Mountain in the Wallenpaupack watershed.

The historic record also contains the heritage of Native American paths and trails. The Susquehanna Warrior path followed the Susquehanna from the Chesapeake to the Finger Lakes region. The Lackawanna path and the Oquaqa path were a short cut up the valley to the Lake Otsego headwaters of the Susquehanna at present day Cooperstown, New York. The Minisink Trail lead from the upper Delaware River along the Wallenpaupack and over Moosic Mountain into the Lackawanna and Wyoming valleys. The Minisink was later the route of Connecticut settlers who developed it into a wagon road known as the Connecticut Road. Traces of this road are evident on Moosic Mountain today as jeep trails.

The region was settled by people from Connecticut and the Philadelphia region between the 1760's and 1780's. These groups fought skirmishes with one another and with Lenape and Iroquois groups during the period. The conflicts known as the Yankee-Pennamite wars were related to conflicting land claims and sovereignty based on Royal Charters granted by English King Charles II. These conflicts were resolved by 1787 and Connecticut relinquished its claims. The settlers were given land title under Pennsylvania law and Luzerne County was erected.

An important battle occurred in the valley during the American Revolution. In July 1777 a war party of approximately 800 Loyalist Tories and 1200 Iroquois moved down river from New York and besieged the Wyoming Valley farms and settlements at Wilkes-Barre, Forty Fort and Pittston. The war party lured the settlers' militia out of Forty Fort and routed them along the flood plain of the Susquehanna. After defeating this group, the party defeated other settlers in forts and blockhouses. There was a great loss of life from savage beatings and torture subsequent to the battle. Several hundred settlers escaped by fleeing through the Pocono Mountains to Stroudsburg and Easton or downriver to Fort Augusta at Sunbury.

The Continental Congress commissioned John Sullivan to conduct a punitive campaign the following year. Sullivan's Army built a roadway through the Poconos from Easton to Wilkes-Barre and transported weapons and supplies to mount an attack up the Susquehanna and into the Finger Lakes region, the Heartland of the Six Nations Iroquois Confederacy.

After successive battles, Sullivan's Army defeated the Iroquois as a fighting force and laid waste to their villages and crops. Many Iroquois fled to the safety of British protection past the Niagara frontier. The removal of the Iroquois as a political-military presence on the Pennsylvania - New York frontier was a strategic victory in our nation's war of independence. That victory had its impetus in the Lackawanna Wyoming watershed.

Following the Revolutionary War, the region developed primarily with an agricultural economy. Economic development was hindered by the difficulties of transportation through the mountains between the valley and coastal settlements. The presence of anthracite coal began to attract the attention of capitalist entrepreneurs after the War of 1812. By the 1820's, anthracite coal became recognized as both an industrial and domestic fuel, more economical and practical in its uses than wood or charcoals.

The area's rivers became avenues of commerce, coal was shipped down the Lackawanna and Susquehanna or taken in ox carts to the Lackawaxen, Lehigh and Delaware rivers. The Wurts Brothers led the formation of the Delaware and Hudson Canal Company in the 1820's to access coal in the northern Lackawanna Valley and ship it to ports of New York. The D&H Canal ran from the Hudson River at Kingston up the Shawngunk Valley to the Delaware River and up the Delaware and Lackawaxen rivers to Honesdale. Due to the impracticality of building a canal over the 2,200' high Moosic Mountain, the D&H developed an ingenious gravity railroad using stationary steam engines, hoisting cables and inclined planes to transport coal wagons over the Moosic Mountain from Carbondale on the Lackawanna River to Honesdale at the head of the D&H Canal along the Lackawaxen River.

This began a 150-year industrial legacy of resource exploitation in the Lackawanna Valley. As the Wurts brothers' D&H enterprises expanded down the valley in the 1840's, the Town of Carbondale grew as an urban industrial center. By 1840 the older towns down valley which dated to the Connecticut settlement, Providence, Hyde Park and Slocum Hollow began to grow as transportation improvements advanced commercial opportunities.

The Scranton and Platt group of iron makers established an iron works industry at the Slocum Brothers Mill on Roaring Brook a half-mile above its confluence with the Lackawanna in 1838. After several difficult years, they secured a contract to produce Iron "T" rail for the New York and Lake Erie Railroad in 1846. This advanced the industrial urban development of the valley as the iron works at Slocum Hollow grew to become the City of Scranton.

The Scranton Brothers and other investors developed the Delaware, Lackawanna and Western Railroad in 1852. The DL&W provided an alternative means of transportation which further accelerated the valley's development. Later the Pennsylvania Coal Company developed a gravity rail connection to the D&H Canal at Hawley and the Susquehanna Canal at Pittston.

The Lehigh and Susquehanna Railroad connected with the Lehigh Coal and Navigation Company also entered the valley in search of coal mining opportunities. The Erie railroad had several routes into the Lackawanna Valley, these included the Erie and Wyoming Valley Railroad which resulted from a merger with the Pennsylvania Coal Company Gravity Railroad. This route followed Roaring Brook. The Jefferson Branch of the Erie followed the Lackawanna River north from Carbondale to Lanesboro in 1869, leaving the watershed as it crossed Ararat Summit.

The New York, Ontario and Western Railway was the last railroad to develop a route into the Lackawanna Valley in 1890. The O&W paralleled the Lackawanna River from Scranton to Union Dale. Its gateway to the watershed was near Lake Lorain at the east branch Lackawanna headwaters.

The demand for anthracite coal as a primary fuel accelerated as America underwent the industrial revolution in the mid 19th Century. Coal mining activities increased at a feverish pace in the watershed. Coal, iron and rail industries were intertwined along the valley even as they competed for markets. The impacts of the infrastructure and coal mining process caused a tremendous amount of ecological, geological and hydrological damage to the watershed. This damage expanded with the advent of strip mining and wet process coal preparation in the early to mid 20th Century (see Appendix B).

The production of anthracite coal peaked in 1918. The human population of the region which had grown exponentially with large European migration in the 19th Century peaked in the 1920's.

The human population of the Lackawanna Valley evolved into a diverse spectrum of ethnic, cultural and religious groups. English, Welsh, Irish and German were the predominant early migration groups with Southern and Eastern European groups arriving in large numbers between the 1880's and 1920's.

The conflicts between industrialists and the working classes in the anthracite region contributed to the evolution of the American Labor Movement. These conflicts helped to institutionalize and legitimize collective bargaining agreements. By the 1920's through numerous strikes in the previous fifty years, regional coal and rail workers had finally achieved a reasonable standard of living.

The economy was still dominated by anthracite mining with silk and textile industries forming the largest alternative industry. Iron and steel making ended in Scranton in 1902 with the transfer of the Lackawanna steel works to Buffalo, New York under the ownership of the Bethlehem Steel Company.

The Great Depression of 1929-1940 had a profound effect on the regional economy. The market for anthracite coal began to diminish along with employment in the mining and rail industries. Strip mining become a more common practice as underground mining became more expensive to conduct.

Social dislocations became endemic as workers left the region for better and safer employment opportunities with manufacturing industries in nearby states.

The out-migration increased during and after World War II and remains evident into the 2000 Census as Lackawanna and Luzerne counties continue to loose population.

The fuel dependence of the United States shifted away from coal to oil and natural gas after the Second World War. By 1956, the costs of mining exceeded the price per ton of underground mined anthracite coal. In 1959, the tragic Knox Mine Disaster occurred at Pittston, the Susquehanna River broke into the underground workings and flooded all deep mines in the Wyoming Valley. On November 1, 1960 the Hudson, Moffat and Glen Alden operations ceased underground pumping in the Lackawanna Basin creating the northern anthracite mine pool between Old Forge and Carbondale.

On November 1, 1966, the Continental Mine at the base of West Mountain was closed ending all underground mining in the Lackawanna Valley. This mine is now open as the Lackawanna Coal Mine Tour at McDade Park, operated by Lackawanna County.

Marginal coal strip mining and culm bank reclamation projects have occurred from time to time since the 1960's. Numerous Bureau of Abandoned Mine Reclamation projects have been completed based in part on the Scar-Lift program of 1970.

The legacy of mining has left many environmental scars. Vast acreages of the valley are affected by strip mine overburden piles, pits and un-vegetated coal waste banks also known as culm dumps. Over a dozen major acid mine drainage outfalls discharge between 1 and 150-million gallons per day into the river and tributary streams.

The mining legacy has also provided the background for the growth of two large municipal waste landfills and related rock quarrying operations, Alliance in Taylor and Keystone in Dunmore. These entities as part of the interstate waste disposal industry continue to influence the economic and cultural variables of the watershed and its human and natural communities.

The regional transportation infrastructure has undergone significant changes in the 20th Century. The extensive railroad network shrunk as coal shipments diminished. The automobile and trucking culture gradually overtook rail as the public's transportation choice. By 1970, the Phoebe Snow, the Lackawanna Railroad's flagship streamline Pullman train between New York and Chicago was history. Contractors were hard at work pouring concrete and blasting mountainsides to complete the interstate highway system in Northeast Pennsylvania.

The population of the Lackawanna Watershed in the year 2000 is estimated to be approximately 240,000 (based on 1990 projections for Lackawanna County and estimates for adjacent areas of Wayne, Susquehanna and Luzerne within the Lackawanna Watershed boundaries).

Some significant employment statistics are as follows: *

Persons employed age 16 & older	97,400
Retail Trade	18,100
Manufacturing	21,000
Health Services	11,000
Finance, Insurance, Real Estate	5,300
Education	7,600
Professional Services	5,650
Construction	5,200
Wholesale	4,500
Transportation	4,500
Public Administration	4,500
Repair Services	3,600
Personal Services	2,700
Communications & Utilities	2,000
Entertainment & Recreational	1,000
Agriculture Forestry & Fisheries	700
Waste Management	500
Mining	150
River Conservation	3

* Sources: 1990 Census Data, Pa Dept. Labor and Industry, Harris PA Industrial Directory, Scranton Times, Scranton Chamber of Commerce, Lackawanna River Corridor Association. Some figures rounded to nearest hundred and updated with year 2000 estimates by LRCA staff.

The communities in Lackawanna Valley engendered their own recovery from the anthracite industry beginning in 1942 with the Scranton Plan. Local chambers of commerce, business and local governments have cooperated to create an economic diversity of manufacturing, logistical and presently, high tech industries. This economic growth has expanded at the beginning of the 21st Century with a larger role for the information industry and institutions of higher education. The recently developed Great Valley Initiative promotes the area's communications and

technological infrastructure and quality of life issues such as small town values, open space-natural areas and recreational opportunities as a foundation for smart economic growth.

The Lackawanna River Corridor Association (LRCA) and the Lackawanna Heritage Valley Authority (LHVA) evolved in the 1990's to develop future oriented programs based on the cultural and environmental heritage of the watershed. Educational and recreation programs tied to cultural tourism, environmental management technologies, and stewardship of natural and cultural resources are helping to preserve and recreate the regions environment and heritage. The LRCA, LHVA and the Rail Trail Council of Northeast Pennsylvania (RTC) are working collaboratively to acquire abandoned rail corridors and develop pedestrian bicycle recreational trails along the Lackawanna River.

The LRCA continues its work with the community to advance the stewardship of watershed and river corridor resources. Many municipalities in Lackawanna County have comprehensive plans, zoning, land use and subdivision regulations, these include stream corridor building setbacks, flood plain ordinances and storm water management regulations. In the upper Lackawanna watershed, Forest City Borough and Herrick Township in Susquehanna County have comprehensive zoning plans and regulations. Few of the rural townships have comprehensive plans, relying instead on county plans and ordinances to regulate land use and development.

The construction of the Governor Robert Casey (Lackawanna Valley Industrial) Highway between Interstate 81 and U.S. Route 6 in Carbondale between 1995 and 2000 brought federal and state funding to support updates of comprehensive plans and ordinances in twelve Lackawanna Valley municipalities. With the participation of the Lackawanna County Regional Planning Commission (LCRPC), the municipalities are working with planning consultants to develop a unified land use and subdivision program based on a transportation and land use planning process which involved diverse community interests. The new ordinances and plans may help to promote reclamation of mining sites for infill redevelopment, the creation of greenway corridors and buffer zones along waterways and the conservation of natural areas.

Subsequent development activities and proposals to extend sewer service into previously undeveloped watershed lands and ridge top natural areas highlight concerns that planning and zoning alone cannot and will not protect essential watershed water quality and natural habitat values. Recent involvement of land trusts and conservancies such as The Nature Conservancy may provide alternative and complimentary land management strategies to assist in maintaining a sustainable watershed habitat.

As previously mentioned, a natural areas inventory was completed in Lackawanna County in 1997, Wayne County was surveyed in 1991. Other natural areas and scenic or historic sites have been identified throughout the watershed by biologists, archeologists, property owners, conservation, civic and educational organizations.

4. Issues: A discussion and review of public policy issues and topics affecting the Lackawanna River watershed environment

The Lackawanna River Citizens Master Plan (LRCMP) identified a range of issues affecting the Lackawanna River through a needs assessment. The LRCA and various agencies have continued a needs assessment in the identification of problems and the development of programs and projects to address or solve the problems. This process of local ranking, prioritization and implementation occurs in the context of state and national environmental policy. There are numerous local issues that are not adequately addressed or funded by state and federal sources. Local funding capacity is often insufficient to address most issues.

The classification of issues in this plan by general topics address the physical environment of water and land, the human interactions which affect the water and land and the cultural and governmental institutions which influence the human interactions. This organizational approach to issue discussion is also applied later in this plan to the formulation of recommendations for programs, projects and public policy decision-making.

The continuing assessment of needs is discussed across all issues. Numerous criteria have been employed by various agencies to determine need and reach a consensus that specific needs either are or are not being addressed sufficiently to solve an identifiable problem.

The LRCA utilizes one basic criteria in the needs assessment, which has led to the inclusion of the issues in this plan, namely the impact or potential impact of a particular action or inaction on the land and water quality, habitat quality and ecological sustainability of the Lackawanna River and its watershed.

These criteria represent the values embodied in the mission statement of the LRCA found in Article 11, Section One of the Association's bylaws.

“The purpose of the Lackawanna River Corridor Association is to encourage the appropriate protection, development and management of the Lackawanna River and its adjacent lands. The LRCA's primary long-term goals are to improve the environment of the Lackawanna River and its adjacent corridor to restore healthy, reproducing fish and wildlife populations; to make the river safe; to expand other recreational uses of the river corridor through the development of riverside parks, trails, boat liverys, and other facilities; to encourage economic development that will benefit and benefit from the enhanced values of the river corridor; and to help the communities bordering on the Lackawanna River to value the river and their heritage, and to appreciate the importance of environmental quality to the health and the economy of the region.”

While the LRCA continues to build consensus towards a solution to the problems evident along the Lackawanna and across its watershed, the practicality of solutions is not a consideration in the identification of problems. It becomes one in the prioritization of public policy and the consensus building needed to implement a given solution.

5. Water Quality and Quantity

The evolution of our understanding of clean water and water pollution issues during the Nineteenth and Twentieth centuries has led to the development of water, air and general environmental quality regulation in all developed countries. Gradually through legislation, regulation and appropriation, states and localities began to address issues like sewage treatment, erosion control, industrial waste, drinking water protection and here in the Anthracite Coal Region, acid mine drainage problems.

The Pennsylvania Clean Streams Act of 1937 mandated the elimination or control of pollution. The Act soon impacted local municipalities and businesses as various state agencies would issue orders for compliance from time to time. The anthracite coal industry, particularly older operations were exempt from many of the requirements of the Act and subsequent amendments. These exceptions gave the municipalities a significant reason for not developing modern sewer collection and treatment systems.

By 1960 the anthracite industry had declined to a point where it no longer generated water pollution as it had in the past. Commonwealth of Pennsylvania agencies such as the Sanitary Water Board of the Department of Health were finally able to prevail on local governments to begin the long over due cleanup of the Lackawanna. The incentive of matching federal and state grants was the final element inducing the cooperation of local municipalities.

With the development of municipally owned sewage treatment works, many private industrial discharges found it to their benefit to develop a pretreatment discharge program with the local sewer authority rather than develop and operate their own treatment works. With the Clean Water Act of 1972 and the inception of the National Pollution and Discharge System permits (NPDES), the incentives for industrial users to join municipal systems increased.

5.1 Sewage Treatment, Treatment Plants, CSO's, ACT 537 planning

The late 1960's and early 1970's saw the creation of four initial sanitary treatment authorities:

- The Scranton-Dunmore Sewer Authority, also known as the Scranton Sewer Authority (SSA) was created. Between 1962 and 1966 it constructed a 22-million gallons-per-day plant on the Lackawanna River off Cedar Avenue in South Scranton. The SSA also developed a complex interceptor sewer collection system at that time.
- The Lackawanna River Basin Sewer Authority (LRBSA) was created by Lackawanna County to address treatment needs in twelve municipalities in the county as well as Forest City and Susquehanna County and Clinton Township in Wayne County. LRBSA operates plants in Clinton Township, Archbald and Throop.

The plants came online in early 1973. LRBSA originally operated a plant in the Borough of Moosic but it was closed and a treatment arrangement was instituted with the Lower Lackawanna system in 2000.

- **The Lower Lackawanna Valley Sanitary Authority (LLVSA) also called “Lower Lack” was created by several municipalities in the lower watershed: Taylor and Old Forge in Lackawanna County joined with Avoca, Duryea, Hughestown, Dupont and Pittston Township in Luzerne County. The Lower Lackawanna plant is located on Coxton Road in Duryea one-half-mile upstream from the confluence of the Lackawanna and Susquehanna rivers. It came online in 1973.**
- **The Clarks Summit – Abington Joint Sewer Authority (CSAJSA) was created by a merger of the Clarks Green Treatment Works into a new multi municipal arrangement that built a new and larger plant at Chinchilla along Leggetts Creek on US Route 6. The CSAJSA plant came online in 1972. It provides service to a large area of Clarks Summit and Clarks Green boroughs and South Abington Township in the Leggetts Creek watershed.**

As of 1990 several small treatment systems were permitted for private use or industrial waste treatment and discharge with individual NPDES permits. Most industrial and commercial discharges are discharging through pretreatment system plans into one of the municipal treatment works.

With the advent of urban/suburban sprawl-type growth in the previously agricultural or wooded uplands of the Lackawanna watershed from the 1970’s through the present, there have been increasing incidents of water supply, aquifer, lake and stream contamination from a growing number of on-lot septic systems which are compromised due to age, lack of proper maintenance or improper installation. Several developer-owned treatment plants have also failed leading to a serious threat of water supply contamination.

These facilities contributed in 1985 to the giardia cyst contamination of the urban water supply that is located in suburbanizing watersheds along the flanks of the Lackawanna Valley. The USEPA and the PA DER ordered several municipalities to update their Act 537 sewer facilities plans and begin to develop treatment plant and collector systems. New sewer authorities and plants have been developed during the 80’s and 90’s in Moscow Borough, Elmhurst, Roaring Brook, Spring Brook, and Covington townships in the North Pocono area.

Act 537 plan updates and plans for new systems have been stalled for over ten years in Jefferson Township in the North Pocono area and in Scott Township.

The development of the watershed’s sewer systems is a study in contrast. The early systems in the urban corridor were built with 80% federal grants and subsidized loans. The authority’s were formed through intergovernmental cooperation and have benefited from certain economies of scale. These systems developed interceptor pipelines to basically retrofit the old municipal sewers and convey that daily flow to a treatment plant. These systems have relatively affordable rates and have been on occasion re-capitalized with regular maintenance and enhancements to capacity and capability. Both the plants and the interceptor systems are showing their age. The Scranton system especially is in need of major upgrades. The LRBSA system has undergone significant upgrades in recent years.

By contrast, the newer suburban systems have been built with a greater percentage of loans versus grants. Efforts at inter municipal cooperation have

not succeeded in creating a single North Pocono Sanitary Authority. Each municipality has gone its own way, building and operating its own system, with the exception of Roaring Brook/Elmhurst and Roaring Brook/ Spring Brook where some cooperation has occurred. These newer systems also serve a wide geographic and topographic area making operation and maintenance problematic. There have not been any significant economies of scale with these disjointed systems.

One distinction with these new systems is that by and large they have separate sewage collection and conveyance systems not tied into older combined storm and sanitary sewers as is the case on the urban systems. High precipitation periods have resulted in some plant overflows, an indication that there may be some storm water inputs in the system. A likely source is rain gutters tied into area drains at some residential and commercial properties.

There have been significant costs associated with building and operating treatment plants and developing and maintaining extended collection systems across rolling topography serving sprawl and strip developments in the suburbanizing watersheds and headwaters areas along the rim of the Lackawanna watershed. These costs and problems of rate payer affordability, the decline in the rural/village character, and issues of sprawl-type growth have caused and continue to cause a great deal of acrimonious disagreement among the body politics of many communities engaged in updates of their Act 537 sewage facilities plans. These disagreements have forced the near bankruptcy of several sewer authorities. The successional scrapping and revision of various plans, the hiring and firing of consultants, solicitors, the appointment and resignation or termination of numerous authority members as well as influences on the election or retention of township supervisors are characteristic of the dissension associated with these Act 537 plans.

These conflicts have been ongoing in Jefferson Township in the North Pocono area on the east side of the Lackawanna Valley and Scott Township in the Abington area on the west side of the Lackawanna Valley for much of the past ten years. Both townships lie partially in the Lackawanna watershed and partially in the Tunkhannock (Scott) and the Wallenpaupack (Jefferson). In both townships the proposed central collector systems were extensive and were designed to feed treatment plants deemed unaffordable by many residents. The Jefferson project has also been tied into controversies related to the conservation of the Moosic Mountain barrens natural areas.

The latest revision (2001) of the 537 plans for Jefferson propose a collection system and pumping station with a trans-mountain pipeline to convey waste water over Moosic Mountain along PA Route 247 for treatment through the Scranton Dunmore system. The economies of this plan and the utilization of the Scranton treatment plant seem to meet both affordability and water quality attainment criteria.

The most recent consultant proposal for Scott Township would entail development of collection systems, pumping stations and connections to the LRBSA and CSAJSA systems. Again, economies of scale, affordability and attainment of water quality goals seen possible with the proposal.

Both of these proposals will mean there will not be new sewage treatment plants discharging into high quality headwater streams. Treatment will occur at long established plants discharging into the Lackawanna that may have a greater capacity to absorb the total maximum daily load (TMDL) from these additional sources.

LRCA remains concerned that the TMDL for Leggetts Creek is being reached or exceeded especially during summer months during low flow/low precipitation periods. The urban, CSO and AMD influences on the Lackawanna may cause similar exceedences in TMDL. More assessment work on Lackawanna watershed TMDL's is needed to help influence decision-making regarding treatment and collection system upgrades.

The inputs of suburban wastewater will only be marginal constituents of CSO events but the LRBSA, SSA and LLSSA systems have a disproportionate number of combined overflow discharge points. According to their NPDES permits, the systems have the following permitted CSO discharges:

LLSSA	45
SSA	68
LRBSA	45
Total CSOs on Lackawanna River	158

The Lackawanna receives a total of 158 CSO discharges for a period of minutes or hours during and after each precipitation event. While the combined sewage and storm water discharges into the river, greater hydraulic flows from natural storm runoff as well as urban storm flows contribute to flushing and diluting the CSO flows. Operational malfunctions such as debris accumulation often cause a continued sewage discharge from given points on the CSO system. Lack of line maintenance, difficulty in accessing, inspecting and maintaining some discharge chambers often accentuate the problem. During the most recent permit period all sewer authorities have been required to be more rigorous in inspecting and maintaining their CSO's. All CSO's have been numbered and posted with identification placards.

The LRCA and the Corps of Engineers had identified the CSO's as a major water quality problem in the 1993 Lackawanna River Greenway Reconnaissance Study. The Study offered several recommendations to reduce and eliminate the CSO problems. Some funding is presently available through the USEPA / Lackawanna County Lackawanna Watershed 2000 program. The complete treatment of the CSO's on the Lackawanna is estimated to cost from three to four-hundred-million-dollars.

The Pennsylvania Department of Environmental Protection (PA DEP) through its Environmental Futures Planning process (EFP 2) has prioritized a reduction in CSO in the Lackawanna watershed by 50% during the next ten years.

5.2 Storm Water Management

Flooding from tropical storms, heavy winter and spring storms and flash flooding from summer cloudbursts has always been problematic in the Lackawanna watershed. With steep forested mountainsides and built-up communities along the flood plains of the river and tributaries, runoff from storms quickly reaches and inundates low lying areas. In the Nineteenth Century, a clear-cut timber harvest for the building construction, rail and coal mining industry greatly diminished the forest cover in the Lackawanna watershed. During the Twentieth Century, strip mining and culm dumps caused further impacts to the watershed's natural functions.

Historic floods of record occurred in 1902, 1922, 1936, 1942, 1954, 1955, 1972, 1985 and 1996 in the Lackawanna watershed. The floods resulted in millions of dollars of property damage, the loss of life and the disruption of economic and domestic activities. Local, state and federal agencies have responded first with emergency actions and then with engineered solutions such as flood control dams (Stillwater – 1960, Aylesworth – 1970) and numerous levee and floodwall projects.

As Lackawanna County began to anticipate greater economic development in the 1980's, the County Regional Planning Commission took the lead in developing a storm water management plan for the entire Lackawanna River watershed. This work was implemented through, Act 67, the Pennsylvania Storm Water Management Act. The Lackawanna River storm water management plan and ordinance program was one of the first such plans completed under Act 67. The intent of the plan is to insure that storm water discharge from a developed property does not exceed its predevelopment volumes or rates. Storm water is required to be collected and channeled to a detention basin for gradual discharge into a natural stream or a constructed drainage system leading to a natural stream.

The Lackawanna storm water plan has been implemented through municipal ordinance and has at least been successful in preventing inundation of adjoining properties to large residential and commercial developments. In practice however, the engineering community's initial response to the ordinance requirements has been to design engineered, structural, volumetric systems consisting of curbed gutters, grated concrete catch basins and culvert lines discharging into mostly dry rip rap stone-lined trapezoidal storm water detention basins. These basins have become ubiquitous features at new developments. Often surrounded by chain link fences, they have been referred to as rock-filled ice cube trays devoid of many of the natural values and functions found in a natural system. Some engineers have recognized opportunities to use more natural design features and recreate a naturally appearing water amenity as well as meet the storm hydrologic requirements. The further development of these systems, especially in areas of reclaimed mine land, can help to retro fit and restore many of the natural values and functions once obtained with small wetlands and vernal ponds perched at locations from the valley floor to the ridge line.

An integration of storm water systems can also serve to restore or maintain greenways and natural habitat corridors throughout the watershed. Lackawanna County is considering an update of the Act 67 plan in a few years.

The update process will provide opportunities to address natural values and functions, water quality of discharge and the effect on TMDL's in the watershed.

5.3 Acid Mine Drainage/Abandoned Mine Reclamation

The Lackawanna watershed has been affected by the negative environmental impacts of coal mining. The anthracite coal industry was active in the watershed from the 1820's to the 1960's. Since 1960 active coal mining has consisted of a few marginal strip mines, re-mining previously strip mined and underground mined sites.

The impacts to the watershed from mining and a description of the acid mine drainage problems are contained in the Lackawanna River Watershed Mine Reclamation Plan which is published as a supplemental volume, as part of this report (see Appendix B).

5.4 Erosion and Sedimentation

Erosion and sedimentation is a natural phenomena where flowing water wears away rock and soil and carries these materials as bed load or suspended in the water column. As the flowing water moves downstream, over time it loses velocity and its ability to move or carry material is diminished. These materials are deposited in the streambed or along adjacent plains.

Human generated earth disturbance activities such as farming, road and building construction, timber harvest, mining and quarrying and off-road recreation vehicle use are the major sources of erosion affecting watersheds. All of these activities occur in the Lackawanna and all in various ways negatively impact the river, its tributaries, their water quality and aquatic habitat quality. Erosion in the Lackawanna affects the water and aquatic habitat quality of the Susquehanna River and the Chesapeake Bay.

Soil particles eroded upstream and carried in suspension become a matrix for nutrient pollution as nitrogen and phosphorous molecules become attached to suspended solids. The suspended solids and nutrients combine to serve as a media for algae growth that becomes especially prevalent in summer.

Numerous state and federal regulations govern the various activities and practices that often result in erosion or contribute to the potential for erosion. In Pennsylvania the conservation districts are the primary permitting, inspection and enforcement agency for earth disturbance permits. The minimum threshold of acreage requiring a permit is five acres. The permit process requires the filing of a soil erosion and sedimentation control plan that demonstrates the application of current best management practices to prevent, control and direct any erosion potential through a construction or earth disturbance site drainage control system.

The conservation districts approve and issue permits based on information provided by the applicant. The districts do not always have the capacity to monitor and inspect each project to insure complete compliance. District staff do inspect larger projects that may demonstrate the likelihood of site or developer-based compliance issues.

Earth disturbances under five acres are not presently required to obtain a permit under state regulations. Compliance is often governed through local zoning, land use, subdivision and/or storm water management ordinances. Many municipalities may not have the resources or staff to adequately interpret, review and monitor compliance practices for erosion and sedimentation and other environmental impact control issues.

In the Lackawanna Valley there are a large number of small lot, five acres or less subdivisions under development through zoning permits at any given time. There are an even larger number of un-permitted earth disturbance activities of various sizes whereby property owners solicit the public with signs such as “clean fill wanted.”

There are dozens of examples of cut and fill operations on steep hillsides and along river and tributary flood plains in each and every municipality in the watershed. These type of operations which fall in a regulatory gray area below a threshold requiring some type of permit and review are widespread across this and other watersheds.

These operations often contribute to several endemic problems in the Lackawanna watershed.

- **Erosion problems**
- **Encroachment into flood plains and water courses**
- **Problematic alteration of local drainage**
- **Adjacent property damage**
- **The spread of noxious and exotic invasive plants**
- **The opportunity for illegal dumping and waste disposal**
- **Degradation of community aesthetics**
- **The establishment of unstable and unsuitable building lots**
- **The introduction of hazardous materials into the water course**
- **The association with steep, unstable high walls and slopes**

Abandoned mine lands in the Lackawanna watershed contain upwards of 25- to 30-thousand-acres of un-vegetated soils, culm banks, stripping overburden piles, silt basins and impacted water courses. There are numerous large culm banks and coal silt deposits in/on and adjacent to watercourses. Erosive drainage swales and sheet flow cross upland areas of these sites. These abandoned coal lands are also common sites for unregulated “clean fill” activities, auto junkyards, illegal dumping and off-road vehicle activity. These activities and the ambient condition of these lands are significant contributors to the erosive suspended and mobilized bed load of the Lackawanna. A sediment transport and output study would be useful in determining the total volume of sedimentary output of the Lackawanna. Such a study could serve as a benchmark to measure the effectiveness of future control strategies.

5.5 Water Supply

The water supply in the Lackawanna watershed has a complex set of physical, political and economic management variables related to the historic development and settlement patterns which themselves have been influenced by geology and typography. A more recent political, economic and resource management variable has been the sale of 45-thousand acres of previously regulated water utility company (The Pennsylvania Gas and Water Company, PG&W) property to a private non-utility owner, Theta Corporation.

The Department of Environmental Protection (PA DEP) is presently (2001) conducting a statewide drinking water source water assessment program (SWAP). The Pennsylvania American Water Company (PAWC) is the operator of the water supply utility in the urban area of the Lackawanna watershed. PAWC acquired the water utility, 8,000 acres of buffer land, 36 reservoirs, pipelines and water supply filtration plants from PG&W (later PG Energy, now a subsidiary of Southern Union Gas Company) in 1996. PG Energy kept the balance of 45,000 acres and transferred title into Theta Corporation, a PG Energy affiliate in 1999. After the merging of PG Energy's parent company Pennsylvania Enterprises Incorporated (PEI) with Southern Union in late 1999, Southern Union sold the stock in Theta Corporation to an unnamed purchaser in February 2000 for \$12.3-million.

The sale has generated significant public controversy. Theta originally restricted public access at many stream access points and other areas popular for fishing and hunting. The PA Game Commission and Theta Corporation announced a cooperative agreement to allow hunting on the properties (August 2001).

The water supply for the urban/coal mine corridor of the valley is predominantly served by reservoirs located in upland areas of the watershed on tributary streams or at the headwaters of the river above Stillwater Dam. The surface supply reservoirs were developed between the 1870's and 1930's to compensate for the loss of source water supply, groundwater and stream flow in the lower river corridor due to coal mining impacts to groundwater and the river as well as sewage contamination in the river by the 1890's.

The investor-owned water companies that developed in the 1880's were gradually merged into the Scranton, Spring Brook Water Company by 1928; becoming the Pennsylvania Gas and Water Company in 1960 to 1996. The PG&W Company responded to state mandated water filtration after an outbreak of giardia cyst contamination in 1984 and 85. PG&W capitalized \$400-million to construct eleven new state of the art water filtration plants. This program led to the reconfiguration of the water supply system and a move by PG&W to sell the water business, eventually to PAWC and spin off the ("surplus") watershed lands.

LRCA had intervened in the regulatory process before the PUC in 1996. A consent decree was negotiated whereby the intervention was dropped in exchange for PG Energy's development of a watershed land use plan and advisory committee. The committee was empowered and a plan developed with the Company and its consultants in 1997-98. With the merger of PG Energy into Southern Union and the sale of Theta Corporation and its real estate assets, the

legal status of the plan and its recommendations is unclear. It can serve as a primary planning instrument for the municipalities to plan, zone, and regulate subsequent use of these lands.

There are a significant number of concerned parties, public and private which are interested in the permanent conservation of these lands. There are a number of activities underway related to these properties at the present time including related open space plans being developed by Lackawanna and Luzerne counties with the participation of several state agencies and conservation organizations, including the LRCA and Pennsylvania Environmental Council (PEC).

While all of this serves as context to place the water supply and reservoir areas both physically and politically, the business of supplying safe drinking water continues by the PAWC. In the Lackawanna watershed PAWC reservoirs and filter plants provide approximately 50-million gallons per day in this area. PAWC has rebuilt many miles of pipeline and service mains. During the past six years these improvements have reduced water losses by approximately 15 to 20-million gallons per day.

There are also several smaller water companies serving the watershed. National Utilities operates the Moscow Water Company and a small reservoir along a tributary to Roaring Brook in Covington Township. Several small residential subdivisions in the Abington and North Pocono areas are served by small developer-built and owned systems primarily supplied by wells.

The balance of the rural areas in the watershed are served by private wells. The water quality of some wells is affected by leaching from malfunctioning on-lot septic systems. Other wells have been compromised by illegal dumping of chemicals (Covington Township) migration of road salt storage leachate (Jefferson Township), draw down of commercial wells and golf course irrigation (South Abington, Newton, Covington).

The public perception of its water supply was shaken during the giardia crisis in 1985. There remains a severe and widespread distrust of the water supply. There has long been a disconnect between the consumers of surface supply (the urban residents) and the stewards of the supply, the citizens and local governments in the upland areas of watershed and the water companies. With the contamination of groundwater now becoming a significant issue along with the problems of safeguarding surface supplies, there may be opportunities for our communities, water companies and property owners to cooperate on watershed protection measures that have proven useful in other areas of Pennsylvania and across the United States.

Issues related to water supply quantity have also been advanced after droughts in the 1990's caused water use restrictions. While the Lackawanna watershed has been relatively a water rich area, severe drought has been known to pinch local supplies. The potential for continued suburban sprawl and the creation of more impervious surfaces with higher runoff coefficients remains a challenge to water quality that needs to be addressed both through municipal ordinance and regional comprehensive planning to insure appropriate growth management and best management practices in development design.

Local municipalities may benefit from water conservation and water supply protection concepts that have been discussed in a statewide series of public meetings held by PA DEP during 2001. Further enhancements to public policy through regulatory and legislative recommendations generated from this process are likely.

5.6 Aquatic Habitats and Fisheries

The Lackawanna was known historically as a vibrant brook trout fishery (Hollister, 1887). Shad may also have been a seasonal fishery on the Lackawanna, as it was a significant fishery in the Wyoming Valley in colonial times into the 1820's when dam construction downstream closed off the Susquehanna to these anadromous fish.

Anecdotal evidence suggests the Lackawanna was still a viable trout fishery into the early Twentieth Century. By that time the accumulation of mining impacts and urban sewage flows had completely degraded the aquatic habitat of much of the Lackawanna and numerous reaches of its tributaries. The Upper Lackawanna and upper reaches of tributary streams continued to harbor vestiges of the native brook trout fishery. Wild native brook trout and other non game fish can still be found in these waters (PA F&BC 1992, PA F&BC & LRCA 1996).

Since the closure of the anthracite collieries in 1960 and the installation of public-owned sewage treatment works by 1972, the river's aquatic habitat began a slow recovery. Efforts of local civic and fishing clubs to stock the Lackawanna further demonstrated its resurgence as a sport fishery by the mid 1980's. Fishery and aquatic habitat studies conducted by PA F&BC and LRCA in the 1990's built on the work of fishing clubs and sportsmen to recognize the Lackawanna had in fact become a vibrant wild brown trout fishery especially in the twelve-mile reach between Carbondale and Olyphant. This reach as well as upstream reaches from Carbondale to Stillwater contain riffle and pool structures with a mix of boulders, cobble, ledges and woody debris, which constitute classic coldwater fishery habitat.

This reach is now classified as a Class A trout water and is attracting angling interest from throughout the region. The base of the food chain supporting the fishery is a healthy and diverse macro invertebrate population. The LRCA volunteers have monitored macros at twelve stations on the Lackawanna tri-annually since 1990. These macro studies show improving ambient water quality and habitat quality as far downstream as North Scranton. Through Scranton and downstream communities of Taylor, Moosic and Old Forge, macro studies suggest a stabilization of improvement in aquatic health. Embeddedness assessments at many Scranton and downstream reaches show a higher proportion of embeddedness of the benthic substrate relative to upstream reaches. The principle sources of the fine silts, sands and clays is sedimentation from un-vegetated mine spoil areas, construction sites and road grit from urban storm and combined storm sewage flows, (LRCA/NOAA study 1996 & stream walk surveys 2000).

The Upper Lackawanna fishery is influenced by the presence of Stillwater Dam and metal loadings from the Clinton Forest City Treatment plant operated by LRBSA. (Townsend/Trout Unlimited study, 1995). The Lackawanna presents

several anomalies that influence its fishery. Where one would normally expect a good reproducing fishery in the upstream reaches and an adequate fishery downstream where a stream begins a transition from a cold to warm water fishery, the Lackawanna offers several surprises.

The Townsend/TU study indicated higher ambient upstream temperatures; the suggested influence being the shallow pools at Stillwater and Old Stillwater dams. PAF&BC and private assessments on the east and west branches demonstrate adequate conditions for a reproductive fishery exist in these reaches above Stillwater. Townsend suggests the temperature influence of Stillwater result in warmer downstream flows and lower dissolved oxygen (D.O.) availability. While these conditions are acceptable for adult trout they mitigate against hatchlings and fingerlings reaching adolescence.

Downstream of Carbondale, although there are increasing urban and abandoned mine land impacts, the macro population remains as vibrant as in the Forest City area. Herein lies the anomaly, large flows of mine drainage into the river in Simpson, Jermyn and Archbald may actually lower the river's ambient summer temperature helping it to retain the dissolved oxygen so necessary for all aquatic species. Conversely the cold flows, even though they are mine drainage, do not contain the metal loading or acidity they once had thus the flows do not mitigate against aquatic habitat.

Further information on LRCA River Watch volunteer water quality monitoring program as well as other LRCA conducted water quality and habitat assessments is available on the LRCA website: www.lrca.org.

The good news for the Lackawanna fishery upstream of Scranton contrasts sharply with that downstream. While the river tends towards warm water fishery in its lower reaches, there is still the potential for a mix of cold and warm water fisheries below Scranton. For its final three miles from Old Forge through Duryea to the confluence at Coxton, the Lackawanna is essentially a dead-water, suffocated with the D.O. consuming iron and acid load from the Old Forge Bore Hole AMD. Over 100-million gpd of mine water loaded with 3,000 pounds of iron oxides enters the river from the Bore Hole near the Luzerne-Lackawanna county line.

The Duryea AMD at Coxton Bridge adds another 30-million-gallons per day of AMD loading. These discharges have been referred to as the largest visible point sources of pollution in the entire Chesapeake Bay watershed.

6. Land Stewardship

The stewardship of the land and land-based resources and the regulation of uses and activities on land especially land near water bodies, wetlands, streams and rivers has a significant influence on the water quality and overall habitat quality of the Lackawanna watershed. The history of resource exploitation, extractive use and land development in the Lackawanna watershed has created endemic problems, which continue to affect the river and its watershed.

This section reviews issues that have been identified in key person interviews, public meetings and in the stream walk surveys conducted by LRCA staff and volunteers as part of this plan.

6.1 Flood Plain Management

Due to the intensive development of many areas of Lackawanna River flood plain, property damage and loss from annual storms as well as major flood events has been a common occurrence.

As the communities developed along the floor of the Lackawanna Valley along with the anthracite industry, level buildable land was a premium. There are numerous neighborhoods built on flood plain including:

Downtown Carbondale	Boulevard section of Dickson City
Mayfield	The Plot, Scranton
Downtown Archbald	Green Ridge Flats, Scranton
Peckville	Albright Avenue, Scranton
Olyphant	Southside Flats, Scranton
Duryea	Moosic

Successive floods in 1902, 1922, 1936, 1942, 1954 and 1955 were followed up by state and federal projects to dredge, berm, construct levees and flood walls and two flood control dams at Stillwater on the confluence of the east and west branches and on Aylesworth Creek.

The 1972 Hurricane Agnes flood, the flood of record (500-year flood) on the Susquehanna did not cause any appreciable flooding in the Lackawanna basin. The Coxtan area at the confluence was flooded and some individual properties or clusters of homes in Old Forge and Moosic were also flooded. There was some bank instability along Springbrook Creek as well but by and large the Lackawanna Basin did not sustain the type of damage that the balance of the Susquehanna Basin received.

Hurricane Gloria in October 1985 and a winter rainstorm-snowmelt event in January 1996 caused street and basement flooding in Downtown Olyphant, and in The Plot, Green Ridge, and Albright –Weston Field neighborhoods in Scranton. Bank failure and flooding of homes and trailers on Spring Brook and St. Johns Creek in Moosic and Old Forge were also recorded in the 1985 and 1996 events.

After the event crisis and the subsequent cleanup response, the 1985 and 1996 flood events generated a longer-term social, political and engineering response.

The 1985 event response generated congressional action authorizing the Corps of Engineers to study the flood problems and develop a solution. The Albright Avenue Weston Field neighborhood levee in Scranton and the Olyphant levee were two alternatives deemed appropriate for continued federal involvement. The Corps use of a one to one or greater cost benefit ratio indicated that the Green Ridge Flats and Plot neighborhoods did not qualify for a continued federal cost share.

The Albright and Olyphant levees are at last under construction with completion expected in 2003, eighteen years after the flood loss event.

The 1996 event occurring only eleven years after the 1985 event and flooding the same neighborhoods set off a maelstrom of political activity by The Plot Neighborhood Association and other neighborhood activists. The criticism of the Corps economic analysis, which had previously considered The Plot, Greenridge and Albright levees as separate projects insured that firm congressional language in the water resources authorization would prevent a piecemeal economic analysis and lead toward a positive cost benefit ratio for the other areas in Scranton. The project averaging cost benefit ratio has allowed a federal interest to be recognized in The Plot and Green Ridge neighborhoods. Those levee projects are now proceeding to construction and will be built as a follow on implementation.

The 1996 event and the resulting levee projects in Olyphant and Scranton have been an issue of concern in Dickson City. With new levees upstream and downstream of their community, many residents are worried that the next flood event will result in an over-topping of the Dickson City 60-year-old flood berm. The Corps has since been authorized to study Dickson City to determine if federal interest in an improved level of flood protection is warranted there as well.

Since the flood events had occurred, an intensely emotional reaction developed in the affected neighborhoods. This reaction and the concern of upland neighbors not to deny a decent level of protection to their fellow citizens downhill saw the public meetings completely dominated by a single issue constituency and all of the elected officials responding to that single issue with unanimity. While this has helped to underscore the need for flood protection and has undoubtedly helped to get the levees built, the opportunities for rational discussion of all of the potential positive and negative impacts of the levees were notably absent from the process.

With a sense of concern about these issues and other factors, the Lackawanna River Corridor Association Board of Directors decided early on to support a levee project that would place the levee back from and allow the maintenance of the existing riparian corridor where feasible and would include provisions for the future use of the levees as part of the Lackawanna River Heritage Trail with opportunities for landscape and river access improvements. LRCA involvement was focused on direct discussions with elected and appointed officials and staff of the Corps of Engineers.

The affordability of the local government share has been a limiting factor in the design and development of the levees that leaves a number of impacts to be addressed in the near future. Due to affordability issues, the Corps

recommended a mixture of acquisition by both fee and easement for levee construction and occupancy. This means that although the government owns and maintains the levee, it rests on essentially private property wherever an easement was acquired in less than fee terms. This leaves the private property owner with certain liabilities as well as the right to restrict or prevent public access and use. These circumstances will require the extinguishments of the remaining fee interests if the levees are to be used as public trail and recreation corridors.

The other outcome of concern is that of several private property owners who will have the levee take a significant portion of their parcels without taking their homes. The compensation, affordability issues and the hopscotch pattern of fee and easement taking are an unmet need that deserved more adequate consideration relative to the size of the indebtedness incurred by the local municipalities.

The flood plains and corridors of many tributary streams have also been affected by encroachments, relocated private property flood loss, post flood cleanups and follow-up flood control and channelization projects. The following are major federally or state-funded flood channelization projects with the appropriate year and distance that the channelization work was installed:

Mill Creek	Dupont	WPA	1938	1 mile
Mill Creek	Dupont	Bureau of Mines	1958	½ mile
Mill Creek	Avoca	PA DEP	2000	½ mile
Springbrook Creek	Moosic	PA Forest & Waters	1960	1 mile
Springbrook Creek	Pittston Twp	PA DER	1970	1 mile
Roaring Brook	Scranton	Corps of Engineers	1960	1 mile
Keyser & Lindy Creek	Scranton	PA DEP	1999-2000	1 mile
Hull Creek	Blakely	PA DER	1975	1 mile
Tinklepaugh & Wild Cat Creek	Blakely	PA DEP	1996	4 mile
Sterry Creek	Jessup	PA DER	1990	1 mile
Powderly Creek	Carbondale Twp	PA DER – BAMR	1991	1 mile
Fallbrook Creek	Carbondale	US Bureau of Mines	1965	1 ½ mile

Numerous other smaller creeks have been channelized and culvertized as a response to flood events, to facilitate local storm drainage work and for sewer projects. Coal mining destroyed many watercourses or rerouted streams and the Lackawanna River itself. As discussed in the mine reclamation plan, many streams were placed in flumes or other artificial channels by coal operations. Most of these structures were not maintained after the closure of mining operations. Subsequent storms and physical redevelopment of mine sites contributed to the failure of the flumes and artificial channels allowing the

streams to return to their historic courses often choked with coal wastes, sediments and urban debris.

6.2 Stream Encroachment

The historical patterns of watershed and habitat destruction have contributed towards the prevalence of stream encroachments common in the Lackawanna watershed today. The pattern of encroachments is incremental, many times occurring with a gradual filling of the flood plain and flood way fringe, in some instances into the watercourse itself.

Small property owners and developers soliciting the deposition of “clean fill” conduct most of these encroachments. The LRCA receives several reports of these activities on a monthly basis usually from a concerned neighbor or fisherman. LRCA in turn sends staff to investigate and forward the complaint to municipal and state agencies. Without adequate controls at the municipal level, state agencies do not always have jurisdiction especially outside the 100-year plain.

While actual encroachments into the watercourse and flood plain are numerous, the ability to control the numerous small private incidental encroachments is very limited.

6.3 Riparian and Upland Forest and Forestry Management

The Lackawanna River has a surprising extent of its riparian forest cover intact. Based on the 1988 river and shoreline assessment and the 1999-2000 river and stream walk surveys, 88% of the Lackawanna riparian edge is intact or has recovered from previous damages. 40 of 320 one-quarter-mile-reaches exhibit a total loss of riparian cover. These reaches are primarily flood control levees in Duryea, Scranton, Dickson City and Mayfield. The second leading cause of riparian loss is property owner encroachments. Culm dumps are the third riparian forest eliminator followed by clearances for bridge crossings. Historic waterfront buildings in Carbondale, Archbald, Olyphant, Scranton and Old Forge also detract from the riparian corridor but add cultural interest and like bridge crossings, they comprise the least intrusive impacts.

The upland riparian forest and upland forest is a different story. The LRCA survey did not measure forest cover. Since the main stem of the Lackawanna Valley has been heavily urbanized and has had its topography and hydrogeology altered by coal mining, one would expect a significant loss of original forest cover. The urbanized areas occupy approximately 20% of the surface feature of the valley, the adjacent abandoned mine land sites another 20%. (Spatial grid analysis by LRCA) The urban community does however host an extensive urban forest. The riparian corridor of the river and its tributary streams form key links joining the urban forest with the diverse upland forest along the Moosic and West Mountain ridges and in the headwaters areas above Carbondale and in the North Pocono watersheds.

The Lackawanna headwaters, the ridgeline forests and the North Pocono watershed forests are large fairly intact second to third generation growth successional forests. The Moosic and West mountains also contain a globally rare dwarf tree forest of scrub oak and pitch pine in association with extensive

heath barrens and rocky acidic outcrop communities. There are three major property owners in the Lackawanna watershed forests. The Pennsylvania Bureau of Forestry manages the nearly 10,000-acre Lackawanna State Forest along the boundary of the Lackawanna and Lehigh watersheds. The Pennsylvania Game Commission manages 5,000 acres of game lands along Moosic Mountain in Archbald and several thousand acres in Ararat and Herrick townships in the headwaters area. The Theta Corporation owns approximately thirty-thousand-acres in the Lackawanna watershed with large contiguous tracts in the Spring Brook and Roaring Brook watersheds, along the Moosic Mountain from Avoca to Carbondale and around several key headwaters sources such as Dunn Pond and Mud Pond in Ararat Township, Susquehanna County.

The Theta properties now privately owned were once part of the holdings of the former Pennsylvania Gas and Water Company (PG&W Co.) PG&W's parent Pennsylvania Enterprises Incorporated (PEI) sold its water business, 36 reservoirs and eight-thousand-acres of buffer lands to the Pennsylvania American Water Company (PAWC) in 1996. LRCA was involved as a protestant during the Public Utility Commission hearings that eventually allowed the divestiture to proceed. LRCA signed a consent decree with PG&W, which promised to develop a land use plan for its retained watershed lands. LRCA staff participated in an advisory committee that worked with the Company in 1997–98 to develop a land use plan. By the time the plan was completed, PEI changed the name of PG&W to PG Energy.

PEI and its PG Energy affiliate merged into the Southern Union Company of Austin, Texas in late 1999. In February 2000, Southern Union sold the assets of Theta Company which included its 45,000 acres of watershed land in Lackawanna and Luzerne counties to an unnamed buyer for \$12.3-million. PG Energy had formerly sold a forestry harvest easement to Keystone Sanitary Landfill (KSL) in Dunmore in exchange for a 15-year supply of landfill gas for a steam electric generating plant in Archbald.

Theta and Keystone are presently conducting timber harvest on many tracts in the Lackawanna watershed. The Pennsylvania Game Commission and Theta Company announced a game and hunting management program in August 2001 to allow hunting on 30 of the 45-thousand-acres of Theta lands. There are also ongoing discussions between Theta and several conservation organizations for the potential acquisition and permanent conservation management of these forest lands.

There is a concern that the timber harvest on Theta lands is not a sustainable forest management harvest. There have been opinions by forestry experts on both sides of this issue. LRCA reviews have indicated that the harvest is similar to many others throughout the northeast region. While some cuts may be heavier and are seemingly high yield cuts. LRCA remains concerned about invasive species intrusions and the ultimate disposition of the Theta properties.

Another significant forest and habitat conservation project is underway with the Commonwealth of Pennsylvania, the Scranton Lackawanna Industrial Building Company - SLIBCO, Moosic Lakes Incorporated and The Nature Conservancy. This project is expected to facilitate the acquisition of 2,400 acres of upland forest and ridge top barren by The Nature Conservancy. This project will help to solve a multi year controversy that resulted when SLIBCO proposed the

development of an industrial park on the ridge top of Moosic Mountain at the same time the site was recognized as the most important natural area in Lackawanna County.

6.4 Wetlands

The Lackawanna watershed contains over 20,000-acres of wetlands. Another 10 to 15 thousand-acres of wetlands have been lost to mining activities and urban development (LRCA: comparative analysis of historic topographic maps to contemporary maps). The loss of wetlands and the ecological and hydrologic health of remaining wetlands is a major concern for water supply, storm water and flood management, wildlife habitat and overall watershed resource conservation.

Wetlands exist primarily in the forested watershed areas at the headwaters and along stream corridors of the upper Lackawanna River and tributary stream headwaters. Known as Palustrine Forested Wetlands, they occur primarily on glacial terraces along the Moosic and West mountains, on the North Pocono Plateau and the Allegheny Plateau at the Lackawanna headwaters in Susquehanna and Wayne counties.

Some of the more significant and regionally important wetland complexes are:

- Freytown and Hollister swamps at the headwaters of Roaring Brook
- Bear Swamp, Simerson Marsh and Little Virginia along Stafford Meadow Brook
- Yostville marshes, headwaters of Spring Brook and its tributaries
- Dunns Pond, Orson Glade, Mud Pond complex on the East Branch of the Lackawanna
- Lake Romobe, Ball Pond complex, West Branch headwaters of the Lackawanna
- Panther Bluff tract

All of the Lackawanna's smaller tributaries have their sources in wetlands on terraces along the Moosic and West mountains. These perched wetlands serve as collectors for springs from ridge top aquifers which form in glacial sand and gravel deposits and in crevices along the conglomerate sandstone and shale outcrops on the ridgelines. The conservation of open space and the maintenance of the ecological and hydrological integrity of springs and wetlands is crucial to the maintenance of good water quality and perennial flows in the Lackawanna watershed.

There are also a variety of riparian wetlands along the lower corridor of the river and its tributaries. While mining and urban development had destroyed natural wetlands, the displaced water often flowed to adjacent areas and hydric soil conditions gradually created successional wetlands. Strip mining has created many isolated pocket wetlands and some larger successional complexes. This process has been aided by some mine reclamation work in recent years.

The confluence area at Duryea and Coxton holds some interesting water features. Large areas of the confluence have been undermined and strip-mined for coal, and pit mined for sand and gravel. The abandoned gravel pits at Coxton have since flooded with the interception of surface flows from Campbells Ledge run and Red Springs Run and the surface migration of mine water. These ponds are known locally as the Duryea swamps.

The loss of wetlands occurs in the Lackawanna Valley as elsewhere on an incremental but relentless basis. Much of the loss is on small private developments under five acres. Many of the land clearing and grading operations on these small development sites are conducted without proper engineering or permitting. This means that municipal, county, state and federal agencies often do not know about an impact until it is too late. Again and again this pattern is repeated across the watershed. Encroachments and fill of flood plains and stream corridors occur in a similar manner.

The expansion of sprawl related development into the mountains and former water supply watershed lands only accelerates the loss of wetlands and stream habitat. There are several examples of wetlands losses occurring on larger developments. More effective local involvement in permitting and inspections would have precluded the fills and encroachments from occurring in the first place.

Some of these sites have had regulatory actions and mitigation has occurred or is planned. For these major sites there are hundreds of “Mom and Pop”-encroachments which often escape notice for years.

6.5 Natural Areas and Open Space Management

The riparian corridors, upland watershed and ridge top forests and wetland complexes previously discussed provide the Lackawanna watershed with an extensive network of open space with a broad diversity of natural habitats. This temperate forest ecosystem exists in close proximity to the extensive Scranton/Wilkes-Barre urban corridor and adjacent suburban villages.

Due to historical development patterns, the mountainous topography and extensive forested wetlands associated with water supply reservoir development in the late 19th and early 20th Century, the region benefited from a substantial, informal greenbelt system. As the 20th Century drew to a close, sprawl-type development has become an increasing threat to these open space and natural resources. Sprawl is occurring as an out migration from the urban valley as well as from the New York/New Jersey metropolitan region to the east of the Pocono Plateau. The proposed restoration of passenger rail service on the Scranton–New Jersey rail corridor may place additional pressures on the open space resources of the Lackawanna watershed particularly in the North Pocono sub-watersheds.

This is the basis of concern expressed by many local residents and public officials especially in the context of watershed land associated with the water supply system. The land use plan developed in 1998 for the Theta Corporation watershed lands examined some of the concerns and recommended that a majority of Theta tracts remain in long-term timber management and/or be conveyed through acquisition or easement to conservancies or public resource

agencies such as the Bureau of Forestry, State Parks or Game Commission. A decision of Theta in July 2001 previously referred to will develop a management program for hunting under the direction of the Game Commission. Additional proposals for acquisition are in discussion between various private agencies and Theta with a potential for state involvement.

In this context, several Commonwealth agencies and a private foundation are funding a Lackawanna County open space management plan. A similar and related plan is being conducted in Luzerne County.

The Nature Conservancy developed a natural areas inventory for Lackawanna County in 1997. That inventory was developed with the support of the Lackawanna Heritage Valley Authority with a programmatic interest in facilitating open space and natural resource conservation and the Neighborhood Development Trust that is associated with the Scranton Chamber of Commerce. An overlay of the inventory on the watershed tracts is included in the resource mapping of the PG Energy (Theta) land use plan. Both of these documents can help to inform the decision making associated with the pending open space plan.

Additional issues that affect open space management and natural areas protection and which have been mentioned by study participants or identified in stream walk surveys or by inference in other public forums are as follows:

- Concerns that sprawl development destroys or fragments open space and natural areas and causes ecosystem degradation.
- Development and land clearing activities promote the introduction of non-native, invasive, exotic and noxious species.
- Fragmentation and adjacent development accelerate intrusive public use or misuse of natural resource areas resulting in further habitat destruction and degradation, i.e. littering, illegal dumping, trespass, ATV damages.
- The proximity of development to natural areas increases the urban-wild lands interface with related public safety and fire control issues.
- The creation of infrastructure, roads and buildings increases the areas of impervious surface accelerating storm hydrographs causing further downstream aquatic habitat degradation.

6.6 Land Use Regulations and Watershed Best Management Practices

Land use regulations, subdivision, development and zoning regulations governed by local municipalities are often the first line of defense in protecting water quality and natural resources. There is a wide arc in the capacity of the numerous municipalities in the watershed with regard to the administration of adequate regulations. Municipalities in the watershed range from the City of Scranton with 70,000 residents and a professional municipal staff to the Borough of Vandling with 650 residents and a part time staff. There is a wide disparity in the quality of the various regulations and their ability to address a greater number of watershed variables. There is an urgent need to upgrade both the quality of municipal ordinances and the to expand the diversity of environmental topics addressed by the municipalities.

Storm water loading, road construction, site grading and the variable of soil and rock conditions as well as building site suitability, slope issues, are just a few issues which are inadequately addressed at the municipal-watershed level.

Two factors underlie the need to implement thoughtful site and activity Best Management Practices in the watershed: the increasing number of new homes and businesses being developed on abandoned mine land in the river corridor and the potential for suburban sprawl-type growth in the North Pocono watershed.

Growing Greener & Growing Smarter best development practices are a newer dimension to the process of contemporary community development in Pennsylvania. These practices promote an understanding that traditional village and small main street town and country development can be more economically and environmentally sustainable than the automobile-based suburban sprawl that has been prevalent for the past sixty years.

The Center for Watershed Protection, a nonprofit education and technology organization based in Maryland has become a notable source for watershed best management practices. The Natural Lands Trusts in Media, Pennsylvania has developed a conservation development practices guide based on the work of Randall Arendt and other practitioners of traditional development practices, which suggest ways that the design of the built environment can be accomplished in greater harmony with its natural environment. Staff from both of these and similar organizations, as well as an increasing number of consultants and engineers in private practice, have been active in working with municipal groups across Pennsylvania and neighboring states. Audits of existing ordinances can become a starting point to upgrade the capacity of local municipalities as agencies for sustainable watershed protections.

The use of land trusts or conservancies in partnership with property owners, developers and municipalities can bring new tools and resources to address needs for open space, natural areas management and watershed best management practices. Conservancies can work with property owners and developers to design and implement open space resource conservation plans. The Lackawanna Valley Conservancy was incorporated in 1995 and works in affiliation with the LRCA to provide conservation planning, acquisition, management and education services throughout the Lackawanna watershed.

6.7 Reclamation and Economic Development

The reclamation of nearly 50,000 acres of abandoned mine lands in the Lackawanna Valley, the subsequent reuse of those lands and other economic and community development on mine lands and adjacent sites can be seen in two ways: as an opportunity to help restore watershed habitat and water quality values or as a source of future problems from unwise, haphazard and incremental developments.

The recent change in regional economic development strategy has brought a focus to redevelopment of abandoned mine lands for all types of projects. Industrial and business parks, shopping malls, residential and mixed-use developments have been developed on AML sites in the past and they have been successful. Keystone and Stauffer business parks, Viewmont and Commerce

malls, North Point Estates in Olyphant, the Woodlands in Jermyn are historical and contemporary examples of economically successful projects with varying degrees of environmental sustainability. Newer projects designed and built specifically to respond to reclamation needs, with sustainable design goals can help to restore the degraded habitats of the Lackawanna watershed. These infill-type projects can offer an alternative to suburban sprawl into the water supply areas.

Conservation designs for suburban subdivisions which incorporate multiuse mixed-zoning and residential zoning in higher densities integrated into the sites topography and habitat can provide opportunities for economic and community growth at the same time limiting negative impacts to the sites environment, watershed and ecological habitat. The creation of neo-traditional village developments can meet all of our economic and residential needs while conserving land and water resources. Conservation designs essentially accomplish all of the economic goals for a subdivision development while creatively conserving 40% to 70% of the site by designing the developed portion on the remaining 30% to 60%. These practices can exempt steep slopes, wetlands, flood plains from the development footprint and qualify to support higher densities on the developed area of a site.

The dissemination of these practices and their incorporation into local ordinances and their adoption by the development and building sector is recognized as an important watershed protection goal by a large number of participants in this river conservation planning work. Numerous individuals, agency staff, municipal officials and business interests have recognized the problems associated with incremental and sprawl-related development. Comments at public meetings and key person discussions indicate a significant level of interest in upgrading municipal development practices in the Lackawanna watershed.

6.8 Litter, Illegal Dumping and Contaminated Sites

Littering, dumping and contamination from toxic or hazardous materials are problematic across the Lackawanna watershed. Contaminated sites range from the Marjol Battery site in Throop to a myriad of electric power pole sites under Pennsylvania Act 2 remediation.

Several sites have been cleaned up under the federal superfund program: The Iaccavazi Dump in Old Forge, The Lehigh Electric site along the Lackawanna River in Old Forge, The Aladdin Plating site near Leggetts Creek in South Abington and the Lavelle Bore Hole in Scranton. Of these sites, the Lavelle Bore Hole and Lehigh Electric directly contributed to contamination in the river, which has since been abated.

There are a range of small sites that have been listed on the Federal CERCLES and RCRA lists, state list for underground and leaking underground storage tanks (UST's and LUST's). Contamination at most reported sites has been limited or abated.

Due to the nature of the abandoned mine lands, there are a multitude of sites along the river and in upland areas of the watershed that are used as automotive junkyards, scrap metal yards and in several conspicuous cases, municipal waste

landfills. Other abandoned mine lands serve to degrade the habitat and aesthetics of the watershed and adjacent developments. Many of these properties are the site of illegal dumping of household waste, construction and demolition debris, furniture and appliances (white goods).

There are a variety of levels of municipal waste collection services for the effective control of furniture and white goods. There are no trash drop-off centers (other than the landfills or a private waste collection site) to regularly receive household wastes, furniture, and construction waste. There are adequate municipal waste collection services for garbage. Lackawanna County operates a superb recycling center and program for newspaper, office paper, corrugated cardboard, plastic bottles, glass bottles, jars and metal cans.

Due to the presence of the Alliance Landfill in Taylor and the Keystone Landfill in Dunmore, the Lackawanna watershed is one of the largest out-of-state trash import and burial sites in Pennsylvania. An average of 8,000 tons of waste per day is landfilled at these two landfills. Only about 5% of this waste is generated in the watershed.

Littering and dumping also occurs at remote and pristine sites in the forests and ridge tops of the watershed, again construction debris, auto parts, tires, white goods, furniture, and household waste are to be found along utility roads, jeep trails and abandoned rail grades. Trash fires at these sites are occasionally the source of forest fires and mine fires.

The most recently developed anti-litter and dumping campaign for state forest and parks may provide a model for use in the Lackawanna watershed over the hundreds of thousands of acres of privately owned forest lands and open space.

A litter and dumping enforcement program has been suggested as well to involve community groups, local police, magistrates and the district attorney's office.

7. Recreation, Public Access, Public Use

Previous studies and assessments have indicated a deficit in the number and quality of public recreation resources and facilities in the Lackawanna watershed (Lackawanna River CMP 1990, Lackawanna Heritage Valley Plan 1991, Lackawanna River Greenway Study 1993). The lack of trails for walking and bicycling was also noted in previous studies.

There are state parks, game lands, county and municipal parks as well as facilities such as Montage Mountain, public and private golf courses, Little League fields, school district facilities and thousands of acres of private forest land and abandoned mine land used informally by the public throughout the Lackawanna watershed. The various proposals for trails and greenways can be ways of joining the more remote recreation areas with the developed residential and commercial centers of the watershed. This should include safe access to water resources (see Appendix A and Section 12).

7.1 Water Flow Management, Stillwater Dam Issues

While it maintains a perennial flow, the Lackawanna is subject to extensive low flow conditions particularly in warmer weather. Many study participants have commented on the need for low flow releases from Stillwater Dam to augment flow for warm weather canoe and kayak paddle sport. Commentary at the public meeting for the Upper Lackawanna River Conservation plan (July 1998) discussed a variety of issues related to the operation and management of Stillwater Dam. This discussion provided impetus for the Pennsylvania Fish and Boat Commission to develop an agreement with the Corps of Engineers to construct and operate a boat launch and fishery access site. The site opened in 2000. There are a number of issues related to Stillwater Dam which need to be addressed through a reallocation and reauthorization study of Stillwater Dam. Those identified in this plan and the Upper Lackawanna plan are:

- 1. Pool level management, depth and water temperature influences**
- 2. Low flow and recreational flow releases**
- 3. Impact of existing warm water flow release on downstream fishery**
- 4. Maintenance of larger, deeper pool vs. flood storage loss**
- 5. On-site recreation use, fishing, swimming, picnicking**
- 6. Use of dam breast as connector trail between D&H and O&W rail trail grades.**
- 7. Potential to identify nonfederal sponsor for a reauthorization and reallocation study**
- 8. Development of county, regional or state recreation facility at Stillwater**
- 9. Conservation management of upland areas at Stillwater.**

Dam releases have been helpful in sustaining canoe and kayak navigation during certain canoe-a-thon events which coincided with authorized surplus releases

from Stillwater. At these rates there has not been any adverse impacts to the trout fishery or bank stability. Scheduled releases of this type would greatly enhance the potential for regular and predictable paddle sport use and related economic benefits to river corridor communities.

7.2 Fisheries

The Lackawanna has been recognized as a Class “A” fishery for brown trout. Under PAF&BC regulations, a Class “A” fishery is one that sustains up to 600-pounds of trout per hectare in various ages and sizes with indications of reproduction maintaining a population at that level over several years. PAF&BC have classified the reach of river from Fallbrook in Carbondale to Hull Creek at Blakely Corners as Class “A”. The reach from Blakely Corners to White Oak Run has Trophy Trout special regulations limiting take and requiring the use of artificial lures only. The Lackawanna has become a destination for fly fishermen.

Some topics relative to the fishery which have become issues along the Lackawanna are fishing access and fisheries regulations. Access is available along recently acquired rail trail properties such as the D&H and O&W trails in the Upper Lackawanna and the O&W, Providence reach and CNJ trails in the Mid Valley and Scranton. Several public parks and levees have added to fishery accessibility on the Lackawanna.

The acquisition of former PG&W watershed lands by Theta Corporation had resulted in the closure of sections of Roaring Brook and Spring Brook, which had previously been open for fish stocking and fishing. Some Theta properties have recently been included in a hunting management program whereby Theta and the Game Commission will cooperate on a hunting and resource management program. A similar program for fisheries access is also underway with the cooperation of the Fish and Boat Commission.

Regulations in the Trophy Trout waters in the Mid Valley have been an issue with a minority of local residents who want their children to be allowed to use live bait. The Fish Commission has granted an exception to the regulations to allow live bait use by children in the Condella and Mellow parks in Olyphant and Blakely.

7.3 Canoeing, Kayaking and Other Navigation

The Lackawanna River offers opportunities primarily for canoeing and kayaking. The larger tributaries offer seasonal and marginal kayaking runs. The Lackawanna drops an average of 19-feet-per-mile from Forest City to Pittston. The rivers course is characterized with features known as riffles and pools, ledges and strainers. These features present challenges to navigation. Navigability on the Lackawanna is also affected by flow characteristics, precipitation events and the management of Stillwater Dam.

The riffle and pool structure is somewhat like a watery stairway. Where the river drops in elevation it flows over boulders, cobble and rock ledges or small waterfalls, these are the risers on the watery stairway. The treads are the pools of still water between the riffles and ledges. The depth and length of pools varies

with the gradient of the surrounding topography. The pools on the Lackawanna range a few hundred to several thousand feet in length.

Longer pools are mostly associated with broad flood plains. Olyphant, Dickson City, Nay Aug Avenue, South Washington Avenue areas in Scranton have relatively longer pool features associated with adjacent flood plains.

Steep gradients, ledges, riffles and associated rapids are common to areas like the Panther Bluffs reach in Fell Township, the Winton area in Archbald and Jessup, the Cliff Street reach in Scranton and the Moosic anticline in Old Forge.

Since the Lackawanna is a steep and at places narrow river with an intact riparian forest corridor there are numerous strainers where riverbank trees have fallen into or overhang the water presenting challenges to navigation.

The flow characteristics of the river are the most significant factor affecting navigation. Using the USGS Gage Station at Archbald as a guide, the river can be generally assumed as navigable for downstream canoe and kayak use when the Archbald Gage is above 2.5 feet. The river becomes more of a challenge for navigation above 4 feet as it approaches bank full flood stage at 6 to 8 feet. The dangers of navigating on a flood crest are numerous.

The river usually runs in the 2.5 to 3-foot range in late winter into late spring under conditions of normal precipitation. Summer flows are usually in the range of 1.8 to 2.2 feet. At this depth, some of the pool features in Dickson and Scranton remain navigable.

The LRCA has conducted the Lackawanna River Canoe-a-thon on the river each May since 1988. Prior to that, the event had been conducted by the Luzerne-Lackawanna Environmental Council and the Jaycees, since 1973.

The LRCA postponed the event once due to flooding and canceled it once due to drought. It has been run successfully in other years with low flow conditions, an inhibiting factor. Some canoe-a-thons benefited from an incidental release from Stillwater Dam. While the Dam is not authorized to conduct recreational releases, LRCA has on occasion been fortunate to coordinate the timing of an operational release.

The ability to utilize Stillwater Dam for regular flow releases has been obvious to a large number of paddle sport participants. From comments received by LRCA through the course of this planning work, there is a consensus among several stakeholders that a reauthorization and reallocation project for Stillwater could allow regular low flow releases at volumes and velocities which would allow or enhance paddle sports while not having any negative affects on fisheries habitat. Releases at rates which mimic natural storm events during low flow periods could have water quality and habitat benefits.

The designation of the appropriate nonfederal partners and the establishment of an inclusive stakeholders group and related issues are discussed in the recommendations section of this plan.

Another topic which has emerged during the course of this work, is the potential to install a low flow weir on the river in Scranton in conjunction with the

development of a Riverfront Greenway from Lackawanna Avenue upstream through Olive Street to the vicinity of the Farmers Market.

The LRCA and Corps of Engineers considered such installations in the 1993 Greenway Study. With the installation of flood control levees, low flow weir or a low head dam could provide a navigation pool up to two miles in length. Fish and canoe passage facilities would be necessary on any such structure.

7.4 Trails

The National Park Service recreation needs assessments conducted during the development of the Lackawanna River CMP and the Plan for the Lackawanna Heritage Valley indicated a deficit of passive recreation facilities such as trails in the Scranton/Lackawanna County area.

Both plans recommended the development of a Lackawanna River Trail and parks system along forty miles of the river from Pittston through Scranton, the Mid Valley, Carbondale and Forest City. The Rail Trail Council of Northeast Pennsylvania (RTC) was formed in 1990 to promote and develop recreational trails. The RTC has acquired 32 miles of the former D&H Railroad along the Upper Lackawanna watershed as well as easements on eight miles of the parallel O&W Railway.

The LHVA has acquired and developed six miles of trail on the Central Railway of New Jersey between Scranton and Taylor and on the O&W between Blakely and Archbald. LHVA also has funding agreements with PA DOT for additional acquisitions. The Lackawanna Valley Conservancy (LVC) has acquired one-half-mile of the O&W in North Scranton and related river lands in Jermyrn, Throop and Taylor. Problems with the implementation of PA DOT grant program agreements and property owner resistance have slowed the further acquisition and development of trails along the Lackawanna.

The integration of the Scranton, Olyphant and Dickson City levee projects has been anticipated as a mechanism to clean up degraded river corridor reaches and establish a trail gradient. These projects are gradually moving towards implementation. Additional funding and work programs will be required to integrate the levees into the trail system.

Links to other areas in the watershed have been suggested in connection with the following projects:

- **Leggetts Creek & the Abingtons:** Leggetts Creek Greenway project in North Scranton; Leggetts Creek Trail in South Abington Township; Northern Electric Trail between Clarks Summit and Dalton being advanced by Countryside Conservancy.
- **Sibley area recreation site, Milwaukee Avenue Soccer Field in Old Forge** along the St. John's Creek – Lehigh Valley rail corridor.
- **The Duryea to Pittston to Wilkes-Barre Trail.**
- **The North Pocono Trail proposed on 12 miles of county-owned rail corridor in Dunmore, Roaring Brook, Elmhurst, Jefferson and Madison townships by the North Pocono Rotary Club.**

- **A Roaring Brook greenway linking the river, Nay Aug Park and the upper Roaring Brook corridor to the North Pocono area.**

Trails and trail alternatives along the river are discussed and prioritized in Appendix A of this plan. Trails along tributary streams are discussed and prioritized in the stream walk survey recommendations and municipal recommendations.

7.5 Hunting

Hunting is a major recreational activity in Pennsylvania. Hunting provides a necessary control on some populations, especially whitetail deer. The control of whitetail deer is essential to insure the diverse succession of forestry resources in the Lackawanna watershed. There are several areas of state game lands in the Lackawanna watershed. Recent agreements between the Pennsylvania Game Commission and Theta Corporation has brought 30,000-acres of Theta-owned watershed lands under a five-year game-hunting management program.

7.6 Motor Vehicle Issues

Motor vehicle use impacts the river and watershed in a generic sense as well as on a site- specific basis. Generically, motor vehicles impact the watershed with excessive air pollution and surface deposition of airborne particle pollution as well as direct atmospheric deposition on water bodies. The excessive creation of impervious surfaces and promotion of sprawl-type development and questions of long-term political and ecological sustainability are other issues related to our petroleum-based, motor vehicle using society.

The specific impact issues related to motor vehicle use and public access to river corridor and watershed natural areas are of a more immediate concern to local resource managers, property owners and public safety officials. Off-road vehicle (ORV) and all terrain vehicles (ATV) uses are major concerns in the Lackawanna watershed from an ecological and public safety perspective.

ORV access by pickup trucks is occasionally abused by persons engaged in illegal dumping of construction debris, white goods, trash and hazardous materials. ORV's also provide access into remote natural areas for other illicit activities such as drug and alcohol parties, poaching and vandalism.

ATV use is occasionally abused for similar purposes. In addition both ORV and ATV uses cause ecological destruction, erosion and sedimentation problems and noise pollution. The trespass by illegal ATV users causes the habitat destruction resulting from ATV trails crushing forest understory or ridge top barrens vegetation, pulverizing the shallow soils at the root zone and creating erosion channels on steep slopes. ATV's provide a noisy and intrusive human presence in formerly remote natural habitat areas disrupting wildlife forage and reproduction patterns.

Pennsylvania Bureau of Forestry and Pennsylvania Game Commission properties have been taking the impact of growing ATV usage in Pennsylvania and particularly in the Northeast Region. Large private property owners, Conservancy properties, farmers and woodlot owners have also suffered property damages and vandalism associated with ATV usage.

Recent surveys of DCNR district foresters identified the following problems with improper ATV use on trails where ATV usage was allowed: noise, litter, erosion, unsafe driving, off trail use, helmet violations, improper registration, under age use.

In addition to repair and maintenance costs, the additional man-hour costs for forest and game land management are increasing with ATV usage. The experience of the Rail Trail Council on the D&H Trail along the Upper Lackawanna indicates a similar set of problems. Fugitive dust problems created by ATV's running at excessive speed have compromised rudimentary dust control practices. Even with a registration program the RTC is still plagued with trespass and vandalism problems. Attempts to enlist adult rider clubs to assume a more active role in policing the trails have not been as successful as hoped.

Recent legislation in Pennsylvania now requires registration, license plate display, inspection, insurance and a training course for ATV's used off personal property. There are additional public safety and resource management needs not addressed in the legislation. Input from resource managers and law enforcement personnel for this plan indicates these additional needs:

- More ATV's for use by resource managers and law enforcement.
- Development of better and coordinated patrol, pursuit and trespass control programs.
- Development of designated ATV use trails and activity areas.
- Focus on local ridership education; many violators in the teen and 20 age group.
- Increased investigation powers for state agency personnel and increased assistance for inter-municipal cooperation.

In another area, where both ORV and ATV issues combine with littering and dumping problems, there have been suggestions for surveillance and enforcement projects involving law enforcement, resource management agencies and property owners.

The development of waste drop-off sites for white goods, brown goods, furniture and construction debris at convenient locations and times of operation is another alternative that has been suggested along with a litter and dumping awareness campaign.

7.7 Public Safety

The presence of a large urban population in close proximity to open space lands, natural areas, ridge tops and watershed forest lands has contributed to issues such as trespass, dumping, illegal behavior and vandalism across the Lackawanna watershed.

Trespass at many reservoirs, stream corridors, waterfalls and in some natural areas has been a common daily occurrence throughout the watershed particularly in the warmer months. Swimming at reservoirs and waterfalls

along with alcohol use by trespassers often results in injury or death by drowning or falling. Public safety and emergency response to these remote areas is slowed by roadways which have not been adequately maintained.

Wildfire is another public safety issue which may be of greater concern in future years as development at the wild lands urban interface increases.

8. Natural Areas and Special Places Inventory

The cultural and social heritage of the Lackawanna watershed communities is diverse and provides a strong base for contemporary arts and culture. The numerous organizations and institutions provide opportunities for local residents and visitors to learn about and experience aspects of cultural heritage and the creative arts.

During the past twenty years, several interpretive sites and programs have developed in the valley dealing with the mining, railroad, iron and textile industries and the various cultural aspects of the settlements of the valley by European immigrants. The communities' interactions with its river and watershed resources have recently received some attention with the 1990 Citizens Plan for the Lackawanna River and the 1991 Heritage Valley Plan. The plans for the Lackawanna River Heritage Trail include sites and opportunities to access the river and encourage a friendlier relationship with the river. Plans for more river access sites and interpretive signage are gradually being implemented.

The evidence gathered in the river and tributary stream walk surveys provides some interesting commentary on the degree and quality of the communities contact with historic, cultural and scenic resources in the watershed.

The LRCA has developed an Inventory of Lackawanna Watershed Special Places, which includes natural areas and habitat, scenic view sheds, ridge top summits, waterfalls, ravines, escarpments and geological features, historic and archeological features.

The inventory contains about one hundred sites and areas along the river and tributary streams. Most of these sites are on private property or former utility property. Most sites even those close to developed areas are not readily or easily accessible by the public. Most sites have a high degree of visitation by local youth and persons with outdoors skills, hunters, anglers, hikers, mountain bikers and ATV riders.

Some sites more accessible to off-road vehicles present a contrast of remarkable natural beauty marred by thoughtless dumping of trash and litter. There are approximately fourteen significant waterfalls in the Lackawanna watershed on the inventory. They range from the well known Nay Aug Falls and Gorge at Nay Aug Park in Scranton to the Forty Foot Falls on Indian Cave Creek at White Oak Creek in Archbald. Escarpments include Campbells Ledge, Old Forge Cliffs, The Notch, Bald Mountain and Cobbs Gap. Wetlands complexes include Dunns Pond and Mud Pond/Orson Glade, Simersons Marsh, Bear Swamp, and Little Virginia. Historical and archeological sites include the Duryea Canal Prism, the Pennsylvania Coal Company and D&H Gravity Railroad inclines and stationary engine sites, the Powder Mill Dam and the Scranton Iron Furnaces. Many of the natural areas are included in the Lackawanna and Wayne county natural areas inventory. Those natural areas not included on the county inventories are included in the Watershed Special Places inventory due to their local significance as a scenic, habitat, or cultural feature.

The protection and conservation of these special places is recognized as a significant need by many participants in this study process. The sites on this

inventory are all under threat. Only a small number of sites such as Lake Scranton or the Iron Furnaces have adequate conservation management and public use plans.

8.1 Historic Places	Municipality	Watershed
Confluence habitations	Duryea	R1
Canal Prism	Duryea	
Canal masonry	Duryea	R1
Ore Mine Road	Scranton	Stafford Meadow Brook
South Works	Scranton/Taylor	R3
Scranton Iron Furnaces	Scranton	Roaring Brook
Erie Arch	Dunmore	Roaring Brook
Pennsylvania Coal Co. Building	Dunmore	Roaring Brook
Pennsylvania Gravity Railroad	Dunmore & others	Roaring Brook and Stafford Meadow Brook
Chico's Spring	Dunmore	Roaring Brook
Cliff St. Bridge Site	Scranton	R3
Capouse Meadows	Scranton	R4
Market Street	Scranton	R4
Depot Street	Scranton	R4
Cayuga Vault	Scranton	Leach Creek
Griffins Mills	South Abington	Leggetts Creek
Marvine Conveyor Trestles	Scranton	R4
Valley Junction	Dickson City	R5
South Valley Arch	Olyphant	Eddy Creek
DL&W Pancost Arch	Throop	Eddy Creek
Erie Arch	Throop	Eddy Creek
DL&W Winton Arch	Throop	Eddy Creek
Erie Abutments	Jessup	R6
Heritage Crossing	Peckville	R6
Gravity Slope Shanties	Archbald	R6

Laurel Park	Archbald	R6
Frogtown Inclines	Archbald	R7
Powder Mill Dam	Jermyn	R7
D&H Light Track	Carbondale Twp.	Powderly Creek
Carbondale Retaining Walls	Carbondale	R8
D&H sites and Gravity Inclines	Carbondale	R8 and Racket Brook
Racket Brook Vault	Carbondale Twp.	Racket Brook
Doyle & Roth	Fell Twp.	R8 and Wilson Creek
Morss Mills	Fell Twp.	R9
Greys Slope	Fell Twp.	R9
Shepards Crook	Fell Twp.	Panther Bluff Creek

8.2 Waterfalls and Morphologic Sites (water gaps and escarpments)	Municipality	Watershed
Campbells Ledge	Duryea	R1 and Campbells Ledge Run
Suscon Falls	Pittston Twp.	Mill Creek
Moosic Anticline	Old Forge	R1 and R2
Old Forge Escarpments	Old Forge	R2
Race Brook Falls	Old Forge	St. Johns Creek
Moosic Bend	Taylor	R2
Fawnwood Falls	Scranton	Keyser Creek
Nay Aug Gorge and Falls	Scranton	Roaring Brook
Mill Street Tubs	Dunmore	Roaring Brook
Nay Aug Tubs	Dunmore	Roaring Brook
Cobbs Gap and Barneys Ledge	Dunmore	Roaring Brook
Little Roaring Brook Falls	Dunmore	Little Roaring Brook
Rock Bottom Glen	Roaring Brook Twp.	Rock Bottom Creek

Madisonville Cliffs and Glen	Madison/Covington Twps.	Roaring Brook
Leggetts Gap and the Notch	Scranton	Leggetts Creek
Blakely Falls	Blakely	Hull Creek
Marshwood Slides	Olyphant	Eddy Creek
Laurel Run Sinuosity	Archbald	Laurel Run
White Oak Ravine	Archbald	White Oak Run
Forty Foot Falls	Archbald	Indian Cave Creek
Edgerton Slides	Archbald	Aylesworth Creek
Rush Brook Gap	Archbald and Scott Twp.	Rush Brook
Fall Brook Falls	Carbondale Twp.	Fall Brook
Panther Bluff Falls	Fell Twp.	Panther Bluff Creek
No. 10 Falls	Fell Twp.	R9
Stillwater Gap and Cliffs	Clinton and Clifford Twps.	R10
Lake Lewis Falls	Uniondale	R12 and Fiddle Lake Creek
8.3 Natural Areas	Municipality	Watershed
Moosic Mountain Barrens	multiple municipalities	multiple watersheds
West Mountain Summits	multiple municipalities	multiple watersheds
8.4 Ponds, Reservoirs and Water Works	Municipality	Watershed
Campbells Ledge and Falling Springs	Ramsom Twp.	Campbells Ledge Run
Spring Brook, Nesbitt and Watres	Spring Brook Twp.	Spring Brook
Maple Lake	Spring Brook Twp.	Spring Brook
Lake Scranton, No. 5 and Williams Bridge Dam	Scranton and Roaring Brook Twp.	Stafford Meadow Brook

Hazard Pond	Roaring Brook Twp.	Stafford Meadow Brook
The Step Falls	Scranton	Roaring Brook
Dunmore No. 1	Dunmore	Roaring Brook
Dunmore No. 7	Dunmore	Roaring Brook
Elmhurst	Elmhurst	Roaring Brook
Curtis	Jefferson and Madison Twps.	Roaring Brook
Hollister	Covington Twp.	Roaring Brook
Griffin Pond, Maple Lake and Summit Lake	South Abington and Scott Twps.	Leggetts Creek
Fountain Springs	South Abington Twp.	Leggetts Creek
Marshwood	Olyphant	Eddy Creek
Dunmore Nos. 3 and 4	Jefferson Twp.	Eddy Creek and Little Roaring Brook
O'Conner Dam	Jessup	Sterry Creek
Olyphant Nos. 1, 2 and 3	Jessup	Grassy Island Creek
Francis Cawley Dam	Archbald	Laurel Run
White Oak Dam	Archbald	White Oak Run
Aylesworth Dam	Archbald	Aylesworth Creek
Edgerton Dam	Archbald	Aylesworth Creek
O&W Reservoir	Carbondale Twp.	Lees Creek
Rush Brook Intake and Heart Lake	Scott Twp.	Rush Brook
Brownell and Carbondale Nos. 4 and 7	Carbondale and Clinton Twps.	Racket Brook
Forest City Intake	Forest City	R10
Brace Brook Reservoir	Clinton Twp.	R10 and Brace Brook
Old Stillwater	Clifford Twp.	R10
Stillwater Dam	Clifford Twp. and Uniondale	R10
Lewis Lake	Uniondale	Fiddle Lake Creek

Fiddle Lake	Herrick Twp.	Fiddle Lake Creek
Hathaway Lake	Herrick Twp.	R12
Orson Pond	Preston Twp.	R11
Lake Lorrain	Preston Twp.	R11
Independent Lake	Preston Twp.	R11
Bone Pond	Preston Twp.	R11

8.5 Wetlands, Swamps and Bog Complexes	Municipality	Watershed
Duryea Swamps	Duryea	R1
Little Virginia	Scranton	Stafford Meadow Brook
Simmerson Swamp	Roaring Brook Twp.	Stafford Meadow Brook
Bear Swamp	Roaring Brook Twp.	Stafford Meadow Brook
Justus Meadows	Scott Twp.	Leggetts Creek
Throops Tank Swamp	Roaring Brook Twp.	Roaring Brook
Muni Bogs	Jefferson Twp.	Rock Bottom Creek
Freytown Marshes	Covington Twp.	Roaring Brook
Dunmore Swamps	Jefferson Twp.	Eddy Creek
Marshwood	Olyphant	Eddy Creek
Laruel Run Marshes	Jefferson Twp.	Laurel Run
Powderly Bogs	Carbondale Twp.	Powderly Creek
Fall Brook Glade	Fell Twp.	Fall Brook
Panther Bluff Bog	Fell Twp.	Panther Bluff Creek
Old Stillwater	Clifton Twp.	R10
Herrick Glen	Herrick Twp.	R12
Ball Pond	Herrick and Ararat Twps.	R12
Lake Romobe and Sinkhole	Herrick Twp.	R12

Swamp

Orson Glade/Mud Pond	Ararat Twp.	R11
Dunns Pond	Ararat Twp.	R11

In addition to these sites, this plan includes recommendations for permanent conservation management of all sites listed in the Natural Areas Inventory of Lackawanna County and similar sites identified in the Natural Areas Inventories of Wayne and Luzerne Counties. This plan recommends inclusion of these sites in open space plans and the further development of conservation easements and management agreements with private property owners, or the acquisition of these sites and natural areas by public or private conservation agencies.

9. Environmental Education and Public Involvement

Requirements for environmental education and community service are being expanded through newly implemented education policy in Pennsylvania. Presently, there is a wide disparity in the type, amount and quality of environmental education provided or available to students in public and private schools in the watershed. The degree and diversity of exposure to environmental education is directly relative to the knowledge and interests of the teachers.

The LRCA has provided modest support for water quality monitoring and macro invertebrate sampling to several schools during the past twelve years. Lackawanna County Conservation District has conducted an Environ-thon for many years in which teams from different schools compete in identifying and solving or managing an environmental problem.

Recently the Bureau of State Parks has developed a full-time environmental education program at Lackawanna State Park. The DCNR program includes support for a strong outreach program and for partnership with community conservation organizations.

The Lackawanna Heritage Valley Authority conducts an annual environmental fair for middle school students at the Heritage Center in Mayfield. The LHVA also supports the Children's Heritage Festival, a multi faceted series of heritage and cultural education activities. The program includes heritage-based curriculum developed with the Northeast Educational Intermediate Unit (NEIU).

LRCA is presently developing river related curriculum and educational materials based on the river and watershed. The dissemination of this material will be conducted through NEIU 19 and local schools.

There are also more opportunities for college level environmental education through local colleges. The Lackawanna watershed is being used by several professors in research and education projects both for student-based work and longer term academic research.

There is an ongoing unmet need for continuing environmental education for adults on both the technical and professional level related to watershed and resource management issues. This is evident for local elected and appointed officials, municipal staff and in the private sector for the engineering professions, construction industry, real estate and banking.

There are also unmet needs for public information and education in areas such as recycling and litter control.

The LRCA, Rail Trail Council, LHVA and Scranton Tomorrow have conducted a variety of public involvement activities in the watershed. Many of these activities provide community volunteers with opportunities to help pick up litter and trash, plant trees and shrubs, and maintain trails, parks and river access points.

The LRCA also recruits volunteers to help with Canoe-a-thon, an annual 14-mile canoe race and fun paddle held each year in early May.

LRCA recruits and trains volunteers to conduct water quality monitoring and macro invertebrate collections. LRCA partners with the Voluntary Action Center and Area Agency on Ageing to sponsor and support the Lackawanna Senior Environmental Corps (LSEC) as part of the statewide Environmental Alliance for Senior Involvement (EASI) program.

Some of the challenges to managing these programs are the coordination of efforts of the various partners and securing funding to employ and supervise support staff and to provide funds for equipment and operational expenses for the various activities. The importance of providing volunteers with safe and defined tasks and following through with volunteer recognition requires the services of staff familiar with physical access and appropriateness of river and watershed sites, water quality monitoring, trail and landscape maintenance.

10. Watershed Management and Program Administration

The implementation of public policy and programs, the management and use of land and water resources by the private sector and the behavior and practices of the public as both individuals, property owners and economic players are some of the major variables affecting the human interactions with this watershed and its resources.

At the beginning of the 21st Century, Pennsylvania is just beginning to assess its natural resources and begin to develop resource management policies based on watersheds and the natural values and functions inherent to watersheds.

Since 1987, the Lackawanna River Corridor Association has been a regional leader in the concept of watershed planning and management. The LRCA developed through a partnership among local citizen interests, county government, state and federal interests. The Citizens Master Plan was developed as a comprehensive and multi objective document. It wove together the many different issues and stakeholders and it offered a systematic series of recommendations all based on the watershed and all relevant today.

The Citizens Master Plan for the Lackawanna River of 1990 has four basic features:

- **Project River Clean, a comprehensive environmental cleanup plan.**
- **Lackawanna River Park system, a linkage of neighborhood parks, rails-to-trails projects, trails on river levees and public roadways to create a continuous park land system from the confluence of the Lackawanna and Susquehanna rivers at Pittston, upstream through Scranton and Carbondale to the headwaters at Stillwater Dam.**
- **A Community Planning and Development project was proposed as a strategy to enhance the rivers recovery and provide for long-term redevelopment of neighborhoods adjacent to the river.**
- **A Lackawanna River Partnership was recommended as a coordinating body formed under the leadership of Lackawanna County. The partnership would facilitate implementation of the other elements of the plan.**

10.1 Management Program Assessment

Since 1990 all of these elements have been implemented in some way. Significant advances have occurred in addressing river corridor and watershed issues identified in the CMP of 1990.

- **Project River Clean has been implemented in various ways, such as local trash and debris cleanups conducted by the LRCA, community groups and volunteers, Lackawanna Watershed 2000, a \$30-million federal-funded cleanup of abandoned mine land drainage problems and sewer upgrades is underway with over \$28-million in nonfederal funds. Additional reclamation work is underway along the river and tributary streams through state funded Growing Greener projects.**

- The Lackawanna River Heritage Trail is being developed by Lackawanna Heritage Valley Authority between Scranton and Carbondale, and the Rail Trail Council of Northeast Pennsylvania (NEPA RTC) between Carbondale and the Lackawanna River headwaters north of Stillwater Dam and Union Dale. The LRCA is working in various ways to support these projects.
- There has not been a watershed-wide coordinated program for municipal ordinance upgrades. The Lackawanna Industrial Highway Corridor program has developed upgrades to ordinances and plans between Dunmore and Carbondale. The interest and ability of the municipalities to utilize the new ordinances to protect open space, natural areas, wetlands and stream corridors has not yet been demonstrated. An open space plan presently being initiated by Lackawanna and Luzerne counties may provide the framework for a comprehensive resource management program.
- The Lackawanna River Partnership suggested in the 1990 CMP has not been formally convened by the Lackawanna County Commissioners. Several related public-private partnership initiatives have evolved around different aspects of program implementation for cultural heritage, recreation and greenways and environmental resources. LRCA proposed a Lackawanna River Partnership model in 1996 which would bring water resource management, infrastructure and reclamation agencies together through a partnership under the county planning commission. The partnership could be organized similarly to the transportation planning model whereby the planning commission acting as a metropolitan planning organization (MPO) would bring partners and stakeholder groups together to identify and priority water resource management, conservation, and reclamation needs and coordinate the implementation and integration of programs and projects on a watershed basis.

10.2 Unmet Needs and Growth Issues

The Watershed 2000 program is addressing some but not all aspects of watershed planning and management needs. Watershed 2000 may have the ability to become institutionalized as a management system with defined partnership commitments and roles.

A closer integration of management on watershed resource issues could also be achieved through creation of a watershed-based storm water management utility. Such an agency could have responsibilities for storm drainage infrastructure as well as for the management of natural water resources, stream corridors, flood control works and reclamation areas. Storm water utility districts have been developed in some metropolitan areas and have succeeded in relieving municipalities of certain public works responsibilities while achieving economies of scale to better manage resources on a watershed level.

The open space management issues in the watershed may be seen as one aspect of public water supply security. The protection of source waters for the Scranton/Wilkes-Barre metropolitan area has been and remains an important priority. The means of that protection is both a physical and institutional challenge. Do Lackawanna watershed municipalities have the capacity to absorb increases in the population in critical watershed areas? What are the alternatives to incremental sprawl-type growth? What impacts will the

restoration of commuter rail service on the Scranton/New York rail corridor have on the North Pocono watersheds of the Lackawanna Basin?

Are there opportunities to encourage, direct and manage demographic change and economic development with conservation development strategies like transit/rail commuter line oriented design and neo-traditional village/town development? Will the Luzerne and Lackawanna county open space plans result in mechanisms which actually lead to the permanent conservation of a linked system of open space and natural areas tied into water resource protection and conservation?

These are just a few of the questions which watershed stakeholders in the Lackawanna Basin may wish to consider in the formulation of management and administrative initiatives to address the challenges to this watershed anticipated as we begin this new century.

The creation of the water supply system between the 1880's and 1920's helped to protect and conserve as significant amount of watershed resources during the past one-hundred-years. The variables for the next one-hundred-years are drastically more interactive and due to our technological capacities, poor decision-making may impact a wider array of undesirable consequences.

Thoughtful, deliberative, informal, consensus-based decision-making, focused on goals of long-term sustainability has contributed to successful community building elsewhere. During the past it has been successful here as well on a variety of singular or focused topics. Perhaps our challenge now is to insure we can combine the practice of consensus-based decision-making with the values of environmental and economic sustainability.

11. River Conservation Plan Recommendations

The recommendations developed for the implementation of the Lackawanna River Watershed Conservation Plan are presented in Sections 11 and 12. Policy recommendations for issues and topics of a watershed level are presented in Section 11. Site-specific recommendations for individual sites on the river or tributary stream, for river reaches, and for natural resources and special places are included in Sections 12. These recommendations are grouped by municipality (recommendations are grouped by river reach and sub-watershed in Appendix C).

The recommendations have been developed by the Lackawanna River Corridor Association based on input received at public meetings, from key person interviews, surveys of municipal officials, county and state agency staff, property owners and business interests. The recommendations are also based on analysis of the river and tributary stream surveys conducted by LRCA and community volunteers between 1999 and 2001.

Existing and proposed projects and programs related to the river, its watershed resources, recreation, transportation and economic development were assessed for their impact potential and overall project synergy on a watershed scale or as site specific projects.

River and watershed conservation plans in other watersheds were also reviewed and various typical projects were assessed for applicability in the Lackawanna watershed. The original Lackawanna River Citizens Master Plan of 1990 was a primary assessment-base document. Many of the general recommendations from the 1990 plan are still relevant today.

Prior to discussing future recommendations a brief review of the accomplishments based on the 1990 plan will be useful. While some of this information was presented in previous sections, it is presented here in one unit. The accomplishments summary is formatted around the four main recommendations of the 1990 plan.

o A Lackawanna River Greenway and park system

- 1991, a Rail Trail inventory completed by LRCA and National Park Service (NPS)
- 1993, Based on the 1990 plan, the Corps of Engineers and Park Service team with LRCA to develop Lackawanna River Heritage Trail plans
- 1991, LRCA helps to establish the Rail Trail Council of Northeast Pennsylvania
- 1993, LRCA works with Lackawanna Heritage Valley Authority to secure \$300K ISTEA Grants to acquire and develop 6 miles of trail
- 1993, Rail Trail Council secures \$400K ISTEA Grant to acquire 32 miles of D&H along 15 miles of upper Lackawanna watershed
- 1995, LRCA partners with Lackawanna Valley Conservancy to acquire ½-mile of NYO&W rail corridor in Scranton

- **1996, RTC completes acquisition of D&H, secures easements on NYO&W effectively gaining control along 12 miles of both sides of upper Lackawanna**
- **1998, LHVA completes 1.5-mile CNJ Trail and 3.1-mile O&W Trail**
- **1999, LVC acquires 3 parcels totaling 1.2 miles of shoreline**
- **1999, LVC acquires 3 parcels totaling 1.2 miles of shoreline**
- **2001, Total 41.7 of 80 river miles acquired and protected through Trail and Conservancy acquisitions**

o Project River Clean

- **800 cubic-yards of debris removed from riverbanks along 10 miles of corridor by volunteers over 10 year period**
- **\$30-million USEPA funds allocated for water quality work for mine drainage and combined sewer overflows. \$28-million in nonfederal and in-kind funds designated from state, county and local sources as a match.**
- **PA DEP, Bureau of Abandoned Mine Reclamation has developed projects along 8 miles of tributary stream corridor for channel and habitat restoration**
- **Corps of Engineers is initiating projects on 5 miles of tributary stream**
- **Over 10 culm banks remain on flood plains**
- **Over 20 miles of river and tributary stream corridor are in need of reclamation**
- **Over 150 combined sewer overflow points remain to be addressed**
- **Over 4 miles of riverbank or upland remain severely impacted with trash, debris, municipal waste or junkyards**

o Public Involvement and Education

- **LRCA mobilizes over 300 volunteers per year for a variety of hands-on activities.**
- **LHVA and LRCA are planning work with volunteers and the LHRT municipal trail committee.**
- **Rail Trail Council conducts volunteer events with over 300 volunteers per year.**
- **LRCA conducts River Watch, a citizen water quality monitoring program, 30 volunteers per year for the past 12 years.**
- **LRCA partners with county Agency On Ageing and Voluntary Action Center to sponsor the Lackawanna Senior Environmental Corps.**

- **LRCA conducts up to 10 River in the Schools programs with local middle and high schools.**
- **LRCA is developing river trunks and watershed curriculum focused on the Lackawanna watershed.**

o Lackawanna River Partnership

- **The partnership as proposed in the 1990 plan has not developed as a comprehensive oversight group.**
- **Several ad hoc partnerships have evolved; one is focused on the Lackawanna River Heritage Trail, another is focused on Watershed 2000**
- **Both partnerships involve Lackawanna County in a lead role with the active participation of the Lackawanna River Corridor Association, other county agencies, state and federal agencies.**
- **The LRCA has proposed that the Metropolitan Planning Organization (MPO) process used by Luzerne and Lackawanna counties to conduct transportation infrastructure planning with PA DOT may provide a useful model to be adapted to water resources planning and management.**

11.1 Lackawanna River Partnership and Watershed 2000

There has been a progressive movement since the completion of the LRCMP in 1990 towards a comprehensive and consensus-based water resources policy in the Lackawanna watershed. The lead taken by Lackawanna County Regional Planning Commission to develop the Act 67 storm water management plan demonstrated the practicality of working on a watershed-wide basis.

The work of Lackawanna County and the LRCA with the Corps of Engineers and National Park Service on the Lackawanna River Greenway Study developed an assessment and an inventory of potential projects and partnerships focused on environmental habitat restoration, recreation and economic development.

This work lead to the appropriation by Congress in 1994 of a \$30-million water resources grant through the USEPA for Lackawanna County to develop projects to abate acid mine drainage and abandoned mine land drainage impacts in the watershed as well as initiate partnerships with sewer authorities to demonstrate combined sewer overflow control technologies. This program requires a 55/45 % federal/nonfederal match.

After several years of discussions regarding congressional intent, the definition of and requirements for match, the understanding of the scopes of work and the involvement of various local, state and federal partners. The program is finally underway on a project basis rather than a watershed basis. The development of the Watershed 2000 program between 1994 and 2001 has led to a good working partnership among the local and state agencies, especially on mine reclamation and drainage issues. A sufficient amount of nonfederal funds has been qualified from state and local sources to allow the Watershed 2000 program to proceed to site characterization and project design.

The key factor in these achievements has been the leadership of Lackawanna County and the strong support and participation by the Bureau of Abandoned Mine Reclamation (BAMR) and Water Quality (BWQ) of the Pennsylvania Department of Environmental Protection (PA DEP). The potential to maximize the effectiveness of state and local efforts combined with the use of federal funds has been a strong incentive to keep all partners working to advance the program. Regular meetings of agency representatives in a working group have been important in achieving the consensus-based decision-making, which is now likely to have demonstrable watershed-wide impact.

The Environmental Futures Planning process (EFP2) presently being instituted by PA DEP to implement planning cycles involving stakeholder consensus on a watershed basis provides a significant opportunity to support and broaden the watershed management dialogue in the Lackawanna Basin. A confluence of EFP2 precepts with the vision and recommendations for a Lackawanna River Partnership entity based on successful aspects of the MPO transportation planning model is encouraged as an outcome of this river conservation plan.

Some of the following topics could become part of the partnership's agenda:

- **Update of the Act 67 storm water management plan**
- **An assessment of sanitary sewage infrastructure and jurisdictions**
- **Implementation of watershed-based total maximum daily loads (TMDL's)**
- **Development of a stream corridor management program with local municipalities**
- **Enhanced public/private partnership for drinking water system management including water conservation and source water protection**
- **Flood protection system management**
- **Integration of sustainable water resources management with economic development**
- **Integration with recreation, trails, greenways and open space management**
- **Conduct of post Watershed 2000 mine reclamation programs.**

To advance the potential of the partnership concept, this plan recommends that Lackawanna County and/or the LRCA conduct a strategic planning feasibility study to more fully develop a mission, structure, and agenda for a watershed partnership entity to serve the residents and local governments in the Lackawanna watershed. This project is recommended as a river conservation implementation program.

11.2 Water and Environmental Quality Protection and Enhancements

This plan recommends that all municipalities consider environmental audits of their plans and ordinances to include resource conservation measures, conservation subdivision opportunities, storm water Best Management Practices, water body and water course buffer requirements and building

setbacks, open space network requirements, performance based zoning practices which are included in the Growing Greener-Growing Smarter approach suggested by recent changes in the Municipalities Planning Code and outcome from the 21st Century Environment Commission. These practices also include those promoted by the Center for Watershed Protection and the Natural Lands Trust.

This plan recommends programs to upgrade and consolidate public waste-water treatment facilities, improve discharge parameters and reduce combined sewer overflows. To further inform decision making for water quality improvement this plan recommends a comprehensive assessment of Total Maximum Daily Loads (TMDL's) and a sediment transport and output study for the Lackawanna Watershed.

This plan also recommends mitigation of all acid mine drainage outfalls and elimination of non-point AMD sources.

11.3 Municipal Advisory Committee

While a river partnership brings together representatives from different levels of government, there may also be a role for a municipal level body that would focus on water resources. A first step would be the creation of a municipal advisory committee for the Lackawanna watershed. In the past, various inter-municipal committees have formed as part of a Council of Governments (COG) activity. Lackawanna County developed one as part of the Act 67 storm water plan. Lackawanna Heritage Valley Authority has initiated an inter-municipal agreement to create a management committee for the Lackawanna River Heritage Trail.

This plan recommends that Lackawanna County and its agencies collaborate with LRCA and local municipalities individually or through an existing COG or to advance the concept of a municipal advisory committee for the Lackawanna watershed. The committee could function at the level of a COG and/or become a component of a more formalized Lackawanna River Partnership.

This plan recommends that the development of a municipal watershed committee be considered for a river conservation implementation program.

11.4 Abandoned Mine Land Reclamation Plan

The mine reclamation component of this plan in Appendix B contains an extensive inventory of mine reclamation projects, which await implementation. Where appropriate, this plan recommends implementation of projects through the Watershed 2000 program or by PA DEP, BAMR. However, when feasible, other partnerships are encouraged to involve economic development with mine reclamation work to restore riparian and upland habitat. This plan recommends where appropriate, river conservation implementation projects accomplish reclamation work.

This plan also recommends and prioritizes projects by all agencies to remove culm dumps and coal wastes from the immediate flood plains and water courses of the river and tributaries.

11.5 Economic Development

This plan recommends that all economic development agencies and projects address their interface with watershed resources in the context of mine reclamation, storm water management, open space and natural areas preservation, greenways and recreation corridors. This plan further recommends the use of the river conservation implementation programs to facilitate a beneficial interface between economic development projects and watershed resources.

11.6 Recreation and Trails

The opportunities to develop recreational and community greenway trails in the Lackawanna watershed have been demonstrated by the work of the LRCA, Rail Trail Council and Lackawanna Heritage Valley Authority along the Lackawanna River. The trail alternative report in Appendix A develops an extensive trail alternative analysis to support a continuous 40-mile trail from Pittston to Stillwater.

The plan recommends application of the river conservation implementation program to support further trail development along the preferred alignment. This includes integration of the flood levees with the Lackawanna River Heritage Trail and development of greenways in Downtown Scranton.

There are additional trail opportunities referenced in the river and tributary survey recommendations which are reiterated here to support the development of trail links throughout the watershed. The following trail projects are also recommended through this plan for river conservation and other appropriate implementation programs.

- **Nay Aug/Roaring Brook greenways/ North Pocono Greenway Trail system**
- **St. John's Creek Greenway Trail**
- **Spring Brook / Wilkes-Barre and Eastern Greenway**
- **Mill Creek Greenway**
- **LHRT link to Dunmore via I-81 channel, Marywood Campus**
- **PA Gravity & Moosic Lake Trolley Line Loop Trail**
- **Leggetts Creek Greenway & Trail: link to Abingtons and Northern Electric Trail**
- **Grassy Island Creek Greenway**
- **Powderly Creek Greenway**
- **Fallbrook Trail**
- **D&H Gravity/Racket Brook Trail**
- **Wilson Creek Trail**
- **D&H Gravity Shepards Crook Trail**

This plan recommends and prioritizes a Nay Aug greenway plan or a component of a Nay Aug Gorge Restoration program. A North Pocono Trail/Roaring Brook Greenway is also a recommended priority to build on the existing county-owned rail corridor between Dunmore and Elmhurst and along water line rights-of-way to Moscow and Covington.

All other projects are recommended when partnerships are developed at the sub-watershed level to advance specific projects.

11.7 Open Space Management, Watershed Resource Protection

This plan recommends the use of river conservation implementation programs where appropriate to implement the acquisition and management of open space, natural resources, ridgelines, water resources, forest lands or historical resources.

Local municipalities can become more effective in meeting the communities' needs for open space preservation and improved natural resource management through informed and active use of existing and newer provisions in the Pennsylvania municipalities planning code. The community comprehensive plan can embody a strong conservation policy for the municipality which enhances economic development opportunities while establishing methods to conserve and protect environmental and cultural resources. The zoning plan, subdivision and land use ordinances can provide flexible techniques to encourage appropriate economic growth with incentives for open space and resource protection. The creative mix and use of compliance and incentive-based ordinances can provide the municipality with capacities to protect resources on a site-by-site basis and link through greenways to other conservation and recreation sites across the municipality.

This plan recommends audits of all new and existing ordinances and further proposes support for municipalities to upgrade their ordinances in the context of Growing Greener and Growing Starter policies inherent in the amended municipalities planning code.

11.8 Environmental Education and Public Involvement

An educated, informed and involved citizenry is the best guarantee for long-term, sustainable relationships among the human and natural communities in the watershed. The LRCMP of 1990 offered a series of recommendations for both educational and public involvement strategies. LRCA and other partners have developed programs on an incremental basis. There are emerging needs for new programs and partnerships in this area. Proposed updates to educational standards pending with the Pennsylvania Department of Education for environmental education will provide both new opportunities and needs for conservation organizations to collaborate with school districts on the delivery of environmental education programs.

During 2001-2002 the LRCA is in the process of developing a Lackawanna River watershed curriculum in partnership with the Northeast Intermediate Unit #19 with funding through a Growing Greener Grant. LRCA has also developed a 2-day school program known as the "River in the Schools" program. LRCA staff conducts a portion of a day in the classroom orientating students and teachers to

watersheds in general and the Lackawanna and its sub-watersheds in particular. A second portion of a day is spent with teachers and students along the river or at a tributary stream near the school.

This plan recommends that these programs be continued as appropriate with support from river conservation implementation programs and other sources developed by LRCA and local partners. The LRCA works in partnership with several environmental educators and organizations including the PA DCNR naturalist and education specialist at Lackawanna State Park. This plan recommends river conservation program support for collaborative programs with the DCNR watershed education specialist and other partners.

Another long-term unmet need in this watershed is the need for a nature center specifically situated and designed to educate the public about the local environment and its ecology. There are several potential opportunities to develop such a center or centers in the watershed. This plan recommends using river conservation implementation programs to further develop the nature center or centers as collaborative projects involving LRCA and other agencies such as the Everhart Museum, local institutions of higher education, local school districts, the NEIU #19, and other conservation organizations as appropriate.

There are needs for adult continuing education and technology training for resource management, environmental engineering, public policy (i.e. the municipalities planning code) and conservation practices. This plan recommends support for the dissemination of technical and academic education through adult watershed education programs conducted with the involvement of LRCA and local educational institutions.

The LRCA has been providing public involvement opportunities for local residents along the Lackawanna watershed. These include:

- Active involvement as a board member or regular member in planning and advisory activities
- Citizens water quality monitoring (River Watch and EASI/LSEC)
- Special events promotion (Canoe-a-thon & annual dinner)
- River and trail projects (trash clean-ups, tree planting)
- Nature hikes and natural resource/conservation lectures

While the LRCA will continue to provide these opportunities, the organization and partners may from time to time propose public involvement activities in the context of advancing community and organizational capacity to address enhanced stewardship of the Lackawanna watershed.

These programs and projects may include but are not limited to the following:

- Strategic planning for organizational development and institutional advancement
- A watershed sojourn – a single or multi day exploration of the watershed and its special places

- **Support for the operation of a municipal advisory committee program**
- **Support for the creation of Environmental Advisory Committees (EAC's)**
- **The development and enhancement of watershed information media, websites, videos, CD programs, maps, posters, brochures and newsletters**
- **Creation and operation of a Lackawanna Valley Ranger Corps for youth employment training**
- **Watershed theme-based arts and performance programs such as river festival performances, river related fine arts, AMD and art-type activities.**

11.9 Land Use Recommendations for Watershed Conservation

The recommendations for upgrading municipal ordinances offered in previous sections and in Section 12 need to include state of the art best management practices and principles of ecological restoration and landscape ecology as a basis for achieving better resource protection and conservation. The best management practices developed by the Center for Watershed Protection coupled with open space and conservation subdivision techniques developed by the Natural Lands Trust are typical of the practices which are successfully being implemented by local governments in upscale communities around the country where the conservation of local natural resources is seen as integral with the economic health of the region.

There is widespread interest at the local, regional and state level in promoting these practices in Northeast Pennsylvania. Therefore this plan recommends programs and proposals which promote the adoption and use of these practices, ordinances and techniques in the Lackawanna watershed.

The recommended programs may include:

- **Integration of appropriate practices in an update of Act 67 storm water management ordinances.**
- **Auditing existing or recently updated ordinances to include additional practices.**
- **Development of demonstration projects.**
- **Training and technology transfer support for local practitioners and municipal officials.**
- **Creation of public private partnerships to support the voluntary application of practices on private development.**
- **Involvement of water supply utilities with adjacent landowners and municipalities in the application of these practices as a component of local source water protection.**

While this plan endorses watershed-based best management practices across the entire watershed, the application of these practices in previously undeveloped watersheds associated with the water supply system is critical to the protection

of water and habitat quality. The plan therefore recommends that municipalities in which these water supply sheds are located consider the adoption and implementation of watershed protection practices as a high priority.

11.10 Historical and Cultural Conservation

The conservation of historical and cultural resources in the Lackawanna Valley has been accomplished by the private sector, individual property owners and historical societies. The development of the Anthracite Museum, the Scranton Iron Furnaces and the Coal Mine Tour at McDade Park were the beginning of significant governmental involvement in the conservation of historic resources.

The development of the Steamtown National Historic Site and the plan for the Lackawanna Heritage Valley introduced the National Park Service into the Lackawanna Valley. There is a greater understanding and recognition of the Lackawanna Valley as a nationally significant historical and cultural resource area. The physical setting of the valley and the social, cultural and demographic setting all contain resources in need of protection, conservation and interpretation.

A few physical sites, mainly buildings in the public domain have been nominated for listing on the National Registry of Historic Places. Aside from several initial nominations of these public sites, there has not been a sufficient outreach to include some of the physical sites with historical value in the more remote areas of the watershed. These sites are included in the inventory of special places.

This plan recommends that sites listed in the special places inventory as well as similar sites should be catalogued and included in the pending Lackawanna – Luzerne county open space plans. This river conservation plan recommends acquisition of several sites for permanent conservation. The further development of management plans for these sites to include public access, informational and interpretive signage and related site improvements is also recommended.

Sites recommended for conservation protection include:

- The Pennsylvania Canal in Pittston and Duryea, especially the canal prism in Duryea
- The Pennsylvania Coal Company Gravity Railroad
- The Scranton Iron Works and Steel Works associated resources
- The D&H Gravity Railroad: Depot Street, Valley Junction, Inclined Planes
- The Gravity Slope Colliery in Archbald
- Griffins Mills on Leggetts Creek
- The Central Railroad of New Jersey site and Lackawanna Avenue vicinity in Scranton
- The Scranton retaining walls

- **The Providence station site on Market Street, Scranton**
- **All railroad bridges over 60 years old**
- **All stone and barrel vault culverts**
- **Old Forge/Lonesome Road historic district**
- **The Peck Mills on Market Street, Scranton**
- **The Doyle & Roth site in Simpson**
- **All historic cemeteries with pre-1900 burials are recommended for special conservation consideration**
- **All dams and waterworks**
- **The confluence prehistoric sites and potential rock shelter sites throughout the watershed**

The development of a historical sites maps and guidebook series is also recommended as well as integration of a “sense of place” program for local school curriculum.

The physical designs and spatial relationships of some main street and village residential neighborhoods can serve as templates to influence the designs of new developments using a neo-traditional theme as new neighborhoods and commercial sites are created on abandoned mine reclamation sites. These ‘infill’ developments can provide opportunities for new economic growth while helping to maintain the historic and cultural fabric of the communities in the Lackawanna Valley.

12. River Conservation Project Recommendations

12.1 Down Valley Communities

Municipalities in this section include: the Boroughs of Duryea, Old Forge, Moosic, Taylor, Avoca and Dupont, the City of Pittston, and Pittston and Ransom Townships. The listed recommendations are related to the protection and potential projects along the Lackawanna River and tributary streams within its lower watershed, which include: Campbells Ledge Run, Red Springs Run, St. Johns Creek, Mill Creek, Spring Brook and Keyser Creek.

Duryea Borough

A 2.6-mile reach of the Lackawanna River lies within the Borough of Duryea. This reach extends from the confluence with the Susquehanna River to the Duryea/Old Forge border (also Luzerne/Lackawanna county line). Two tributary streams have their confluence with the Lackawanna in Duryea, Campbells Ledge Run and Red Springs Run. A small stretch of Mill Creek also lies within the municipality.

General Recommendations:

- 1. The Borough of Duryea should include the protection of the Lackawanna River, Campbells Ledge Run, Red Springs Run and Mill Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Duryea may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

- 1. This plan recommends development of a confluence resource management area to involve: the Pennsylvania Fish and Boat Commission in wildlife habitat management, the Bureau of Abandoned Mine Reclamation and US Army Corps of Engineers in a large mine drainage treatment program, and the Lackawanna Heritage Valley Authority, local municipalities and Luzerne County agencies in a greenway and recreational trail program throughout the confluence area. Therefore, this plan recommends that a major resource management, reclamation and recreation development plan is needed. Private residential, commercial, institutional and industrial development is also recommended for the perimeter of the confluence area.**

2. **As a first step towards a confluence area plan, this plan recommends a consensus building project to be funded through the River Conservation Program.**
3. **Major transportation improvements will also be needed in this area. Access to Keyser Avenue in the north and I-81 and Rte. 11 in the east and south would need significant improvements.**
4. **The abandoned rail corridor from Coxtown through Connells Patch and the active Reading & Northern line to Taylor along the river are important greenway links described in the Trails section of this plan. These corridors are recommended for trail project implementation through this plan.**
5. **This plan recommends consideration of a large comprehensive acid mine drainage treatment and mitigation project, to treat the Old Forge Borehole, Duryea Outfall and Butler Mine Tunnel discharges. The US Army Corps of Engineers, Bureau of Abandoned Mine Reclamation and the Lackawanna Watershed 2000 program are potential partners on this project. The Popple Brothers Colliery, the Duryea Swamps and the Lower Lackawanna Sewage Treatment plant are potential project resources.**
6. **The Borough of Duryea, along with the City of Pittston and the Luzerne County Rails With Trails program are potential cooperative partners with the Lackawanna Heritage Valley Authority and the LRCA for the development of trail and greenway facilities along this reach of river corridor. Implementation projects to develop this partnership and acquire and develop greenway and trail sites are recommended.**

Recommendations for Campbells Ledge Run:

1. **The Duryea Swamps may provide the site of a large scale acid mine drainage (AMD) treatment program to treat flows from the Old Forge Bore Hole and the Duryea Outfall. Some mine reclamation work to address flow loss and strip pits could enhance the stream corridor and upland habitat.**
2. **The Duryea Swamps are also possible sites for a waterfowl management program and a viable warm water fishery.**
3. **The upland terraces between the swamps and Campbells Ledge and Falling Springs Reservoirs offer potential residential development sites.**
4. **The reservoir areas offer ridge-top conservation opportunities, with recreational uses as appropriate. There are assorted public safety issues regarding the escarpment and the present remoteness of the ridge top sites. Several of the larger private parcels at the reservoirs are owned by Theta Corporation, a real estate holding business formerly associated with the PG Energy/PG&W gas and water utility.**
5. **This plan recommends that future land use in the upland/reservoir area be focused on recreation/conservation use above the reservoirs, with a transition into residential use between the upland sites and the flood plain at Coxtown Road. The swamps need to be reserved for recreation/conservation uses and potential AMD mitigation.**

Recommendations for Red Springs Run:

1. **Effective regrading, revegetating and erosion control are needed at the Airport Sand and Gravel site, as well as similar sites and quarries within the municipality.**
2. **Portions of the Popple Colliery site may be appropriate for an AMD mitigation project for the Old Forge Borehole.**
3. **The Popple Colliery buildings and adjacent residential cluster offer historic preservation and interpretative opportunities.**
4. **The Popple Colliery culm banks should be reclaimed and the site restored for flood plain habitat.**

Recommendations for Mill Creek:

1. **A clean up of coal waste sediments (possibly contaminated from industrial sources) is recommended in the confluence reach from Moosic, Old Forge through Duryea to the Erie railroad culvert and the Avoca flood works. This reach is further recommended for installation of a naturally analogous restoration. A riparian flood plain buffer presently exists and is in need of zoning protection and/or acquisition on the Old Forge-Duryea side of this reach. An abandoned rail corridor lies along the Moosic side and is also recommended for acquisition and greenway development.**

City of Pittston

The Lackawanna River serves as the municipal boundary between the City of Pittston and the Borough of Duryea from the confluence with the Susquehanna River upstream 0.5 miles to the Coxton rail bridge.

General Recommendations:

1. **The City of Pittston should include the protection of the Lackawanna River, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The City of Pittston may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

- 1. This plan recommends development of a confluence resource management area to involve: the Pennsylvania Fish and Boat Commission in wildlife habitat management, the Bureau of Abandoned Mine Reclamation and US Army Corps of Engineers in a large mine drainage treatment program, and the Lackawanna Heritage Valley Authority, local municipalities and Luzerne County agencies in a greenway and recreational trail program throughout the confluence area. Therefore, this plan recommends that a major resource management, reclamation and recreation development plan is needed. Private residential, commercial, institutional and industrial development is also recommended for the perimeter of the confluence area.**
- 2. As a first step towards a confluence area plan, this plan recommends a consensus building project to be funded through the River Conservation Program.**
- 3. Major transportation improvements will also be needed in this area. Access to Keyser Avenue in the north and I-81 and Rte. 11 in the east and south would need significant improvements.**
- 4. This plan recommends consideration of a large comprehensive acid mine drainage treatment and mitigation project, to treat the Old Forge Borehole, Duryea Outfall and Butler Mine Tunnel discharges. The US Army Corps of Engineers, Bureau of Abandoned Mine Reclamation and the Lackawanna Watershed 2000 program are potential partners on this project. The Popple Brothers Colliery, the Duryea Swamps and the Lower Lackawanna Sewage Treatment plant are potential project resources.**
- 5. The City of Pittston, along with the Borough of Duryea and the Luzerne County Rails With Trails program are potential cooperative partners with the Lackawanna Heritage Valley Authority and the LRCA for the development of trail and greenway facilities along this reach of river corridor. Implementation projects to develop this partnership and acquire and develop greenway and trail sites are recommended.**

Old Forge Borough

An approximately 3.25-mile reach of the Lackawanna River flows within the Borough of Old Forge; most of this reach serves as the boundary between Old Forge and the Borough of Moosic. The confluence and most of one tributary stream, St. Johns Creek, is also within the municipality.

General Recommendations:

- 1. The Borough of Old Forge should include the protection of the Lackawanna River and St. Johns Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Old Forge may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. The abandoned rail corridor from the Connells Patch neighborhood to Coxton, and the active Reading & Northern line to Taylor along the river are important greenway links described in the trails section of this plan. These corridors are recommended for trail project implementation through this plan.
2. This plan recommends consideration of a large comprehensive acid mine drainage treatment and mitigation project, to treat the Old Forge Borehole, Duryea Outfall and Butler Mine Tunnel discharges. The US Army Corps of Engineers, Bureau of Abandoned Mine Reclamation and the Lackawanna Watershed 2000 program are the potential partners on this project. The Popple Brothers Colliery, the Duryea Swamps and the Lower Lackawanna Sewage Treatment plant are potential project resources.
3. The Borough of Old Forge is interested in demolishing the vacant multi-story apartment structure at Lonesome Road and promoting redevelopment of this site. LRCA suggests that this site could be associated with a Heritage Landing or Trailhead as referenced in the Heritage Trail Alternatives section of this plan. This could include the former DL&W station site across the river. This project area is recommended as an implementation site for River Conservation program participation.
4. The Lonesome Road area could support a high quality commercial, multi family, mixed-use development. This plan recommends that the Borough of Old Forge and private developers consider a redevelopment of this area.
5. A Lonesome Road redevelopment could provide a link to a Moosic flood levee greenway recreation trail, to extend to Moosic Road as an alternative, or loop trail in conjunction with a Lackawanna River Heritage Trail route along the Reading & Northern corridor on the west bank. This property is recommended for a feasibility study pending the interest of Moosic Borough.
6. This plan suggests that the Lackawanna River Heritage Trail alternative route along the Reading & Northern corridor be developed, with an additional acquisition and management program for the Old Forge escarpments. An acquisition and conservation management plan could be developed for the escarpment area as an individual project action in partnership with the Borough of Old Forge and property owners, or through the initiative of the LRCA and/or Lackawanna Valley Conservancy and individual property owners. A River Conservation project for the Old Forge Escarpments is a recommended action.
7. The development of greenway and trail links across the Lackawanna from the Old Forge Escarpments to upland areas of Moosic, may be possible along abandoned rail corridors adjacent to the PA Turnpike, US Rte. 11, Interstate 81 and PA Rte. 502. The purpose of these greenways are to link the river corridor to the Glen Maura/Montage area and to a Spring Brook greenway trail through PAWC and

Theta Company lands, in the Spring Brook watershed. The development of this trail utilizing the abandoned Wilkes-Barre & Eastern rail corridor would also link the Lackawanna corridor to Lackawanna State Forest and State Game lands in the upper Lehigh watershed and other resource areas in the Poconos. The development of a Moosic/Springbrook/Thornhurst/Pocono greenway is recommended for further consideration, as a feasibility study or for open space conservation acquisition.

Recommendations for St. Johns Creek:

1. Promote the installation of natural stream channel restoration designs, to eliminate sediment transport and restore natural stream functions and habitat.
2. Facilitate upgrades to storm water systems to enhance water quality in watershed.
3. Facilitate improvements to sanitary interceptor system.
4. Acquire and develop a greenway for recreation and open space protection, utilize abandoned rail corridor and linkages to borough, school district and fire company properties. Link greenway to Lackawanna River Heritage Trail.
5. Acquire protective easements along restored stream reaches.
6. Involve school district and watershed residents in educational and stewardship activities.
7. Link greenway to Luzerne County trails.
8. Facilitate development of Heritage Trailheads at rail station or historic site in Old Forge.
9. Develop interpretive site and trail link at, Old Forge Borehole and Moosic anticline ledges in riverbed.

Moosic Borough

The Borough of Moosic is bounded on the west by 2.7 miles of the Lackawanna River. It serves as the boundary between Moosic and the Borough of Old Forge and further upstream as the boundary between Moosic and the Borough of Taylor. The confluence areas and lower portions of Mill Creek and Spring Brook lie within Moosic and a third tributary stream, Greenwood Creek, lies entirely within the municipality.

General Recommendations:

1. The Borough of Moosic should include the protection of the Lackawanna River, Mill Creek, Spring Brook and Greenwood Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Moosic may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions,

especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. A Lonesome Road redevelopment could provide a link to a Moosic flood levee greenway recreation trail, to extend to Moosic Road as an alternative, or loop trail in conjunction with a Lackawanna River Heritage Trail route along the Reading & Northern corridor on the west bank. This property is recommended for a feasibility study pending the interest of Moosic Borough.
2. The development of greenway and trail links across the Lackawanna from the Old Forge Escarpments to upland areas of Moosic, may be possible along abandoned rail corridors adjacent to the PA Turnpike, US Rte. 11, Interstate 81 and PA Rte. 502. The purpose of these greenways are to link the river corridor to the Glen Maura/Montage area and to a Spring Brook greenway trail through PAWC and Theta Company lands, in the Spring Brook watershed. The development of this trail utilizing the abandoned Wilkes-Barre & Eastern rail corridor would also link the Lackawanna corridor to Lackawanna State Forest and State Game lands in the upper Lehigh watershed and other resource areas in the Poconos. The development of a Moosic/Springbrook/Thornhurst/Pocono greenway is recommended for further consideration, as a feasibility study or for open space conservation acquisition.

Recommendations for Mill Creek:

1. A clean up of coal waste sediments (possibly contaminated from industrial sources) is recommended in the confluence reach from Moosic through Duryea to the Erie railroad culvert and the Avoca flood works. This reach is further recommended for installation of a naturally analogous restoration. A riparian flood plain buffer presently exists and is in need of zoning protection and/or acquisition on the Old Forge-Duryea side of this reach. An abandoned rail corridor lies along the Moosic side and is also recommended for acquisition and greenway development.

Recommendations for Spring Brook:

1. The Borough of Moosic may consider the development of a local pedestrian trail on the flood levees at the Spring Brook-Lackawanna River confluence.
2. Recreational trail developments offer a potential to provide passive recreational access in the Spring Brook watershed to link the Lackawanna Valley to the Lackawanna State Forest, State Game Lands and other resources in the upper Lehigh River watershed. This plan recommends a trail program be developed along the former Wilkes-Barre and Eastern railroad alignment which parallels Spring Brook. Other trail links on township roads and fire management roads should be included.

3. The lower reaches of Spring Brook in Moosic, Spike Island and Belin Village offer opportunities for educational interpretation of the various types of structural and nonstructural responses to issues related to bank stabilization, flood control and mine water infiltration.

Recommendations for Greenwood Creek:

1. Coordinate infrastructure upgrades with restoration of lower reaches of open channel to maximize comprehensive nature of work to approach some restoration thresholds.
2. Utilize new storm water management systems to sustain a more natural flow regime.
3. Divert Interstate flows out of watershed with redesign of Davis Street interchange.
4. Retrofit retention basin at culvert discharge site at rear of K Mart to maintain longer discharge hydrographs to enhance natural flows through cataract area.
5. Reclaim and restore as much as possible the water course through cataract area. Regrade coal waste and overburden as part of large site mine reclamation.
6. Use municipal ordinance and/or easements to maintain natural habitat corridor along reclaimed stream reach from Shopping Center to river.

Taylor Borough

Approximately 3.2 miles of the Lackawanna River bounds the south and east perimeter of the Borough of Taylor. It serves as the municipal boundary between Taylor and the Borough of Moosic and further upstream between Taylor and the City of Scranton. Two tributary streams have portions of their length in Taylor as well; the confluence and lower reach of Keyser Creek and middle reaches of St. Johns Creek and the confluence and portions of two of its tributary streams, Race Brook and Sawmill Creek.

General Recommendations:

1. The Borough of Taylor should include the protection of the Lackawanna River, Keyser Creek and St. Johns Creek and its tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Taylor may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors,

recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. The abandoned rail corridor from Coxton (Duryea) through Connells Patch (Old Forge) and the active Reading & Northern line to Taylor along the river are important greenway links described in the trails section of this plan. These corridors are recommended for trail project implementation through this plan.
2. The Borough of Taylor has an interest in developing river corridor and greenway access using its property adjacent to the PA Turnpike and through development of easements, acquisitions and improvements to other parcels in the river corridor in the Borough of Taylor. This plan recommends development of river access and greenway projects in Taylor for further implementation through this conservation plan.
3. This plan recommends development of the Scranton to Taylor reach of the CNJ section of the Lackawanna River Heritage Trail, with a trail head near Depot Street. An upgrade of Depot Street, the public grade crossing of the Canadian Pacific trackage and improvements to the Depot Street/Main Street intersection would enhance public safety and aesthetics in this area.
4. This plan recommends that Lackawanna Valley Conservancy (LVC) work with property owners to develop or acquire easements or fee interest in properties along this reach.
5. This plan recommends development of an educational/interpretive program for the South Works site and its slag dump, now owned by LVC, along the CNJ in Taylor. Presently, there is a cut stone title block from the steel company office building covered in overgrown shrubbery at the Washington Avenue entrance to the Valley Storage site. The educational/interpretive program could also address the war production and SLIBCO history at the site.

Recommendations for Keyser Creek:

1. Major stream channel restoration project on main stem from confluence to Fawnwood.
2. Complete restoration of Lucky Run channel from McDade Park through Keyser Terrace to confluence with Keyser Creek adjacent to Kane Truck yard in Stauffer Park.
3. Excavate and conserve a portion of the flume structure along the creek, upstream of Oak Street, for historical interpretation.
4. Develop a trailhead on the LRHT at the confluence.
5. Develop a trailhead or Heritage Landing at the Moffat Breaker site.

Recommendations for St. Johns Creek:

1. **Promote the installation of natural stream channel restoration designs, to eliminate sediment transport and restore natural stream functions and habitat.**
2. **Facilitate upgrades to storm water systems to enhance water quality in watershed.**
3. **Facilitate improvements to sanitary interceptor system.**
4. **Acquire and develop a greenway for recreation and open space protection, utilize abandoned rail corridor and linkages to borough, school district and fire company properties. Link greenway to Lackawanna River Heritage Trail.**
5. **Acquire protective easements along restored stream reaches.**
6. **Develop easements or acquisitions to conserve upper headwater areas of St. Johns Creek, and two of its tributaries, Race Brook and Sawmill Creek, and the former water works along Race Brook.**
7. **Involve school district and watershed residents in educational and stewardship activities.**
8. **Link greenway to Luzerne County trails.**

Avoca Borough

An approximately 1.5-mile middle reach of Mill Creek flows through the Borough of Avoca.

General Recommendations:

1. **The Borough of Avoca should include the protection of Mill Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The Borough of Avoca may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Mill Creek:

1. **The Borough of Avoca may wish to consider creation of a continuous pedestrian-bicycle recreation greenway along the Mill Creek flood control works. Construction and maintenance easements can form the basis for an acquisition and recreational**

greenway development project. A pedestrian bridge or grade crossing will be required over the secondary, rail freight branch line.

2. The creek's reach near the former Heidleburg Colliery site contains a number of challenges which need to be addressed by various agencies:
 - a culm bank removal-abandoned mine land reclamation and an economic redevelopment of the Heidleburg colliery site and adjacent lands is recommended.
 - a regrading, realignment, reconstruction of portions of the Reading & Northern railroad is recommended at the US Rte. 11 overpass to remove the R & N railroad girder bridge from the Mill Creek flood way. A culvertization or channelization of Mill Creek for several hundred feet through this portion of the Heidleburg reach may be useful in restoration of flow and improved flood passage.
 - a flow loss assessment on the Dupont and Heidleburg reaches of Mill Creek is suggested. The Heidleburg reach may then be a candidate for riparian restoration, with some aspects of naturally analogous installations possible.

Dupont Borough

An approximately 0.75-mile middle reach of Mill Creek flows through the Borough of Dupont. Lidy Creek, a tributary to Mill Creek, has its confluence and most of its length in the municipality as well.

General Recommendations:

1. The Borough of Dupont should include the protection of Mill Creek and its tributary stream, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Dupont may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Mill Creek:

1. The Borough of Dupont may consider creating a pedestrian walkway along portions of the Mill Creek alignment. This reach could benefit from a more active management plan, which could include public access and ornamental landscape improvements.

2. The concrete flume reach between PA Rte. 315 and I-81 needs to be repaired and maintained.

Pittston Township

Middle and headwater reaches of Mill Creek flow through Pittston Township, as does most of Collins Creek and headwater reaches of Lidy Creek, the two tributary streams to Mill Creek. A lower portion of Spring Brook and headwater reaches of three of its tributary streams, including Monument and Trout Creeks, also lie within the municipality.

General Recommendations:

1. Pittston Township should include the protection of Mill Creek and Spring Brook and their tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Pittston Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Mill Creek:

1. The Bureau of Abandoned Mine Reclamation should consider extending flow loss assessment in the Akzo Nobel site, to begin flow restoration to the Dupont and Heidleburg reaches.
2. The Akzo Nobel reach represents an important and predominately natural, high quality habitat for Mill Creek and the entire lower Lackawanna watershed area. This plan recommends that the Akzo Nobel site be considered for preservation through conservation easements or acquisition. This action is recommended whether the site remains as a reserved proprietary business site or is developed for other business or residential purposes. The entire site would provide a good regional park property or an addition to nearby State Game Lands.
3. The Suscon Road reach of Mill Creek contains a ravine with numerous water falls and splash pools at the Llewlyn-Pocono formation boundary. The reach is included on the LRCA's List of Special Places and Natural Areas. Most of this site is on private property. The LRCA recommends that the Lackawanna Valley Conservancy develop contacts with property owners to inform them about voluntary conservation actions. A rail grade at this site has rail to trail potential.
4. The Suscon Road and headwater reaches of Mill Creek and the headwater reaches of Collins and Lidy Creeks all drain high quality mountainous watershed habitats. These reaches of streams and their watersheds should be protected from sprawl

development. Conservation easements and management plans on private properties and acquisition by state conservation agencies are both recommended actions supported in this plan.

Recommendations for Spring Brook:

1. Recreational trail developments offer a potential to provide passive recreational access in the Spring Brook watershed to link the Lackawanna Valley to the Lackawanna State Forest, State Game Lands and other resources in the upper Lehigh River watershed. This plan recommends a trail program be developed along the former Wilkes-Barre and Eastern railroad alignment, which parallels Spring Brook. Other trail links on township roads and fire management roads should be included.

Ransom Township

All of the Down Valley tributary streams that enter the Lackawanna River from the west, have portions of their length within Ransom Township. This includes: the headwaters and Falling Springs Reservoir area of Campbells Ledge Run, essentially all but the confluence area of Red Springs Run, headwater reaches of St. Johns Creek and its tributary streams, and Keyser Creek and its tributary streams Lucky Run and Lindy Creek.

General Recommendations:

1. Ransom Township should include the protection of Campbells Ledge Run, Red Springs Run, St. Johns Creek and Keyser Creek and their tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Ransom Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Campbells Ledge Run:

1. The upland terraces between the Duryea Swamps and Campbells Ledge and Falling Springs Reservoirs offer potential residential development sites.
2. The reservoir areas offer ridge-top conservation opportunities, with recreational uses as appropriate. There are assorted public safety issues regarding the escarpment and the present remoteness of the ridge top sites. Several of the larger private parcels at the reservoirs are owned by Theta Corporation, a real estate holding business formerly associated with the PG Energy/PG&W gas and water utility.

3. This plan recommends that future land use in the upland/reservoir area be focused on recreation/conservation use above the reservoirs, with a transition into residential use between the upland sites and the flood plain at Coxton Road.

Recommendations for Red Springs Run:

1. Effective regrading, revegetation and erosion control are needed at the Airport Sand and Gravel site, as well as similar sites and quarries within the municipality.

2. Reclamation of former mining areas along the stream could promote residential reuses linked to similar uses at Campbells Ledge.

Recommendations for St. Johns Creek:

1. Develop easements or acquisitions to conserve upper headwater areas of St. Johns Creek and its tributary streams, Race Brook and Sawmill Creek.

Recommendations for Keyser Creek:

1. Develop conservation easements, acquisition or other protection for headwaters of Keyser Creek and its tributary streams Lucky Run and Lindy Creek.
2. Monitor operations at Scranton Materials Quarry to define its impacts on Keyser Creek and protect the stream from those impacts.
3. Locate, assess and manage farm dumps and similar sites within the headwaters area.

12.2 Scranton and Dunmore

Municipalities in this section include: the City of Scranton and the Borough of Dunmore. The listed recommendations are related to the protection of and potential projects along the Lackawanna River and its tributary streams, including: Keyser Creek, Stafford Meadow Brook, Roaring Brook, Pine Brook, Meadow Brook, Carter Creek, Leggetts Creek, Greenbush Run and the I-81 Channel.

City of Scranton

An approximately 8.1-mile stretch of the Lackawanna River lies within the City of Scranton; the 2.3-mile downstream reach of this stretch serves as the municipal boundary between Scranton and the Borough of Taylor. The confluence and lower reaches of three of the larger tributary streams to the Lackawanna River also lie within Scranton, including, Stafford Meadow Brook, Roaring Brook, and Leggetts Creek. A fourth tributary stream, Keyser Creek, has a large part of its lower and middle portions in Scranton. Several tributary streams to these streams also have portions of their course within Scranton: Lucky Run and Lindy Creek to Keyser Creek, and Leach Creek and Bell Mountain Run to Leggetts Creek. In addition, smaller tributary streams to the Lackawanna River which have been severely impacted by urban development or past mining activity and are not generally recognizable as a stream, such as Pine Brook, Meadow Brook, Carter Creek and Greenbush Run, also have their confluence with the Lackawanna River in Scranton. Finally, the I-81 Channel, a large, constructed storm water channel, also flows into the Lackawanna in Scranton.

General Recommendations:

- 1. The City of Scranton should include the protection of the Lackawanna River, Keyser Creek, Stafford Meadow Brook, Roaring Brook, and Leggetts Creek and their tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans. The City should also include the protection/restoration of Pine Brook, Meadow Brook, Carter Creek, Greenbush Run and the I-81 Channel in its comprehensive plans.**
- 2. The City of Scranton may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions,**

especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends that the Lackawanna Valley Conservancy (LVC) work with property owners to develop or acquire easements or fee interest in properties along the river in Scranton.
2. This plan recommends development of a trail link to South Washington Avenue in Scranton from the CNJ, using the existing rail bridge at the Valley Storage site. This could provide a loop trail using the Elm Street bridge.
3. This plan recommends development of an educational/interpretive program for the South Works site and its slag dump, now owned by LVC, along the CNJ on the Taylor side of the river. Presently, there is a cut stone title block from the steel company office building covered in overgrown shrubbery at the Washington Avenue entrance to the Valley Storage site. The educational/interpretive program could also address the war production and SLIBCO history at the site.
4. This plan recommends developing a river access point along the CNJ across from the Stafford Meadow Brook confluence.
5. A major cleanup of urban debris is needed along South Washington Avenue, off the entrance driveway to Valley Storage.
6. Acquisition of the Danny's Garage site could provide an enhanced trailhead at Elm Street, an interpretive site for a reuse development of the Baker Colliery site and a maintenance station for the trail.
7. A pedestrian loop trail on the flood works along the east bank between Elm Street and Hickory Street could compliment the CNJ trail and the recreational uses at Schmidt Field. A footbridge over the Roaring Brook confluence would be an element in this implementation project.
8. Canoe-a-thon and recreational paddle uses of the river would be enhanced with an improved canoe access and landing beach at Schmidt Field. This plan recommends an improved canoe access site at this location.
9. Installation of a new pedestrian bridge at Cliff Street would offer opportunities for historical interpretation of the original 1794 log bridge between Slocum Hollow and Hyde park, the railroad development of 1850 and the gas works of 1854. This pedestrian bridge would also serve as a greenway link from the CNJ trail to Steamtown.
10. Engineering, acquisition and construction funding for the Bridge 60 to Lackawanna Ave. reach of the CNJ trail is recommended for implementation with River

Conservation Program funding and other sources of funding. Trailhead links to Lackawanna Avenue and the river would help in integrating this segment of CNJ trail and river corridor into the Downtown Scranton River Greenway.

11. This plan recommends a major debris removal and community cleanup along the banks of the Lackawanna in Scranton. The USACOE levee project will address several sub-reaches, the Lackawanna River Heritage Trail (LRHT) will address several other reaches, however other reaches will need program attention; particularly the Boulevard Avenue sub-reach, from Sanderson Avenue to Parker Street. The LRHT program will need assistance within the Greenridge Street to East Market Street sub-reach, with building debris, auto parts and junkyard soil removal. Therefore this plan recommends a variety of cleanup projects in Scranton be developed with River Conservation program implementation grant support.
12. As recommended in the Trails Alternative Report, a Scranton greenway area is proposed from Cliff Street through Lackawanna Avenue, the Mulberry Street/Expressway area to Olive Street, on both sides of the river. This would include the Gas Works, the Verrastro site, the CNJ station site, the LCRA' Carbondale line, Diamond and Strawberry Hill lines, the Redners site, the new Scranton High School campus and adjacent recreation facilities to Olive Street. An appropriate historic, cultural, retail and public access/commercial reuse for the Sprague and Henwood site on Olive Street is suggested.
13. River access improvements for water access and water contact are recommended throughout this sub-reach. A canoe/paddle sport put-in and take out beach (constructed point bar) is a requirement, with interface to the school district site and the CNJ site. Foot bridges to access east bank activity locations and uplinks to the street grade at Mifflin and Spruce Streets are suggested.
14. This plan recommends that an Urban River Greenway, or Heritage Gateway facility be created along both sides of the River from Cliff Street/Steamtown NHS site, through Lackawanna Avenue, the CNJ station site, Linden and Mulberry Streets, including the Strawberry Hill area, to Olive Street. This area would be developed as a waterfront similar to the San Antonio, Texas waterfront. This should include multiple river access sites, a flow control lock with fish and canoe passage and multiple commercial and public open space opportunities. This plan recommends a feasibility/design study and a development partnership involving LRCA, LHVA, and private and municipal interests.
15. This plan recommends that an upgrade of the USACOE levee project is needed to integrate managed recreational trail and public access use along the entire levee alignment in Scranton. This will require a reexamination of the fee and easement acquisition pattern along the levee to fund the acquisition of remaining residual fee interest of adjacent property owners. An integrated physical, structural and public use management plan is necessary as well as physical facilities, trail heads, parking access, signage, landscaping, public informational materials, and a promotional, public involvement and volunteer utilization program. These needs may be met through the intermunicipal agreements for the Lackawanna River Heritage Trail Commission. This plan recommends a River Conservation implementation program to develop a levee trail system and integrate it into the LRHT program.
16. This plan recommends acquisition of a portion of the former New York, Ontario and Western railway from the upstream termination of the Weston Field levee at

Diamond Avenue, through to the TEA 21 funded LRHT acquisition of NYO&W parcels north of Greenridge Street. The property is a strategic trail link and will insure safe access and passage for trail users under Greenridge Street and East Market Street, to avoid pedestrian crossings of these busy streets.

- 17. This plan recommends canoe/paddle sport and fishing access, put-in and take-out points along the R4 reach at Mulberry-Linden Street, Olive Street, Albright Avenue, Diamond Avenue, Nay Aug Avenue, East Market Street, Amelia Avenue, Sanderson Avenue and Parker Street. The development of these points should include acquisition of fee or easement integration with levee projects, parking, signage and provisions for public safety, river access and physical management.**

Recommendations for Keyser Creek:

- 1. Major stream channel restoration project on main stem from confluence in Taylor to Fawnwood Estates in Scranton.**
- 2. Complete restoration of Lucky Run channel from McDade Park through Keyser Terrace to confluence with Keyser Creek adjacent to Kane Truck yard in the Stauffer Industrial Park.**
- 3. Develop a trail and greenway link along the Keyser Creek-Lucky Run corridor to join the Lackawanna River Heritage Trail with McDade Park.**
- 4. Conserve and reconstruct Lindy Creek and the ice pond dam site on it, along Frink Street, and the water works at Fawnwood Estates for public access, if appropriate.**

Recommendations for Stafford Meadow Brook:

- 1. The SMB corridor between Lake Scranton, No. 5 Reservoir, Little Virginia and McNichols School in South Scranton has potential for a recreational, cultural and educational interpretive trail. The LRCA recommends development of a trail program along Stafford Meadow Brook, to integrate with urban Scranton neighborhoods, the Lackawanna River Heritage Trail, Montage and Glen Maura, the Lackawanna Trolley Tour and the Lackawanna County Open Space Plan.**
- 2. The culvert system through South Scranton may soon require significant reconstruction. City and state agencies should consider designs for culvert replacement which utilize naturally analogous designs. A capital funding program will be needed for this work.**

Recommendations for Roaring Brook:

- 1. The Lackawanna Valley Heritage Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail. This trail would serve as a link from the Lackawanna River Heritage Trail to Steamtown and the Iron Furnaces, and on to the Nay Aug Gorge area. It could then continue up the Roaring Brook corridor to access the 12-mile, county owned Erie and Wyoming Valley rail corridor between Dunmore, Cobbs Gap and Elmhurst.**
- 2. The Nay Aug Gorge and Falls of Roaring Brook is an extremely important natural resource feature recognized as a National Geological Landmark. The approaches to**

the site through Nay Aug Park and along the Lackawanna Railroad offer many opportunities for public access, natural and cultural interpretation, education, and ecotourism development. The Nay Aug Gorge contains significant old-growth forest with a mixture of oaks, pine and hemlock. Remnant access pathways dating from the development of Nay Aug Park can be restored to provide access to The Gorge area. This plan recommends development of public access, public safety improvements, interpretive and educational programs and facilities in Nay Aug Park to focus on the Gorge Area and the examples of Natural History and native ecosystems still present at the site. More immediate action is recommended to control an infestation of Hemlock wooly adelgid (HWD). The loss of these 100+ year-old hemlocks can be prevented with concerted action by the City. LRCA recommends treatment of the entire grove by an arborist skilled in the control of HWD AS SOON AS POSSIBLE. Other actions are required to control invasive exotic vegetation such as Japanese Knotweed and green briar. The hill slopes along Lynnwood Park from Hannon Grove to Myrtle Street are remnants of the City dump from circa 1930. The toe of this dump slope is mobilized by high storm flows in Roaring Brook. The dump slope is completely covered by invasive vegetation. Many of these recommendations could be implemented through a Master Plan for restoration of Nay Aug Park.

Recommendations for Leggetts Creek:

- 1. The recently developed South Abington Park and Leggetts Creek trail in Chinchilla, can serve as a greenway and trail system base for links through the Leggetts Notch to the Lackawanna River Heritage Trail in Scranton. A trail alignment along Leggetts Creek through Chinchilla, past the water and sewage treatment plants and along the Fountain Springs water works is physically accessible. The Fountain Springs to Scranton Expressway reach has significant engineering challenges. A Leggetts Creek greenway trail feasibility study is recommended by LRCA as an outcome of this watershed plan to advance these greenway links.**
- 2. The Scranton portion of a Leggetts Creek trail can utilize existing City of Scranton owned riparian lands, neighborhood streets and existing recreation areas. The Leggetts Creek/North Scranton greenway can be based at the Leggetts Creek subdivision project, between Rockwell Avenue and the Dutch Gap Little League field.**
- 3. The Lackawanna River Watershed 2000 program can address a number of mine drainage problems in the Rockwell Avenue and Charles Street reach of Leggetts Creek. LRCA recommends using River Conservation Implementation Program funds to match Watershed 2000 program funds where appropriate.**

Recommendations for Pine Brook:

There are no easy River Conservation Recommendations for Pine Brook. It serves as an example of the total destruction of natural stream habitat related to the historical practices of coal mining and urbanization. Some of these practices continue in the actions of private and public projects: private developers or municipal and state agencies often culvertize or channelize portions of natural streams in the interests of flood control or maximizing use of private property. Pine Brook survives today primarily as a sewer shed; all remnants of the natural creek have been replaced with storm and sanitary sewer culvert systems.

The City of Scranton may consider restoring portions of the Pine Brook channel when storm water drainage programs are developed to address neighborhood drainage and nuisance flooding problems. Partially restoring the former channel, day lighting underground culverts in places where the stream once was and retrofitting storm water basins to restore natural hydrological functions of the stream can be accomplished.

Recommendations for Meadow Brook:

The condition of Meadow Brook mirrors that of its neighbor Pine Brook; essentially non-existent. It cannot be practically restored but some measures can be taken to preserve the remnant habitat along the Dunmore cemeteries and Marywood University reaches. A program to retrofit existing and integrate new storm water management systems in this reach has the potential to restore some perennial hydrology to Meadow Brook.

The LRCA suggests that the habitat and hydrologic values of Meadow Brook can be enhanced with a partnership effort to develop a watershed restoration plan for Meadow Brook. Due to the presence of several cemeteries and institutions in the middle portion of the Meadow Brook watershed, the following partnership is suggested:

Marywood University

State School for the Deaf

Dunmore School District

Dunmore Borough

Dunmore Shade Tree Commission

St. Joseph Center

Holy Family Residence

Forest Hill Cemetery Association

Dunmore Cemetery Association

Temple Israel Cemetery Association

Good Shepard Church

St. Claire's Church

If a sufficient number of partners, including Marywood University and Forest Hill Cemetery, are interested, LRCA suggests that the partnership consider a management plan with two elements:

1. Urban Forestry Management

- an assessment survey of all trees and shrub beds as well as unmanaged wooded portions of the campus and cemetery properties needs to be developed.**
- A comprehensive urban forest management program can be developed to enhance collaborative or unified management of the urban forest by the various partners**

2. Water resources

- existing and new storm water systems in the watershed can be designed to mimic and restore natural hydrological conditions.**
- the stream channels of Meadow Brook and the “Ravine” area of Marywood Campus can be restored to advance the ecological and hydrological values of the Meadow Brook watershed and restore the capacity of the middle reach of this watershed for flood storage capacity and lower storm and flood flows downstream in the neighborhoods.**

LRCA suggests that the collaborative partnership can offer an enhanced capacity to address the many issues related to management of the urban forestry and storm water resources. Individually the institutions have differing capacities and interests in the resource management necessary to adequately insure that ecological goals as well as economic goals are achieved.

Recommendations for Carter Creek:

Lackawanna County is presently (2001) working with Marywood University, D&L Realty and others on a site assessment plan for the 500-acre area between the Marywood campus, the former Marvine Colliery, the Lackawanna River, I-81 and Parker Street. This includes the Carter Creek watershed.

The purpose of the plan is to recommend a reclamation and redevelopment plan for the area. The plan will include watershed restoration, campus related development of recreation fields and mixed-use development for commercial, institutional and manufacturing on the colliery site.

Recommendations for Greenbush Run:

Greenbush Run has very little potential for restoration. The water course should be defined and protected through City ordinance. The run may have potential as an outlet for storm water management discharge if any of the vacant land near the Lackawanna County Technology Career Center becomes developed.

There are two large bridge structures which cross over the Lackawanna River at its confluence with Greenbush Run. The bridges were part of the Hudson Coal Company's Marvin Colliery operations. These bridges may be historic under Section 204 of the National Historic Preservation Act. The LRCA recommends that these structures be removed from their present location. An engineering and cultural resource assessment plan, including a demolition and/or relocation program should be an outcome. LRCA recommends that the demolition and/or relocation of these bridge structures serve as a River Conservation Implementation Project.

Recommendations for the I-81 Channel:

- 1. The Department of Transportation should consider design modifications to this system to mimic natural conditions by storing water in detention wetlands to be released as perennial flow. The open channel structure may be modified to induce natural morphological behavior.**
- 2. The corridor area of the channel can be enhanced by a canopy tree and understory restoration scheme. An easement on the maintenance road along the channel can be conveyed to an appropriate agency to manage the roadway as a recreational trail, from the Lackawanna River Heritage Trail between the Lackawanna River and Boulevard Avenue, and the Marywood University Campus.**

Dunmore Borough

Two tributary streams to the Lackawanna River lie within the Borough of Dunmore. They include a lower portion of Roaring Brook and middle to headwater reaches of Meadow Brook. The confluence and lower reach of Little Roaring Brook, a tributary stream to Roaring Brook also lies within the municipality.

General Recommendations:

- 1. The Borough of Dunmore should include the protection of Roaring Brook and Little Roaring Brook, and Meadow Brook, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Dunmore may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Roaring Brook:

- 1. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail through Nay Aug Gorge and continue up corridor to Dunmore along the 12 mile, county owned Erie and Wyoming Valley rail corridor.**
- 2. County, state and federal agencies should consider the scenic, recreational and cultural importance of the Cobbs Gap reach of Roaring Brook. This area between Dunmore and Elmhurst includes the Pennsylvania Gravity Railroad Inclines, Moosic Mountain natural areas, the Moosic Lake Trolley corridor, early historic settlement roads, and Scrub Oak Mountain. The pending Lackawanna County Open Space Plan presents an opportunity to focus on these resources. This area should be prioritized for acquisition of property, public use easements, public access sites for fishing and trail use and a public use and natural resource management plan.**
- 3. Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following community links are eligible for funding:**
 - a link from Roaring Brook to Mill and Chestnut Streets**
 - a link from the E & WV rail corridor to Drinker St., the PA Gravity Trail at Dunmore No. 1 Reservoir**
 - an urban trail link through Dunmore to the school campuses, the Dunmore cemeteries, Marywood University campus and the I-81 drainage access road to link with the Heritage Trail at Boulevard Avenue**
 - a link to the St. Anthony's Park recreation site**

- a link to Scrub Oak Mountain, Long Swamp Road, Mt. Margaret, Lake Scranton and East Mountain.
- Little Roaring Brook between Dunmore Reservoir, Drinker St., and the confluence below Dunmore No. 7 Reservoir is recommended as a greenway/natural area restoration and park development project with Borough and property owner cooperation.

4. Roaring Brook contains vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends state, county, and local governments prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.

Recommendations for Meadow Brook:

Meadow Brook is essentially a non-existent tributary stream. It cannot be practically restored but some measures can be taken to preserve the remnant habitat along the Dunmore cemeteries and Marywood University reaches. A program to retrofit existing and integrate new storm water management systems in this reach has the potential to restore some perennial hydrology to Meadow Brook.

The LRCA suggests that the habitat and hydrologic values of Meadow Brook can be enhanced with a partnership effort to develop a watershed restoration plan for Meadow Brook. Due to the presence of several cemeteries and institutions in the middle portion of the Meadow Brook watershed, the following partnership is suggested:

Marywood University

State School for the Deaf

Dunmore School District

Dunmore Borough

Dunmore Shade Tree Commission

St. Joseph Center

Holy Family Residence

Forest Hill Cemetery Association

Dunmore Cemetery Association

Temple Israel Cemetery Association

Good Shepard Church

St. Claire's Church

If a sufficient number of partners, including Marywood University and Forest Hill Cemetery, are interested, LRCA suggests that the partnership consider a management plan with two elements:

1. Urban Forestry Management

- an assessment survey of all trees and shrub beds as well as unmanaged wooded portions of the campus and cemetery properties needs to be developed.**
- a comprehensive urban forest management program can be developed to enhance collaborative or unified management of the urban forest by the various partners.**

2. Water resources

- existing and new storm water systems in the watershed can be designed to mimic and restore natural hydrological conditions.**
- the stream channels of Meadow Brook and the “Ravine” area of Marywood Campus can be restored to advance the ecological and hydrological values of the Meadow Brook watershed and restore the capacity of the middle reach of this watershed for flood storage capacity and lower storm and flood flows downstream in the neighborhoods.**

LRCA suggests that the collaborative partnership can offer an enhanced capacity to address the many issues related to management of the urban forestry and storm water resources. Individually the institutions have differing capacities and interests in the resource management necessary to adequately insure that ecological goals as well as economic goals are achieved.

12.3 North Pocono Communities

Municipalities in this section include: the Borough of Moscow and Spring Brook, Covington, Madison, Roaring Brook, Elmhurst and Jefferson Townships. The listed recommendations are related to the protection of and potential projects along tributary streams to the Lackawanna River, including: Roaring Brook, Spring Brook, Stafford Meadow Brook, Eddy Creek, Grassy Island Creek, Laurel Run, White Oak Run and Aylesworth Creek and their tributaries.

Moscow Borough

A middle reach of Roaring Brook lies within the Borough of Moscow, with a portion of this reach serving as the municipal boundary between Moscow and Madison Township. Portions of two named tributary streams to Roaring Brook also lie within the municipality. They include the confluence to upper reaches of Van Brunt Creek and the confluence and lower reaches of Langan Creek, a tributary to Van Brunt Creek.

General Recommendations:

- 1. The Borough of Moscow should include the protection of Roaring Brook, Van Brundt Creek and Langan Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Moscow may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Roaring Brook and its tributaries:

- 1. Roaring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and borough prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs, such as Theta Company property within the Elmhurst Reservoir shed. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.**
- 2. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.**

3. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown National Park and the Iron Furnaces, through Nay Aug Gorge and continue upstream to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.
4. The Roaring Brook Greenway can continue with trail development on the 12-mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek, and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.
5. *Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following Moscow Borough links be eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway.*
 - development of the Greenway Trail along the Roaring Brook and Hollister/Elmhurst water pipeline right-of-way, with a trailhead link near the Moscow Sewage Treatment Plant.
 - development of links to North Pocono school campus, from the Moscow commercial and residential districts
 - development of Greenway and Community Trail links along local roadways to Covington Township
6. The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.

Spring Brook Township

A large middle portion of Spring Brook and eight of its tributaries lie within Spring Brook Township. They include: most of Trout Creek and middle reaches of its tributary Monument Creek, all of Plank Bridge Creek, most of Panther Creek and its tributary Painter Creek, all of Rattlesnake Creek and its tributary Six Springs Creek, and lower through middle reaches of Green Run. In addition, headwater reaches of Van Brunt Creek, a tributary to Roaring Brook, lies within the northeast corner of the municipality.

General Recommendations:

1. **Spring Brook Township should include the protection of Spring Brook, Trout Creek, Monument Creek, Plank Bridge Creek, Panther Creek, Painter Creek, Rattlesnake Creek, Six Springs Creek, Green Run and Van Brunt Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **Spring Brook Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Spring Brook and its tributaries:

1. **Spring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Spring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs. This plan recommends the acquisition of a majority of the Theta Company properties within the Spring Brook Intake, and Nesbitt and Watres Reservoir sheds, or the development of a conservation easement program to insure the maintenance of these lands as watershed, open space, natural resource, and timber lands, continue into the future. These lands should be included in the review and policy outcomes of the Lackawanna County Open Space Study.**
2. **Recreational trail developments offer a potential to provide passive recreational access in the Spring Brook watershed to link the Lackawanna Valley to the Lackawanna State Forest, State Game Lands and other resources in the upper Lehigh River watershed. This plan recommends a trail program be developed along the former Wilkes-Barre and Eastern railroad alignment, which parallels Spring Brook. Other trail links on township roads and fire management roads should be included.**

Covington Township

Upper headwater reaches of Roaring Brook and four of its tributary streams lie within Covington Township. The tributaries include: all but the confluence area of Langan Creek, all of Lake Run and its tributary Emerson Run, and all of the East Branch of Roaring Brook. In addition, upper headwater reaches of Spring Brook lie within the southwest portion of the municipality.

General Recommendations:

1. **Covington Township should include the protection of Roaring Brook, Langan Creek, Lake Run, Emerson Run, the East Branch of Roaring Brook and the**

headwaters of Spring Brook, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.

2. Covington Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Roaring Brook and its tributaries:

1. Roaring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs, such as Theta Company property within the Hollister Reservoir shed. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.
2. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.
3. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown National Park and the Iron Furnaces, through Nay Aug Gorge and continue upstream to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.
4. The Roaring Brook Greenway can continue with trail development on the 12-mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek, and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.
5. *Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following Covington Township links be*

eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway:

- continuation of Greenway Trail along Roaring Brook and/or Lackawanna Rail Corridor where feasible
 - links to Covington regional park
 - links to Covington Twp. park and Daleville commercial center
 - links to Hollister-Fryetown natural areas
 - links to Lehigh watershed and Pocono area at Gouldsboro
6. The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.

Recommendations for Spring Brook:

1. Spring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Spring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs (Spring Brook Intake, Nesbitt and Watres Reservoirs in Spring Brook Twp.), or the development of a conservation easement program to insure the maintenance of these lands as watershed, open space, natural resource, and timber lands, continue into the future. These lands should be included in the review and policy outcomes of the Lackawanna County Open Space Study.

Madison Township

Upper headwater reaches of Roaring Brook and three of its tributary streams lie within Madison Township. They include: all of Bear Brook and Kellum Creek and middle reaches of White Oak Run.

General Recommendations:

1. Madison Township should include the protection of Roaring Brook, Bear Brook, Kellum Creek and White Oak Run, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Madison Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Roaring Brook and its tributaries:

1. Roaring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs, such as Theta Company property within the Elmhurst and Curtis Reservoir sheds. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.
2. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.
3. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown National Park and the Iron Furnaces, through Nay Aug Gorge and continue upstream to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.
4. The Roaring Brook Greenway can continue with trail development on the 12-mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek, and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.
5. *Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following Madison Township links be eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway:*
 - a link at Curtis Reservoir
 - a community trail system to be developed with a feasibility study
 - a link on the Elmhurst Reservoir Trail along Kellum Creek to Aberdeen Corners

6. The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.

Roaring Brook Township

Portions of three tributary streams to the Lackawanna River lie within Roaring Brook Township. They include: middle through upper headwater reaches of Stafford Meadow Brook, middle reaches of Roaring Brook, and the upper headwaters of Eddy Creek in the northern corner of the township. In addition, three named tributary streams to Roaring Brook, including: lower through middle reaches of White Oak Run and Rock Bottom Creek and upper headwater reaches of Van Brunt Creek. The upper headwater reaches of Green Run, a tributary to Spring Brook also lie within the southwest portion of the municipality.

General Recommendations:

1. Roaring Brook Township should include the protection of Stafford Meadow Brook, Roaring Brook, White Oak Run, Rock Bottom Creek, Van Brunt Creek and Eddy Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Roaring Brook Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for Stafford Meadow Brook:

1. *Most of the land in the upper three-fourths of the Stafford Meadow Brook watershed, which lies in Roaring Brook Township, is made up of property belonging to Theta Land Company. These lands, which include watersheds associated with Lake Scranton, William Bridge Reservoir, Hazard Pond and Bear Swamp, provide important open space, water supply, timber, recreational and aesthetic resources to the Northeast Pennsylvania region. Therefore, LRCA recommends through this plan that:*
 - Significant large tracts of these properties should be conveyed to public and private conservation agencies, to protect water resources and to insure long term natural resource protection.

- These lands and similar holdings need to be included for assessment and management recommendations in the pending Lackawanna County Open Space Study.
 - Funding from state, federal and private resources for the acquisition and protection of these lands is recommended as an action of the highest priority.
 - If any development does occur on former PG&W watershed lands, the recommendations in the PG Energy Land Use Plan for limited, conservation type subdivisions, state of the art storm water management systems, limited impervious surfaces and substantial buffer zones along water courses should be considered as requirements by township and county agencies.
2. *This plan recommends that Bear Swamp, headwater wetlands along Simerson Road and the Stafford Meadow Brook corridor, be protected with 1000 foot buffers, to be acquired and managed as part of the open space and natural areas included in the pending Lackawanna County Open Space Plan.*
 3. *The Stafford Meadow Brook corridor between Lake Scranton and the No. 5 Reservoir in Roaring Brook Township and Little Virginia and the McNichols School in South Scranton has potential for a recreational, cultural and educational interpretive trail. The plan recommends development of a trail program along Stafford Meadow Brook, to ingrate with Scranton urban neighborhoods, the Lackawanna River Heritage Trail, Montage and Glen Maura, the Lackawanna Trolley Tour and the Lackawanna County Open Space Plan.*
 4. *The LRCA and PG&W had once considered development of a nature center in the caretaker's house at Williams Bridge Dam, near Lake Scranton. LRCA recommends that the Pennsylvania American Water Company develop a watershed resource educational and research station at this site.*

Recommendations for Roaring Brook and its tributaries:

1. Roaring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs, such as Theta Company property within the Elmhurst and Curtis Reservoir sheds. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.
2. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.
3. County, state and federal agencies should consider the scenic, recreational and cultural importance of the Cobbs Gap reach of Roaring Brook. This reach through the Borough of Dunmore, and Roaring Brook and Elmhurst Townships includes the

Pennsylvania Gravity Railroad Inclines, Moosic Mountain natural areas, the Moosic Lake Trolley corridor, early historic settlement Roads, and Scrub Oak Mountain. The pending Lackawanna County Open Space Plan presents an opportunity to focus on these resources. This area should be prioritized for acquisition of property, public use easements, public access sites for fishing and trail use and a public use and natural resource management plan .

4. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown National Park and the Iron Furnaces, through Nay Aug Gorge and continue upstream to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.
5. The Roaring Brook Greenway can continue with trail development on the 12-mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek, and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.
6. *Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following Roaring Brook Township links be eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway:*
 - links and access areas are recommended in the Cobbs Gap area for trails and fishing access
 - links in the Elmhurst and Curtis Reservoirs area are recommended for fishing and trail access.
7. The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.

Recommendations for Eddy Creek:

1. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the Theta Company property within the Dunmore Reservoir No. 3 and No. 4 sheds. A management program for these properties should be a key element in the Lackawanna County Open Space Study.

Elmhurst Township

A short reach of Roaring Brook, including a portion of its reach through Elmhurst Reservoir lies within Elmhurst Township.

General Recommendations:

- 1. Elmhurst Township should include the protection of Roaring Brook, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. Elmhurst Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect:**
 - open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Roaring Brook:

- 1. Roaring Brook and its tributaries contain vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends that the state, county, and township prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs, such as Theta Company property within the Elmhurst Reservoir shed. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these, and related watershed resource lands, is an outcome eligible for implementation funds under this River Conservation Plan.**
- 2. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.**
- 3. County, state and federal agencies should consider the scenic, recreational and cultural importance of the Cobbs Gap reach of Roaring Brook. This reach through the Borough of Dunmore and Roaring Brook and Elmhurst Townships includes the Pennsylvania Gravity Railroad Inclines, Moosic Mountain natural areas, the Moosic Lake Trolley corridor, early historic settlement Roads, and Scrub Oak Mountain. The pending Lackawanna County Open Space Plan presents an opportunity to focus on these resources. This area should be prioritized for acquisition of property, public use easements, public access sites for fishing and trail use and a public use and natural resource management plan .**
- 4. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown National Park and the Iron Furnaces, through**

Nay Aug Gorge and continue upstream to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.

5. The Roaring Brook Greenway can continue with trail development on the 12-mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek, and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.
6. *Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following Elmhurst Township links be eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway:*
 - a trail head link along PA Rte. 590 near Elmhurst Reservoir
 - a bridge over PA Rte. 435
 - a link along Main Street to the Community Park
 - a bridge reconstruction at the Elmhurst Reservoir
7. *The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.*

Jefferson Township

Upper headwater reaches of four tributary streams to the Lackawanna River lie within Jefferson Township. They include, Grassy Island Creek, Laurel Run, Aylesworth Creek, and White Oak Run and its tributary Indian Cave Creek. In addition, the upper headwater reaches of two tributary streams to Roaring Brook, including White Oak Run and Rock Bottom Creek also lie within the municipality.

General Recommendations:

1. Jefferson Township should include the protection of Grassy Island Creek, Laurel Run, Aylesworth Creek, White Oak Run and its tributary Indian Cave Creek and the two Roaring Brook tributaries, White Oak Run and Rock Bottom Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Jefferson Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot

subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

4. Although Wallenpaupack Creek is not in the Lackawanna River Watershed, its headwater reaches in Jefferson Township - the area around Moosic Lake and the Moosic Lake Glen in particular - are important natural and water resource areas. This plan recommends that the township include protection of appropriate resources in the Wallenpaupack headwaters along Moosic Mountain in its plan and ordinances. The Moosic Lake Glen is also a significant natural area, containing old-growth hemlock and pine which includes a steep north facing hemlock and rhodora ravine, with numerous waterfalls and splash pools. Also, there is a stone masonry, barrel vault, culvert dating from 1850 along a section of the loaded track of the PA Coal Company gravity railroad, which crosses Wallenpaupack Creek below the Glen. This plan recommends that Jefferson Twp. consider implementation projects to support the acquisition, protection and conservation of these resources.

Recommendations for Grassy Island Creek:

1. The upland headwater areas of Grassy Island Creek should be managed long term for conservation use, exclusively. The development of conservation easements on, or a conveyance of Theta Company properties within the Moosic Mountain headwaters reach to a conservation agency are recommended actions in this plan.

Recommendations for Laurel Run:

1. The upland headwater areas of Laurel Run should be managed long term for conservation use, exclusively. The development of conservation easements on, or a conveyance of Theta Company properties within the Moosic Mountain headwaters reach to a conservation agency are recommended actions in this plan.

Recommendations for Aylesworth Creek:

1. The upland headwater areas of Aylesworth Creek should be managed long term for conservation use, exclusively. The development of conservation easements on, or a conveyance of properties within the Moosic Mountain headwaters reach to a conservation agency are recommended actions in this plan.

Recommendations for White Oak Run and its tributary:

1. The upland headwater areas of White Oak Run and Indian Cave Creek should be managed long term for conservation use, exclusively. The

development of conservation easements on, or a conveyance of properties within the Moosic Mountain headwaters reach to a conservation agency are recommended actions in this plan.

12.4 Abington Communities

Municipalities in this section include: the Boroughs of Clarks Summit and Clarks Green, and Newton, South Abington and Scott Townships. The listed recommendations are related to the protection of and potential projects along tributary streams of the Lackawanna River, including: Keyser Creek, Leggetts Creek, Hull Creek, and Rush Brook.

Newton Township

The very upper headwaters of Keyser Creek lie within the eastern corner of Newton Township.

General Recommendations:

- 1. Newton Township should include the protection of Keyser Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. Newton Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Keyser Creek:

- 1. Develop conservation easements, acquisition or other protection for headwaters of Keyser Creek.**
- 2. Locate, assess and manage farm dumps and similar sites within the headwaters area.**

South Abington Township

The middle reaches of Leggetts Creek flow through South Abington Township. A number of the tributary streams to Leggetts Creek also lie within the municipality, including: the entire lengths of Summit Lake and Edella Creeks, lower reaches of Landsdowne Creek and Layton Run, and the headwaters of Leach Creek.

General Recommendations:

- 1. South Abington Township should include the protection of Leggetts Creek and its tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**

2. **South Abington Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Leggetts Creek:

1. **A majority of Theta Company lands in the Leggetts Creek watershed, including property around Griffin Reservoir and downstream along the creek and Maple Lake, should be acquired by public or private conservation agencies for long-term preservation.**
2. **The Griffin Glen reach of Leggetts Creek, between Griffin Reservoir and I-81, contains exceptional cultural, historic and natural resources: mill foundations and groves of old growth pine, hemlock and tulip poplar. This reach, which is included on the LRCA's List of Special Places and Natural Areas, is a priority for preservation and acquisition. Most of this reach is owned by PAWC.**
3. **The recently developed South Abington Park and Leggetts Creek trail in Chinchilla, can serve as a greenway and trail system base for links to Clarks Summit and connections with the Northern Electric Trail into the Tunkhannock watershed to the west, and through the Leggetts Notch to the Lackawanna River Heritage Trail to the east. A trail alignment along Leggetts Creek through Chinchilla, past the water and sewage treatment plants and along the Fountain Springs water works is physically accessible. The Fountain Springs to Scranton Expressway reach has significant engineering challenges. A Leggetts Creek greenway trail feasibility study is recommended by LRCA as an outcome of this watershed plan to advance these greenway links.**

Clarks Summit Borough

A middle portion of Landsdowne Creek, a tributary stream to Leggetts Creek, flows through the Borough of Clarks Summit.

General Recommendations:

1. **The Borough of Clarks Summit should include the protection of Landsdowne Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The Borough of Clarks Summit may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage**

conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.
4. The recently developed South Abington Park and Leggetts Creek trail in Chinchilla, can serve as a greenway and trail system base for links to Clarks Summit and connections with the Northern Electric Trail into the Tunkhannock watershed to the west.

Clarks Green Borough

The headwaters of Landsdowne Creek, a tributary stream to Leggetts Creek, lie within the Borough of Clarks Green.

General Recommendations:

1. The Borough of Clarks Green should include the protection of Landsdowne Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Clarks Green may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Scott Township

Portions of three tributary streams to the Lackawanna River lie within Scott Township. They include headwater reaches and tributaries to Leggetts Creek and the headwaters of Hull Creek in the southeast portion of the municipality, and the headwaters and tributaries to Rush Brook in the northeast corner.

General Recommendations:

1. Scott Township should include the protection of Leggetts Creek, Hull Creek and Rush Brook and their tributary streams, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.

2. **Scott Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for Leggetts Creek:

1. **A majority of Theta Company lands in the Leggetts Creek watershed, including property around Griffin Reservoir, should be acquired by public or private conservation agencies for long-term preservation. These and related lands should be included in consideration through the pending Lackawanna County Open Space Plan.**

Recommendations for Hull Creek:

1. **The acquisition of conservation easements by gift or purchase from property owners along headwater reaches of Hull Creek is recommended.**

Recommendations for Rush Brook:

1. **This plan suggests that former PG&W watershed lands, now owned by Theta Company, should be considered for conservation by acquisition or conservation easement. These and related lands should be included in consideration through the pending Lackawanna County Open Space Plan.**

12.5 Mid Valley Communities

Municipalities in this section include: the Boroughs of Dickson City, Throop, Blakely, Olyphant, Jessup and Archbald. The listed recommendations are related to the protection of and potential projects along the Lackawanna River and its tributary streams, including: Grier Creek, Sulphur Creek, Storrs Creek, Scott Creek, Eddy Creek, Miles Creek, Hull Creek, the Lackawanna Outfall, Wildcat Creek, Sterry Creek, Grassy Island Creek, Winton Run, Laurel Run, White Oak Creek, Aylesworth Creek and Calendar Gap Creek.

Dickson City Borough

The Lackawanna River flows for approximately 2.6-miles along the southeastern boundary of the Borough of Dickson City. For 1.6-miles it serves as the municipal boundary line between Dickson City and Throop and upstream as the boundary between Dickson City and Olyphant. Five tributary streams to the Lackawanna also lie within the municipality; they include the entire lengths of Grier, Storrs, Scott, and Miles Creeks and the confluence of Hull Creek. A portion Bell Mountain Run, a tributary to Leggetts Creek, also lies within Dickson City.

General Recommendations:

- 1. The Borough of Dickson City should include the protection of the Lackawanna River, Grier Creek, Sulphur Creek, Storrs Creek, Scott Creek, Hull Creek and Bell Mountain Run, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Dickson City may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

- 1. It is recommend that any future flood control projects in Dickson City be designed and constructed to accommodate trail use, protect river access, habitat and water quality. The maintenance and restoration of a forested riparian buffer through this reach is a vital necessity.**
- 2. The LRCA, Lackawanna Heritage Valley Authority and Dickson City are encouraged to cooperate on a signage program to integrate the Boulevard Levee into the LRHT system as soon as possible.**
- 3. The development of a historical interpretive program with signage and a Kiosk Exhibit is recommended at the Valley Junction/Trestle Hole site.**

Recommendations for Grier Creek:

- 1. Dickson City may wish to consider enacting stream corridor buffer and set back requirements in its ordinances and identify protection of stream and river corridors, flood plains and habitat values and functions as an outcome of future comprehensive plan revisions.**
- 2. Dickson City, developers and government agencies should consider stream flow and channel restoration and protection outcomes in all stream related work.**
- 3. Future culvertization of Grier Creek should be discouraged; existing culverts should be day-lighted when possible.**
- 4. The confluence area and levee tie-in, adjacent to Elm St. Park, may serve as a river corridor access area and habitat restoration site. LRCA, Lackawanna Heritage Valley Authority and Dickson City may consider future projects for development at this site.**

Recommendations for Storrs Creek:

- 1. Dickson City may wish to consider enacting ordinances to more effectively protect streams and stream corridor resources. The Borough plan should establish the protection of natural values and functions as a goal for the better management of stream and river corridor resources.**
- 2. Dickson City, LRCA and property owners may wish to cooperate on a conservation management program for the St. Anthony's Cemetery reach.**
- 3. Dickson City and the Bureau of Waterways Engineering, or other appropriate state or federal agency, should develop a channel restoration project between Rte. 6 and the cemetery reach, to address sediment transport, restoration of stream morphology and habitat.**

Recommendations for Scott Creek:

- 1. Further culvertization and encroachment to Scott Creek should be prevented.**
- 2. The upland corridor near US Rte. 6 offers a viable green space area to enhance and protect natural values and functions of Scott Creek. The Borough may wish to consider acquisition of land for a stream corridor buffer protection zone to limit developmental impacts.**
- 3. As a follow on to any work performed by the PA DEP Bureau of Waterways Engineering, LRCA suggests that Dickson City examine property acquisition, natural morphological management and restoration of flood plain habitat as outcomes.**
- 4. The ravine contains remnant natural habitats. A clean up program could aid in stream and flood event management and a recreational trail could be developed subsequent to cleanup activities. Proactive involvement of property owners and cemetery associations is suggested as a way to enhance stewardship of the Scott Creek corridor.**

Recommendations for Miles Creek:

Miles Creek exists primarily as a storm and sewer shed, originating on the saddle of Bell Mountain, along the Dickson City/Blakely Borough line. It drains a small subdivision off PA Rte.6 and flows through a pipe culvert and rip rapped channel. It passes under Dundaff St. near Sebring Road and Miles Avenue. It is culvertized under the Miles Plot neighborhood. It enters the Lackawanna River in a concrete culvert, downstream of the Hull Creek confluence.

As a storm and sewer shed, Miles Creek has no natural habitat remaining below Dundaff Street. LRCA has no recommendations for Miles Creek. It serves as an example of what not to do with water resource management.

Recommendations for Hull Creek:

1. The acquisition of a right-of-way for the Lackawanna River Heritage Trail and the construction of a pedestrian bridge at the Hull Creek confluence is recommended.

Throop Borough

The Lackawanna River flows for approximately 1.7-miles along the northwestern municipal boundary of the Borough of Throop, serving as the boundary between Throop and Dickson City Borough. An extensive middle reach of Eddy Creek, a tributary stream to the Lackawanna, also lies within the municipality, with confluence and headwater reaches in Olyphant.

General Recommendations:

1. The Borough of Throop should include the protection of the Lackawanna River and Eddy Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Throop may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends that any future flood control projects in Throop be designed and constructed to accommodate trail use, protect river access, habitat and water quality. The maintenance and restoration of a forested riparian buffer through this reach is a vital necessity.

2. **This plan recommends development of easements, acquisition or conveyances of rights-of-way for trails and riparian greenway corridors along the Lackawanna River and Eddy Creek in the Olyphant/Eddy Creek Colliery area. This proposal can be integrated with economic redevelopment, abandoned mine land reclamation and public infrastructure work.**

Recommendations for Eddy Creek:

1. **Support for the Bureau of Abandoned Mine Reclamation's plans for a stream corridor and channel restoration program including, stream bed sealing and lining, total channel restoration using natural morphological designs, and maintenance of stream corridor easements through private properties to insure continued future integrity of the corridor.**
2. **Integration of an Eddy Creek greenway into the BAMR restoration project to include recreation trail and riparian conservation program involving ongoing stewardship and maintenance of the restored creek and stream corridor.**
3. **Involvement of property owners and the municipality in a greenway management program for Eddy Creek.**
4. **Involvement of Mid Valley School District with the greenway and trail. This trail can link the school campus with the Lackawanna River Heritage Trail at the confluence of Eddy Creek.**
5. **Involve municipalities and property owners in the conservation of the upper Eddy Creek watershed and the Marshwood area.**

Olyphant Borough

The Lackawanna River flows approximately 2.3 miles along the northwest border of the Borough of Olyphant. It serves as the municipal boundary for 1.0-miles of this course between Olyphant and the Borough of Dickson City and the remaining 1.3 miles upstream as the boundary between Olyphant and the Borough of Blakely. Portions of two tributary streams to the Lackawanna, including the confluence area and headwater reaches of Eddy Creek and middle portions of Sterry Creek also lie within the municipality.

General Recommendations:

1. **The Borough of Olyphant should include the protection of the Lackawanna River, Eddy Creek and Sterry Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The Borough of Olyphant may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends that the Olyphant flood levee project be designed and constructed to accommodate the Lackawanna River Heritage Trail. Layout of the trail should be a priority action pending completion of levee construction. Development of a bypass alternate or screening alternate is recommended where the interface between the levee and residential homes is a concern. The protection of river access, habitat and water quality and restoration of a forested riparian buffer through the levee reach is also a vital necessity.
2. This plan recommends development of easements, acquisition or conveyances of rights-of-way for trails and riparian greenway corridors along the river and Eddy Creek in the Olyphant/Eddy Creek Colliery area. This proposal can be integrated with economic redevelopment, abandoned mine land reclamation and public infrastructure work.
3. The preservation and re-use of the Olyphant Colliery /Eddy Creek Colliery rail trestle over the Lackawanna is recommended.
4. The preservation and reuse for pedestrian trail linkages, of the surplus 1906 Truss bridge on the Lackawanna County Rail line near the South Valley Avenue crossing and Queen City Station, is recommended.

Recommendations for Eddy Creek:

1. Support for the Bureau of Abandoned Mine Reclamation's plans for a stream corridor and channel restoration program including, stream bed sealing and lining, total channel restoration using natural morphological designs, and maintenance of stream corridor easements through private properties to insure continued future integrity of the corridor.
2. Integration of an Eddy Creek greenway into the BAMR restoration project to include recreation trail and riparian conservation program involving ongoing stewardship and maintenance of the restored creek and stream corridor.
3. Involvement of property owners and municipalities in a greenway management program for Eddy Creek.
4. Involvement of Mid Valley School District with the greenway and trail. This trail can link the school campus with the Lackawanna River Heritage Trail at the confluence of Eddy Creek in Olyphant.
5. Rehabilitation of the historic mine railroad trestle between Eddy Creek confluence and Olyphant Colliery is recommended to link the Eddy Creek greenway with the Lackawanna River Heritage Trail alignment at the Olyphant Colliery site.

6. **Involve municipalities and property owners in the conservation of the upper Eddy Creek watershed and the Marshwood area.**

Recommendations for Sterry Creek:

1. **Complete work started by the Bureau of Abandoned Mine Reclamation on channel restoration from the Casey Highway to PA Rte. 247.**
2. **Identify and seal remaining infiltration points.**
3. **Conduct upland reclamation to backfill stripping pits and grade overburden piles.**
4. **Integrate a greenway conservation and recreation corridor along Sterry Creek with conservation subdivisions in upland areas.**
5. **Identify and protect remnant habitat features such as the rhododendron and laurel groves and rock ledge outcrops in the context of subdivision development.**

Blakely Borough

The Lackawanna River flows for approximately 2.8-miles along the eastern boundary of the Borough of Blakely. Half of this length serves as the municipal boundary between Blakely and the Borough of Olyphant and the other half between Blakely and the Borough of Jessup. Two tributary streams to the Lackawanna River also lie within the municipality, including a large middle reach of Hull Creek and the confluence to middle reach of both Wildcat Creek and one of its tributary streams, Tinklepaugh Creek. The Lackawanna AMD Outfall channel, part of a degraded unnamed tributary to the Lackawanna, also lies within Blakely.

General Recommendations:

1. **The Borough of Blakely should include the protection of the Lackawanna River, Hull Creek and Wildcat and Tinklepaugh Creeks, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The Borough of Blakely may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

1. This plan recommends that any future flood control projects in Blakely, be designed and constructed to accommodate trail use, protect river access, habitat and water quality. The maintenance and restoration of a forested riparian buffer through this reach is a vital necessity.
2. The development of a west bank river trail along the NYO&W and Erie Railroad grades, from Blakely Corners to Peckville and Mellow Park, is recommended.
3. The development of a mitigation and habitat enhancement for the Lackawanna AMD Outfall and its discharge channel is recommended.
4. The development of a bicycle route along the river through Mellow Park to provide continuity for the Lackawanna River Heritage Trail is recommended. The costs for fencing, signage and other improvements to help develop a separate bike route through Mellow Park are recommended to be funded an early implementation project through the River Conservation Program.
5. Development and installation of historical and interpretive signage at the Heritage Crossing site in Mellow Park is recommended to focus on the gravity railroad, mine reclamation, trout and aquatic habitat and river conservation.
6. An upgraded river access point along the Lackawanna at the confluence of Wildcat Creek is recommended for Canoe-A-Thon and for regular public access for canoeing and paddle sport take-out and put-ins. This would require parking, creation of graveled pathways, informational signage, installation of vegetation and screening to address neighbor privacy issues. The Borough of Blakely would need to approve and partner with LRCA and others to accomplish this recommendation. The St. Nichols Church parcel adjacent to the Lackawanna Outfall near the Haband Company facility is an alternate site, which offers another physically appropriate paddle sport access point.
7. A multi-objective combined sewer overflow and acid mine drainage remediation project is recommended at the Gravity Slope outfall.

Recommendations for Hull Creek:

1. The acquisition of conservation easements by gift or purchase from property owners along Hull Creek is recommended.
2. Mitigation for the loss of scenic, natural and historical resources resulting from the PA Rtes. 6 and 347 project should include conservation improvements in Hull Creek and the Lackawanna River.
3. Highway mitigation could be matched with abandoned mine reclamation work to identify and eliminate flow infiltration.

Recommendations for Wildcat and Tinklepaugh Creeks:

1. Due to the intensive and newly installed concrete culvertization, the lower Wildcat and Tinklepaugh watersheds have minimal conservation

opportunities. LRCA recommends creation of an upgraded Canoe-a-thon launch site at the confluence.

2. LRCA and LVC are interested in a conservation and maintenance easement on a specimen white oak tree owned by Vivan Walsh, adjacent to Tinklepaugh Creek, on Keystone Avenue. This tree is estimated to be in excess of 250 years old. It is a special place resource. River Conservation funds are recommended for its conservation as appropriate.

Recommendations for the Lackawanna Outfall:

The outlet of the Lackawanna Colliery AMD outfall in Blakely, is the likely remnant of a long lost tributary stream to the Lackawanna. This watershed is now a storm, sewer, and acid mine drainage shed, which drains a surface area in Blakely Borough between Bus. Rte. 6 and Main Street, and from Lincoln Avenue, north to Hospital Street. A remnant of the stream channel is identifiable along an abandoned Erie railroad corridor from Main Street to Mott Street. At Mott Street, the loading docks at the rear of Quinns Supermarket now occupy the surface. The balance of the channel under the supermarket is routed in a 5'X8' oval concrete culvert.

1. LRCA had begun discussions with representatives of Haband Inc., Blakely Borough and St. Nicholas Church on a proposed AMD mitigation project to possibly include, an anoxic drain channel restoration project and wetland development. LRCA recommends that this project be considered for implementation program funds through the River Conservation Program, and other sources.
2. This plan recommends that Blakely Borough consider installation of a storm water drainage system for this sub-watershed, using a naturally analogous design to recreate the stream corridor and hydrologic resources which once existed in this area.
3. This plan recommends that Blakely Borough, LRCA and the Lackawanna Heritage Valley Authority cooperate on development of greenway and trail linkages along the abandoned Erie and NYO&W rail corridor in this area.

Jessup Borough

The Lackawanna River flows for approximately 2.4-miles through the northern portion and then along the northwest boundary of the Borough of Jessup, where it serves as the municipal boundary between Jessup and the Borough of Blakely. Portions of two tributary streams to the Lackawanna also lie within the municipality. They include, lower and headwater reaches of Sterry Creek, and lower and middle reaches of Grassy Island Creek.

General Recommendations:

1. The Borough of Jessup should include the protection of the Lackawanna River, Sterry Creek and Grassy Island Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans. This plan recommends that Blakely Borough, LRCA and the Lackawanna Heritage Valley Authority cooperate

on development of greenway and trail linkages along the abandoned Erie and NYO&W rail corridor in this area.

2. The Borough of Jessup may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends mine reclamation work at the Pompey site and the Brojack site. LRCA also recommends the removal of the Rose pile and the Waddel pile and the restoration of floodplain habitat on those sites.
2. An environmental restoration of the Winton Rocks habitat along the Lackawanna River Heritage Trail is recommended.
3. A stabilization and interpretive project is suggested for the abandoned Erie Rail grade and its bridge abutments at Winton.
4. Enhancements to the riparian landscape and access pathways are suggested for Winton and the Sarah Braty Park area.

Recommendations for Sterry Creek:

1. Complete BAMR channel restoration from the Robert Casey Highway to PA Rte. 247.
2. Identify and seal remaining infiltration points.
3. Conduct upland reclamation to backfill stripping pits and grade overburden piles.
4. Integrate a greenway conservation and recreation corridor along Sterry Creek with conservation subdivisions in upland areas.
5. Identify and protect remnant habitat features such as the rhododendron and laurel groves and rock ledge outcrops in the context of subdivision development.
6. Develop a conservation plan for the O'Connor Dam and upland headwater springs.

Recommendations for Grassy Island Creek:

1. The Lackawanna County Conservation District has restored the stream channel at confluence with the Lackawanna to its original location using a natural

morphological design. Installation of additional natural vegetation is a recommended action.

- 2. The Bureau of Abandoned Mine Reclamation will conduct a major site reclamation project including: the Rose Pile at the confluence, the stream corridor through Breaker Street, the Pompey site from the stream and river corridors eastward to the Breaker Street neighborhood and the installation of a new bridge at St. Michaels Cemetery to replace the existing coal company era span. To maximize conservation potential, these additional actions are suggested:**
 - the Borough of Jessup should adopt a stream set back ordinance in their subdivision and land use regulations to require a 75-foot building setback from each side of the creek's channel center and from the bank full line along the Lackawanna River for all new development**
 - property owners should work with the Borough, the Lackawanna Valley Conservancy, and the LRCA to develop conservation, and where appropriate, recreation easements or acquisitions along the stream corridor**
 - the Borough of Jessup may consider instituting recommendations for greenways in its comprehensive plan**
 - these steps can augment the reclamation project, construction easements and follow up requirements from the BAMR projects**
 - subdivision and development proposals should require setbacks and recreation/open space set asides to include the greenway corridor along the Creek and river.**
 - special efforts should be made by all parties to protect and enhance remnant stream habitat along lower Sunnyside Road from the PA 247 highwall to St. Michaels Cemetery.**
- 3. The stream corridor from the Robert Casey Highway to Olyphant No. 1 Reservoir should be restored with morphologically appropriate designs. Abandoned mine impacts should be removed from the stream corridor and a greenway design should be developed to enhance the proposed upland industrial and business park.**
- 4. The Borough of Jessup and SLIBCO should consider working with the Lackawanna Valley Conservancy to design and develop a conservation and recreation easement program through the business park site.**
 - This program could include elements for conservation and recreation management at the reservoir and archaeological sites, rhododendron groves, steep slopes and hemlock ravines throughout the business park.**
 - This program can enhance the management of these water features and increase the value of the features in marketing the site to potential clients.**
- 5. The upland headwater areas of Grassy Island Creek should be managed long term for conservation use, exclusively. The development of conservation easements on, or a conveyance of the Theta properties to a conservation agency are recommended actions in this plan.**

6. All development and construction activities should be carefully monitored to prevent the further introduction of noxious weeds into the habitats of the Grassy Island watershed.

Archbald Borough

Approximately 2.5-miles of the Lackawanna River flows through the Borough of Archbald. Portions of five tributary streams to the Lackawanna also lie within the municipality. Three tributaries, Calendar Gap Creek, Laurel Run and White Oak Run and its tributaries Spruce Swamp Creek and Indian Cave Creek, have middle to headwater reaches within the municipality. The remaining two, Aylesworth Creek and Wildcat Creek and its tributary Tinklepaugh Creek have middle reaches within Archbald.

General Recommendations:

1. The Borough of Archbald should include the protection of the Lackawanna River, Laurel Run, White Oak Run, Wildcat Creek, Aylesworth Creek and Calendar Gap Creek and their tributaries, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. The Borough of Archbald may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. A mitigation or treatment project for the Dana Tunnel outfall is recommended to reduce aluminum sulfide pollution.
2. Improved pedestrian access to Dougher Island from the Lackawanna River Heritage Trail is recommended.
3. Support for interpretive and historic district development at Gravity Slope is recommended.
4. Continued acquisition of former the New York, Ontario & Western rail grades through Archbald for the development of the Lackawanna River Heritage Trail is a priority recommendation.

Recommendations for Laurel Run:

1. The reach of Laurel Run from the confluence to the culvert under the Robert Casey Highway, has several sections where flow loss is evident. Previous

channelization structures have been compromised by storm flows and the LRCA recommends that the property owner, PG Energy, cooperate with the Bureau of Abandoned Mine Reclamation and other agencies to restore a naturally analogous system through this reach. The potential also exists for an educational trail in the reach, to interpret geological and mining resources.

2. This plan recommends that Theta Company lands in the Laurel Run watershed should be preserved through acquisition or easements and included in the pending Lackawanna County Open Space Plan.
3. The Laurel Run gorge area, downstream of the Francis Cawley Dam, is included in the LRCA's List of Special Places and Natural Areas. The geological and aesthetic resources at this site require permanent conservation and more active management, to prevent littering and vandalism. LRCA recommends inclusion of this site in the Lackawanna County Open Space Plan.
4. The Laurel Run gorge area, downstream of the Francis Cawley Dam, is included in the LRCA's List of Special Places and Natural Areas. The geological and aesthetic resources at this site require permanent conservation and more active management, to prevent littering and vandalism. LRCA recommends inclusion of this site in the Lackawanna County Open Space Plan.

Recommendations for White Oak Run:

1. This plan recommends that a cleanup of trash and debris be conducted in White Oak Run from its confluence to the Robert Casey Highway.
2. This plan recommends that geological resource, interpretive access sites should be considered at several sites along White Oak Run.
3. This plan recommends the development of a scenic, interpretive area at the White Oak Run reservoir and at the "40 Foot Falls," the confluence of Indian Cave Creek and White Oak Run.
4. LRCA lists two reaches of White Oak Run on the List of Special Places and Natural Areas: the Robert Casey Highway to confluence reach and the White Oak Run Reservoir to "40 Foot Falls" reach.
5. LRCA recommends that PG Energy consider other sources of water supply for its co-generation plant. Consumptive use of the entire flow of White Oak Run, observed during this survey, is an ongoing concern of the LRCA.

Recommendations for Wildcat Creek and Tinklepaugh Creek:

1. This plan supports the pending completion, by the Bureau of Abandoned Mine Reclamation (BAMR), of stream channel work in the Hills of Archbald portion of Tinklepaugh Creek, to address flooding problems from storm water runoff and eliminate flow diversion into the Gravity Slope mine outfall.

2. The headwaters portion of Tinklepaugh Creek have numerous encroachments and mine impacts. This plan recommends a greenway and mine reclamation program for this area.
3. The reach of Wildcat Creek, from Sturgis through Betty Street, to the rear of the Eynon Drug Store Plaza, contains remnants of a O&W railroad branch line. This rail corridor has the potential to link the Archbald Pothole State Park to the Lackawanna River Heritage Trail and to a rail-trail greenway network in Peckville. LRCA recommends that this project be considered for a feasibility study with River Conservation funds.
4. The upper headwaters of Wildcat Creek and its tributaries on Blakely and Myers Mountains are recommended for acquisition or special protection, through updated municipal ordinances and consideration in the pending Lackawanna County Open Space Plan.

Recommendations for Aylesworth Creek:

1. Reclamation of abandoned mine impacts adjacent to the Aylesworth Creek corridor between Aylesworth Dam and Edgerton Dam is the main recommendation for Aylesworth Creek. Opportunities for passive AMD treatment technologies are numerous. Regrading of coal wastes and installation of natural channel improvements will also benefit the conservation of this reach.
2. Upgrades to the recreational facilities at Aylesworth Reservoir may be considered by the Recreation Authority. Establishment of a natural resource interpretive trail at the dam may also be considered.
3. A conservation development plan to manage and enhance the protection and economic utility of the Edgerton Dam and adjacent land is recommended.

Recommendations for Calendar Gap Creek:

1. The Borough of Archbald should protect the upper reaches of Calendar Gap Creek with a 75-foot building setback and a requirement to maintain the corridor in its natural vegetative land use.
2. The mid portion of Calendar Gap may be a candidate for future BAMR or Lackawanna Watershed 2000 projects to restore the channel and flow. If this occurs, the municipalities should insure that a greenway or conservation corridor is maintained.

12.6 Up Valley Communities

Municipalities in this section include: the Boroughs of Jermyn and Mayfield, Carbondale, Greenfield and Fell Townships, and the City of Carbondale. The listed recommendations are related to the protection of and potential projects along the Lackawanna River and its tributary streams, including: Aylesworth Creek, Calendar Gap Creek, Rush Brook, Hosey Creek, Powderly Creek, Lees Creek, Brookside Run, Fall Brook, Racket Brook, Coal Brook, and Wilson Creek.

Jermyn Borough

The Lackawanna River flows for approximately 1.5-miles through the Borough of Jermyn. Three tributary streams to the Lackawanna also lie within the municipality. They include the confluence areas and lower reaches of Aylesworth Creek, Calendar Gap Creek and Rush Brook.

General Recommendations:

- 1. The Borough of Jermyn should include the protection of the Lackawanna River, Aylesworth Creek, Calendar Gap Creek and Rush Brook, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Jermyn may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

- 1. This plan recommends acquisition of the balance of undeveloped New York, Ontario & Western rail line parcels in Jermyn, for development of the Lackawanna River Heritage Trail.**
- 2. This plan recommends the construction of a pedestrian bridge on the NYO&W line to cross the Lackawanna River at River Street; original abutments are still in place at this site.**
- 3. This plan recommends a partnership with Jermyn Borough and others to develop a park, river access, historical and cultural interpretive program and habitat restoration at the confluence of Calendar Gap Creek in Jermyn.**
- 4. This plan recommends no action other than interpretive signage and monitoring for the Jermyn Tunnel acid mine drainage discharge.**

Recommendations for Aylesworth Creek:

- 1. Just upstream of its confluence with the Lackawanna River, additional stream bank stabilization work is appropriate in the Powder Mill Dam River Corridor Preserve site. A linkage trail from the Powder Mill Dam site and the Archbald to Jermyn reach of the Lackawanna River Heritage Trail, to Aylesworth Park is recommended.**
- 2. The further development of a forest stewardship program at the Powder Mill Dam Preserve is recommended. The site may also be an appropriate location for the installation of an interpretive kiosk or pavilion.**

Recommendations for Calendar Gap Creek:

- 1. A park at the confluence with the Lackawanna River should be created through a project involving the Borough-owned parcel and possible easement or acquisition of all or a portion of the adjoining private parcel. The site has potential to tie into the Lackawanna River Heritage Trail development across the Delaware Avenue Bridge and serve as a Heritage Landing for Jermyn.**

Recommendations for Rush Brook:

- 1. This plan recommends construction of a pedestrian bridge along the New York, Ontario & Western rail line over Rush Brook; original abutments are in place at this site.**
- 2. This plan recommends that the Borough of Jermyn and the Lackawanna Heritage Valley Authority consider acquisition of land adjacent to the Rush Brook-Lackawanna River confluence, to support a greenway area linked to the Lackawanna River Heritage Trail.**

Mayfield Borough

The Lackawanna River flows for approximately 1.2-miles through the Borough of Mayfield. Three tributary streams to the Lackawanna also lie within the municipality. They include the entire length of Hosey Creek, the confluence area and lower reaches of Powderly Creek, and the confluence area of Lees Creek, whose course closely follows the Mayfield/Carbondale Township border in its lower reach.

General Recommendations:

- 1. The Borough of Mayfield should include the protection of the Lackawanna River, Hosey Creek, Powderly Creek and Lees Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. The Borough of Mayfield may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends acquisition of the remaining undeveloped parcels of the New York, Ontario & Western rail line in Mayfield for development of the Lackawanna River Heritage Trail.
2. This plan recommends a Lackawanna River Heritage Trail linkage to the pathways along the Mayfield flood control levees and a linkage to the Lakeland elementary center.

Recommendations for Hosey Creek:

1. Restoration of upper Hosey Creek can be achieved with mine reclamation and community development activities. Restoration should utilize bio-engineering and the design and development of stormwater systems to restore and maintain a more permanent streamflow and enhanced habitat along a greenway corridor.
2. The Hosey Creek confluence area near the river can provide recreational, education and habitat opportunities for the Lakeland Elementary Center.
3. The flood control berms along the Lackawanna River at the Hosey Creek confluences can provide local trail and river access sites and potential links to the Lackawanna River Heritage Trail.

Recommendations for Powderly Creek:

1. A major mine reclamation and AMD watershed restoration program is recommended for Powderly Creek. The following partners have work and projects in planning or at early reconnaissance/feasibility phase:

- Northampton Fuels, Inc., an important anthracite waste coal electric co-generator, has leased several of the culm piles along Meredith Street for removal as fuel for their Northampton, PA plant. The residual ash will be transshipped for site reclamation.
- The PA DEP Bureau of Abandoned Mine Reclamation intends to conduct additional stream channel restoration through the Bushwick site.

- The U.S. Army Corps of Engineers is preparing to conduct a feasibility assessment in conjunction with PA DEP-BAMR and LRCA on Powderly Creek projects.
 - Lackawanna Watershed 2000, a Lackawanna County project funded by USEPA and PA DEP-BAMR is also preparing coordinated work on Powderly Creek.
2. A post reclamation, reuse/development plan should be created to involve all property owners, municipalities and appropriate county and private development agencies in a coordinated development program for the potential two to three-thousand acres of developable abandoned mine land in the vicinity of Powderly Creek and the Meredith Street exit of the Robert Casey Highway.
 3. Rail service opportunities for the lower Powderly site should be developed for industrial and commercial uses.

Recommendations for Lees Creek:

1. Channel lining and restoration for 2000 feet up from the confluence will restore good perennial flows to the river. The Lackawanna Valley Heritage Authority and the PA DEP Bureau of Abandoned Mine Reclamation should consider this work when Heritage Authority develops the upper end of its campus.
2. The Lackawanna River Heritage Trail will cross the Lees Creek near its confluence. A sufficiently sized culvert or bridge installation could include 200 feet of channel restoration along the approaches to the bridge site.

Carbondale Township

The Lackawanna River flows for approximately 0.5-miles through Carbondale Township. Six tributary streams to the Lackawanna also lie within the municipality, though none of them confluence with the Lackawanna within the township. They include middle reaches of Rush Brook, upper headwater reaches of Aylesworth Creek, middle to upper reaches of Powderly Creek, all but the confluence area of Lees Creek, upper headwater reaches of Brookside Run, and middle to upper headwater reaches of Racket Brook. A seventh tributary stream to the Lackawanna, Fall Brook, also has a very small portion of its length within the municipality. Murin Run, a tributary to Fall Brook which flows from Mountain Mud Pond in Merli-Sarnoski Park, also lies within the township.

General Recommendations:

1. Carbondale Township should include the protection of the Lackawanna River, Rush Brook, Aylesworth Creek, Powderly Creek, Lees Creek, Brookside Run, Racket Brook and Fall Brook and Murin Run, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Carbondale Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.

3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. This plan recommends acquisition of the balance of New York, Ontario & Western undeveloped parcels in Carbondale Township for development of the Lackawanna River Heritage Trail.
2. This plan recommends development of a greenway and recreational easement with PPL and other property owners between Meredith and Pike Streets along the east bank of the Lackawanna River.

Recommendations for Rush Brook:

No recommendations for the reach of Rush Brook within Carbondale Township

Recommendations for Aylesworth Creek:

No recommendations for the reach of Aylesworth Creek within Carbondale Township

Recommendations for Powderly Creek:

1. A major mine reclamation and AMD watershed restoration program is recommended for Powderly Creek. The following partners have work and projects in planning or at early reconnaissance - feasibility phase:
 - Northampton Fuels, Inc., an important anthracite waste coal electric co-generator, has leased several of the culm piles along Meredith Street for removal as fuel for their Northampton, PA plant. The residual ash will be transshipped for site reclamation.
 - The PA DEP Bureau of Abandoned Mine Reclamation intends to conduct additional stream channel restoration through the Bushwick site.
 - The U.S. Army Corps of Engineers is preparing to conduct a feasibility assessment in conjunction with PA DEP-BAMR and LRCA on Powderly Creek projects.
 - Lackawanna Watershed 2000, a Lackawanna County project funded by USEPA and PA DEP-BAMR is also preparing coordinated work on Powderly Creek.
2. A post reclamation, reuse/development plan should be created to involve all property owners, municipalities and appropriate county and private development agencies in a coordinated development program for the potential two to three-thousand acres of developable abandoned mine land in the vicinity of Powderly Creek and the Meredith Street exit of the Robert Casey Highway.
3. A more vigorous approach to assessment, prognosis and control for the mine fire site needs to be developed.
4. A greenway program along the Powderly Creek needs to be instituted by ordinance protection, easements and management. D&H Gravity Railroad resources need to

be protected and incorporated into the greenway program to support recreational trails.

5. Rail service opportunities for the lower Powderly site should be developed for industrial and commercial uses.

Recommendations for Lees Creek:

1. Channel lining and restoration for 2000 feet up from the confluence will restore good perennial flows to the river. The Lackawanna Heritage Valley Authority and the Bureau of Abandoned Mine Reclamation should consider this work when LHVA develops the upper end of its campus.

Recommendations for Brookside Run:

1. Channel lining and regrading of strip mine pits along the stream in Carbondale Township and the City of Carbondale could restore perennial flows to Brookside Run.
2. The Lackawanna Valley Conservancy is available to work with the township, the cemetery association and property owners or developers, to help plan and manage a greenway project for Brookside Run.

Recommendations for Racket Brook:

Racket Brook presents several opportunities for cultural, recreational and habitat improvements. The Gravity Railroad alignment and structural remnants are eligible for nomination to the National Register of Historic Places. The Gravity also offers economic and cultural justification to serve as a link in the regional trail system and heritage tourism infrastructure. This can also become the basis for a Racket Brook Greenway.

1. This plan suggests a partnership be developed among LRCA, Lackawanna Heritage Valley Authority, Carbondale Township, the City of Carbondale and its agencies, the Carbondale Chamber of Commerce, the Carbondale Historic Society, the Rail Trail Council of North East Pennsylvania and other interested parties to develop a greenway, trail and heritage corridor along Racket Brook.
2. To facilitate the greenway, the LRCA recommends the acquisition of all available parcels of the D&H Gravity Railroad along Racket Brook from Carbondale through Whites Crossing in Lackawanna County and the light track, later Honesdale branch alignment, from Whites Crossing through the Carbondale Number 4 tract and through the correctional institute and federal prison tracts in Canaan Township, Wayne County.

Recommendations for Fall Brook:

The Fall Brook corridor has the potential to serve as a greenway link from Carbondale to Merli-Sarnoski Park and future linkage to the Tunkhannock Creek watershed in Scott and Greenfield Townships. There are also ongoing needs for channel restoration related to flow loss to the mine pool. Also, the riparian habitat can be better conserved by a comprehensive program to create and maintain a greenway along Fall Brook. The following recommendations constitute elements suggested for a Fall Brook greenway:

1. **The Corps of Engineers is developing a feasibility study to address mine reclamation issues along Fall Brook and Murin Run. This work should include stream channel sealing and restoration of the natural morphology and riparian corridor.**
2. **A study is recommended to plan a greenway/recreational trail along Fall Brook from the confluence to Fall Brook Falls. Potential links to Merli-Sarnoski Park and other points in Fell, Greenfield and Scott Townships may be included in the Fall Brook Greenway plan.**

City of Carbondale

The Lackawanna River flows for approximately 2.75-miles through the City of Carbondale. Portions of five tributary streams to the Lackawanna also lie within the municipality. They include the headwaters of Powderly Creek, and the confluence and lower reaches of Brookside Run, Racket Brook, Coal Brook, and Fall Brook and its tributary Murin Run.

General Recommendations:

1. **The City of Carbondale should include the protection of the Lackawanna River, Powderly Creek, Brookside Run, Racket Brook, Coal Brook, and Fall Brook and Murin Run, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
2. **The City of Carbondale may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
3. **This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

Recommendations for the Lackawanna River:

1. **This plan recommends completion of the Lackawanna River Heritage Trail through the City of Carbondale, including several links to the D&H and O&W trails.**
2. **This plan supports restoration of the stone floodwalls along the Lackawanna and installation of river access points through the City of Carbondale.**
3. **This plan recommends development of a Heritage Landing at the Racket Brook confluence and the D&H round house site. This site could become a Carbondale River Commons.**
4. **This plan recommends development of a greenway and recreational easement with PPL and other property owners between Meredith and Pike Streets along the east bank of the Lackawanna.**

5. This plan recommends the development of conservation easements for greenway and recreational purposes along the Lackawanna, including the Thorton property at the former Carbondale rail yards.
6. A river access and educational site at the Schoolside Branch of PennStar Bank could improve river access and presentation of in-stream river and watershed education. This plan recommends improvements and easements at this site.

Recommendations for Powderly Creek:

1. A major mine reclamation and AMD watershed restoration program is recommended for Powderly Creek. The following partners have work and projects in planning or at early reconnaissance-feasibility phase:
 - Northampton Fuels, Inc., an important anthracite waste coal electric co-generator, has leased several of the Powderly site culm piles for removal as fuel for their Northampton, PA plant. The residual ash will be transshipped for site reclamation.
 - The PA DEP Bureau of Abandoned Mine Reclamation intends to conduct additional stream channel restoration through the Bushwick site.
 - The U.S. Army Corps of Engineers is preparing to conduct a feasibility assessment in conjunction with PA DEP-BAMR and LRCA on Powderly Creek projects.
 - Lackawanna Watershed 2000, a Lackawanna County project funded by USEPA and PA DEP-BAMR is also preparing coordinated work on Powderly Creek.
2. A post reclamation, reuse/development plan should be created to involve all property owners, municipalities and appropriate county and private development agencies in a coordinated development program for the potential two to three-thousand acres of developable abandoned mine land in the vicinity of Powderly Creek and the Meredith Street exit of the Robert Casey Highway.
3. A more vigorous approach to assessment, prognosis and control for the mine fire site needs to be developed.
4. A greenway program along the Powderly Creek needs to be instituted by ordinance protection, easements and management.
 - D&H Gravity Railroad resources need to be protected and incorporated into the greenway program to support recreational trails.
 - Russell Park can be expandable by inclusion in reclamation activities. It is recommended to serve as a trailhead for a Powderly/D&H Gravity Greenway Trail.
5. The City of Carbondale through its Community Development Program can include enhancements and improvements to the culvert system that conveys the headwater seeps and mine drainage springs into the Powderly corridor.

Recommendations for Brookside Run:

1. Channel lining and regrading of strip mine pits along the stream through the City of Carbondale could help restore perennial flows to Brookside Run.

Recommendations for Fall Brook:

The Fall Brook corridor has the potential to serve as a greenway link from the City of Carbondale to Merli-Sarnoski Park and future linkage to the Tunkhannock Creek watershed in Scott and Greenfield Townships. There are also ongoing needs for channel restoration related to flow loss to the mine pool. Also, the riparian habitat can be better conserved by a comprehensive program to create and maintain a greenway along Fall Brook. The following recommendations constitute elements suggested for a Fall Brook greenway:

- 1. The Corps of Engineers is developing a feasibility study to address mine reclamation issues along Fall Brook and Murin Run. This work should include stream channel sealing and restoration of the natural morphology and riparian corridor.**
- 2. A study is recommended to plan a greenway/recreational trail along Fall Brook from the confluence to Fall Brook Falls. Potential links to Merli-Sarnoski Park and other points in Fell, Greenfield and Scott Townships may be included in the Fall Brook Greenway plan.**
- 3. Additional greenway sites and links may be included along several Fall Brook sites including the Carbondale Area high school and middle school campus, the commercial strip along Brooklyn Street, the west side residential neighborhoods, and the Tri-County health site.**

Recommendations for Racket Brook:

Racket Brook presents several opportunities for cultural, recreational and habitat improvements. The Gravity Railroad alignment and structural remnants are eligible for nomination to the National Register of Historic Places. The Gravity also offers economic and cultural justification to serve as a link in the regional trail system and heritage tourism infrastructure. This can also become the basis for a Racket Brook Greenway.

- 1. This plan suggests a partnership be developed among LRCA, Lackawanna Heritage Valley Authority, the City of Carbondale and its agencies, the Carbondale Chamber of Commerce, the Carbondale Historic Society, the Rail Trail Council of North East Pennsylvania and other interested parties to develop a greenway, trail and heritage corridor along Racket Brook.**
- 2. To facilitate the greenway, the LRCA recommends the acquisition of all available parcels of the D&H Gravity Railroad along Racket Brook from the City of Carbondale through Whites Crossing in Lackawanna County and the light track, later Honesdale branch alignment, from Whites Crossing through the Carbondale Number 4 tract and through the correctional institute and federal prison tracts in Canaan Township, Wayne County.**
- 3. This plan recommends development of a Heritage Gateway adjacent to the Ben Mar Restaurant in the City of Carbondale, to serve as an strategic junction in linking the Lackawanna River Heritage Trail with the D&H and O&W rail trails to the north, and the developing D&H Transportation Heritage Corridor to the east.**
- 4. LRCA suggests that the City of Carbondale take a lead in a physical cleanup of Racket Brook, to address urban dumping of trash, yard waste and coal**

waste. The cleanup could also address ongoing maintenance issues for urban storm water, invasive species and protection of residual natural habitat.

Recommendations for Coal Brook:

1. A comprehensive restoration program for Coal Brook is needed to restore the water course and natural flow to Coal Brook. This program could provide opportunities for public and private partnerships to reclaim abandoned mine lands, restore water resources and redevelop upland areas for residential and institutional uses. LRCA, the City of Carbondale, Fell Township, state agencies, and property owners may wish to cooperate on such partnerships.
2. The Coal Brook Colliery buildings and the D&H roundhouse offer opportunities for adaptive reuse. Public and private partnerships are recommended to advance cleanup and adaptive reuse of these sites.
3. The City of Carbondale, PA DEP and the Lackawanna River Basin Sewer Authority should investigate and remedy the sewage inflow in the Coal Brook-Dundaff Street culvert. Other sewage streams on the east bank near the Maplewood Cemetery and Belmont Street neighborhood also need to be investigated.

Fell Township

The Lackawanna River flows for approximately 3.1-miles through Fell Township. Portions of three tributary streams to the Lackawanna also lie within the municipality. They include middle to upper headwater reaches of Fall Brook and Coal Brook and the confluence and entire length of Wilson Creek.

General Recommendations:

1. Fell Township should include the protection of the Lackawanna River, Fall Brook, Coal Brook and Wilson Creek, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.
2. Fell Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.
3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.

Recommendations for the Lackawanna River:

1. Panther Bluff ravine and the preserved tract as well as the No. 10 Hole twin waterfalls are included on the LRCA's List of Special Places and Natural

Areas. These sites are recommended for stewardship management activities and educational programs.

2. **The Northwest Dump culm pile is recommended for removal and site reclamation. This plan recommends a conservation subdivision development as an appropriate reuse of the site.**
3. **This plan recommends acquisition of the balance of the 6500-foot gap in the D&H right-of-way.**

Recommendations for Fall Brook:

The Fall Brook corridor has the potential to serve as a greenway link from Carbondale to Merli-Sarnoski Park and future linkage to the Tunkhannock Creek watershed in Scott and Greenfield Townships. There are also ongoing needs for channel restoration related to flow loss to the mine pool. Also, the riparian habitat can be better conserved by a comprehensive program to create and maintain a greenway along Fall Brook. The following recommendations constitute elements suggested for a Fall Brook greenway:

1. **The Corps of Engineers is developing a feasibility study to address mine reclamation issues along Fall Brook. This work should include stream channel sealing and restoration of the natural morphology and riparian corridor.**
2. **A study is recommended to plan a greenway/recreational trail along Fall Brook from the confluence to Fall Brook Falls. Potential links to Merli-Sarnoski Park and other points in Fell, Greenfield and Scott Townships may be included in the Fall Brook Greenway plan.**
3. **Lackawanna County may wish to consider development of public access - interpretive site and management program at Fall Brook Falls and a trail linkage to the developed portion of Merli-Sarnoski Park.**
4. **Fall Brook Falls is included on the LRCA's List of Special Places and Natural Areas. This site is recommended for stewardship management activities and educational programs.**

Recommendations for Coal Brook:

1. **A comprehensive restoration program for Coal Brook is needed to restore the water course and natural flow to Coal Brook. This program could provide opportunities for public and private partnerships to reclaim abandoned mine lands, restore water resources and redevelop upland areas for residential and institutional uses. LRCA, the City of Carbondale, Fell Township, state agencies, and property owners may wish to cooperate on such partnerships.**

Recommendations for Wilson Creek:

1. **A complete channel restoration of Wilson Creek is recommended to eliminate infiltration into the mine pool from Richmondale to Simpson.**

- 2. Subsequent to the removal or regrading of the Richmondale Pile, the site would be appropriate for residential, institutional, or mixed village, commercial, residential development; a public and private partnership may be useful in advancing the appropriate redevelopment of this area.**
- 3. AMD flows at the Upper and Lower Wilson Outfalls and Molensky Slope should be assessed and mitigated, if necessary.**
- 4. The Doyle & Roth site has potential for historic adaptive reuse. LRCA recommends that the property owners, the township and other interested parties consider a partnership to redevelop this site.**
- 5. Opportunities for a Wilson Creek greenway and trail to link Simpson and Richmondale may be developed in conjunction with the D&H trail and Lackawanna River Heritage Trail.**

Greenfield Township

Two tributary streams to the Lackawanna River have upper headwater reaches within Greenfield Township. They include the headwaters of Rush Brook and the headwaters of tributary streams to Fall Brook, including Crystal Lake.

General Recommendations:

- 1. Greenfield Township should include the protection of upper headwater reaches of Rush Brook and Fall Brook, and technical requirements for that protection, in their zoning, land use and subdivision ordinances and comprehensive plans.**
- 2. Greenfield Township may consider enhancements to its zoning, land development and subdivision plans to improve the management of small lot subdivisions, especially relative to slope, soil and drainage conditions. This plan recommends the participation with other local municipalities and county agencies in programs to better manage minor subdivision development.**
- 3. This plan further recommends the enhancement of municipal zoning, land use and subdivision ordinances and comprehensive plans to further define and protect: open space, natural areas, wetlands, woodlands, greenway and stream corridors, recreational corridors, ridge lines, escarpments, scenic view sheds, and historical and cultural resources.**

13. The River Conservation Registry

The Pennsylvania River Conservation Registry is a program maintained by the River Conservation Office of the Pennsylvania Department of Conservation and Natural Resources. The Registry is a non-regulatory, voluntary program which recognizes that a river conservation plan for a particular waterway or watershed has been completed. One or several municipalities may endorse the recommendations and petition for the inclusion of the Lackawanna on the Registry. The municipalities and the LRCA will then work within the context of the plan to implement the recommendations given considerations of time, funding, and the consensus of the community stakeholders to develop specific proposals to address the various recommendations.

There are no time constraints or regulatory requirements to perform or refrain from any action, program or project recommended in the plan. By petitioning the DCNR to include the Lackawanna River and its tributary watersheds on the Registry, municipalities indicate their interest in working on a voluntary basis to implement projects at their own discretion.

The Lackawanna River Corridor Association and the participants in the Lackawanna River Watershed Conservation Plan recommend that the twenty-six municipalities in the Lackawanna River watershed consider the adoption of resolutions endorsing the plan and its recommendations relative to their individual municipalities and further, the resolution petitions the Commonwealth to include the Lackawanna River and its watershed tributary streams on the Pennsylvania River Conservation Registry.

Upon acceptance of the Lackawanna on the Registry, all of the projects and programs recommended in the plan become eligible for 50/50 matching grants through the River Conservation Program. These implementation grants are only available to rivers and municipalities where a plan has been completed and Registry status has been granted.

The model resolution on the following page is offered for the consideration of Lackawanna watershed municipalities.

**BEFORE THE (BOARD OF SUPERVISORS) OR (COUNCIL) OF
THE (TOWNSHIP) (BOROUGH) (CITY) OF _____**

RESOLUTION NO. _____

**A RESOLUTION SUPPORTING THE LACKAWANNA RIVER
WATERSHED CONSERVATION PLAN AND LISTING THE
LACKAWANNA RIVER WATERSHED AND ITS TRIBUTARIES
ON THE PENNSYLVANIA RIVERS REGISTRY. (ADMIN)**

WHEREAS, the (Board of Supervisors) (Borough Council) (City Council) recognize the importance of conserving the Lackawanna River watershed and its tributaries to foster the quality of life in the northeast Pennsylvania region; and

WHEREAS, the Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Division of Conservation Partnerships (PA DCNR) has established a “Pennsylvania Rivers Conservation Registry”;

Whereas, the Lackawanna River Corridor Association (LRCA) has completed a Lackawanna River Watershed Conservation Plan for the Lackawanna River and its watershed tributaries, which includes a number of conservation recommendations suitable for implementation, development or acquisition in this municipality and throughout the entire Lackawanna watershed; and

WHEREAS, the Lackawanna River Watershed Conservation Plan has been reviewed and found acceptable by the (Board of Supervisors) (Borough Council) (City Council) and,

WHEREAS, the (City of) (Borough) (Township) does endorse the Lackawanna River Conservation Plan and will endeavor to take appropriate action to implement its recommendations.

NOW, THEREFORE, the (Board of Supervisors) (Borough Council) (City Council) requests that the Lackawanna River and its watershed tributaries be listed on the Pennsylvania Rivers Conservation Registry.

APPROVED AND ADOPTED this _____ day of _____, 200_, at
a regular public meeting.

BOARD OF SUPERVISORS

TOWNSHIP OF _____

BY:

Chairperson

Date

ATTEST:

Secretary

**COUNCIL OF THE (BOROUGH) OF
(CITY) OF**

BY:

President

Date

ATTEST:

(Borough Secretary)

(City Clerk)

14. Bibliography

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15. Public Comment and LRCA Contact Information

The public is encouraged to participate with the Lackawanna River Corridor Association (LRCA), local government agencies, business interests and community organizations on the development and implementation of this plan.

The LRCA invites comments and contributions from everyone who has an opportunity to read and consider this document. The LRCA is a non-profit, community based, conservation organization created in 1987 by and for the people of the Lackawanna River Watershed, to help foster stewardship of our watershed and its natural, cultural, economic and human resources.

The LRCA is governed by a Board of Directors who serve voluntarily. The LRCA is a membership organization supported by the contributions of the membership, grants from foundations, contracts and grants from government agencies, corporate contributions and special events.

You can reach the LRCA by writing to PO Box 368, Scranton, PA 18501-0368. Our telephone number is (570) 207-7608. We are also accessible by email at: lrca@epix.net and you can visit our web site at: www.lrca.org.

This document is also available as a compact disc.

Your comments and involvement are welcome and encouraged. Visit our web site today!

Lackawanna River Watershed Conservation Plan

Appendix A

Lackawanna River Heritage Trail

Trail Routing Alternatives Report

prepared by

The Lackawanna River Corridor Association

November 2001



Lackawanna River Watershed Conservation Plan

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This project is funded with support from the Chesapeake Bay Program Small Watershed Grants Program administered by the National Fish and Wildlife Foundation, the Scranton Area Foundation, the Rivers Conservation Program of the Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, a cooperative agreement for Technical Assistance with the Lackawanna Heritage Valley Authority

and

The membership and community support funding received through contributions to the Lackawanna River Corridor Association.

Report prepared by

Bernie McGurl

With assistance from

Deilsie Heath Kulesa

Arthur Popp

Christian Watkins



Lackawanna River Heritage Trail

Trail Routing Alternative Report

The Lackawanna River Corridor Association (LRCA) has compiled this report under provision of Section B, Scope of Work of the Agreement for Technical Services dated July 6, 1999 between the LRCA and Lackawanna Heritage Valley Authority extended by Letter of Agreement of November 17, 2000 and further extended to May 31, 2001.

The Lackawanna Heritage Valley Authority (LHVA) shares a mission with the LRCA to develop a forty-mile trail and greenway along the Lackawanna River from its confluence with the North Branch Susquehanna River at Duryea and Pittston,

Luzerne County to the headwaters of the Lackawanna River near Union Dale, Susquehanna County.

The majority of the trail greenway alignment, approximately thirty-two miles is proposed to be developed along the river corridor between Old Forge and Vandling in Lackawanna County. The Lackawanna River Heritage Trail (LRHT) originated in recommendations in the *Lackawanna River Citizens Master Plan* (1989) developed by the LRCA, Lackawanna County and the National Park Service. The plans comprehensive proposals address environmental problems, promote conservation, recreation and the appropriate management of river corridor resources. The greenway trail functions as a vehicle to facilitate and encourage the clean up of pollution sources and improvements to the management of River corridor resources.

The greenway trail is also a significant component of the *Plan for the Lackawanna Heritage Valley* (1990). The LRHT was further developed in the *Lackawanna Heritage Valley Rails to Trails Study* (1991). The study developed an inventory of abandoned railroad corridors in the Lackawanna Valley region.

The *Rail Trail Study* served to coalesce several participants' interests and lead to the formation of the Rail Trail Council of North East Pennsylvania (RTC) in 1991. The mission of the RTC is to promote Rails-to-Trails projects on the D&H and O&W railroads which parallel the upper fifteen miles of the Lackawanna River and its east and west branches prior to exiting the watershed. The RTC created an affiliated organization, the Trail Conservation Corporation (TCC) in 1995 to facilitate property acquisition.

The LRCA had also developed the Lackawanna Valley Conservancy (LVC) in 1995 to provide the services of a land trust / conservancy to assist in the acquisition and management of real estate for conservation, recreation, and cultural preservation.

These entities are all organized as charitable and educational organizations and operate under the terms of Section 501(c)(3) of the Internal Revenue Code. The organizations work collaboratively through cooperative agreements to develop and conserve trail and greenway resources.

The LRCA, NPS and the Corps of Engineers developed more detailed plans in the *Lackawanna River Greenway Study* (1993). This study developed the initial feasibility information which has served as a basis to support LHVA, LRCA and RTC projects which have acquired and developed several trail segments:

- CNJ Trail - Scranton to Taylor , 3 miles acquired , 1½ miles developed in Scranton by LHVA (1997).**
- O&W Blakely to Archbald Trail, 3 miles acquired and developed by LHVA (1998).**
- O&W Providence Trail, ½ miles acquired and developed by LRCA and LVC (1996).**
- D&H Trail, 41 miles acquired, Simpson to Lanesboro, Pennsylvania with some sections developed by RTC (1996).**

- **O&W Trail , Simpson to Forest City, 8 miles of trail easement acquired, trailhead developed at PA 171 in Simpson by RTC (1996).**
- **Lackawanna Heritage Crossing, 150-foot-pedestrian/bicycle bridge installed linking trails in Blakely and Olyphant parks by LHVA and LRCA (1993).**

The LHVA is presently implementing a Transportation Enhancement program (TEA 21) funded project to acquire additional properties for the LRHT. This project, LRHT Phase II is funded to acquire the following:

- **12,000 linear feet of Ontario Scranton and Carbondale Railroad (OSC Corporation) and several adjacent properties in Scranton and Throop.**
- **12,000 linear feet of OSC property and easements on Lackawanna River Basin Sewer Authority property between Archbald and Jermyn.**
- **4,000 linear feet of OSC and adjacent parcels in Carbondale.**

When these acquisitions are completed, additional funds will be needed to develop the rights-of-way and adjacent parcels for recreational trail use. The acquisitions will bring the total of Trail miles acquired by LHVA to twelve miles. The Rail Trail Council's forty miles of D&H and eight miles of O&W fee and easement acquisitions include ten of the LRHT's forty miles. This leaves a balance of eighteen-miles of trail right-of-way acquisition needed to complete development of the LRHT from the confluence of the Lackawanna and Susquehanna rivers in Luzerne County to Stillwater Dam in Susquehanna County.

This report details a variety of route alternatives which may provide feasible choices for the LHVA, LRCA and partner-agencies to acquire and develop the remainder of the eighteen miles needed to complete the LRHT.

The approximate eighteen miles are divided into seven sections as follows:

1. **Old Forge to Pittston, OF/P: Confluence area Pittston / Duryea to Union Street Old Forge: 3 miles**
2. **Taylor to Old Forge, T/OF: Union Street, Old Forge to Depot Street, Taylor (south end of CNJ Trail, Scranton to Taylor): 4.75 miles**
3. **Scranton Greenway, SCR: Bridge 60, Scranton to Mulberry Expressway Bridge, Scranton (Scranton Greenway): .75 miles**
4. **North Scranton, NS: Mulberry Expressway Bridge to Green Ridge Street Bridge, Scranton: 1.75 miles**
5. **Throop to Olyphant/Blakely, TO/BY: Boulevard Avenue, Throop to Condella Park, Olyphant: 3.75 miles**
6. **Jermyn to Carbondale, J/CAR: Rushbrook Street in Jermyn to Racket Brook (Ben Mar Restaurant) Carbondale: 4.5 miles**
7. **Carbondale to Fell, CAR/FELL: Downtown Carbondale to D&H and O&W Trailheads at the PA Route 171 Bridge in Simpson: 1 to 2 miles**

Note that mileage is approximate, total sectional mileage exceeds 18 miles. These sections and the route alternatives present an array of challenges as well as opportunities. Several other related projects are being implemented which may present nearly complete linkages. These include the proposed Wilkes-Barre, Pittston, Duryea Trail which is planned to extend to Old Forge and the Army Corps of Engineers flood levee projects in Scranton and Olyphant. Other obstacles may be more of a challenge such as the need for a pedestrian bridge, regrading of topography, crossing or interface with active railroads, roads and highways.

The alternatives presented in this report are the result of review of previous routing recommendations from the Rail Trails Study of 1991 and the Corps' Greenway Study of 1993. Subsequent to the review and an analysis of successful trail projects and their locations, LRCA personnel and volunteers conducted physical stream walk surveys to gather physical conditions information along the river and tributary stream corridors. This information was then overlaid for comparison on digitized property plats derived from Lackawanna County tax maps, on USGS topographic maps and on 1" = 1,000' digital orthophotography.

In preparing the route selection, the following objective criteria were applied:

- priority utilization of vacant or underdeveloped lands along the river or stream corridor
- utilize abandoned rail corridors where possible
- utilize sewer or utility corridors as a second alternative
- link to existing municipal or municipal authority-owned land where possible to reduce acquisition costs
- include Rail Authority routes where other alternatives are impractical
- link to existing or planned flood control projects
- limit or reduce potential negative impacts to private residential properties and neighborhoods
- develop routes where public use potential is high
- avoid routes to undesirable destinations, rail yards, heavy industrial sites, junk yards and culm dumps
- consider future linkages to cultural and heritage attractions, other trails, natural areas and economic developments
- consideration of new Trail development partners.

Each trail section is analyzed and discussed with recommendations in the following:

1. Old Forge to Pittston, OF/P

Alternative OF/P1: Three miles along active rail corridors.

Description: This route is a continuation of the Wilkes-Barre to Pittston Rails-with-Trails project. It originates at the proposed Pittston City Water Front Park between the Water Street and Ft. Jenkins bridges and is routed along the former Lehigh Valley Wilkes-Barre Branch now owned by the Luzerne County Rail Corporation. It proceeds one mile north to Pittston Junction/Coxton Rail Yard. It parallels Main Street through Pittston Lumber, Insalacos, Bevaco commercial sites and then terminates at Coxton Yard. The route continues through Pittston Junction through the intersection of rail trackage and open space areas along Main Street where the former Lehigh Valley Rail lines were crossed by the former DL&W Bloomsburg branch. Continuing northward from the junction, the route follows the DL&W Bloomsburg trackage now operated by Reading Blue Mountain and Northern Railroad. The route passes under Main Street in Duryea and passes to the east of Main Street, through Duryea for two miles to and along the east side of Main Street into Old Forge.

Discussion: The Pittston Rail- with-Trail project is a partnership of the City of Pittston, the Luzerne County Tourism Agency, and a newly formed trail group. The project has completed feasibility plans and has secured construction funding for two projects in Pittston and Jenkins Township. The feasibility study proposed a route along active rail lines from Wilkes-Barre through Pittston to Duryea/Old Forge. The project has developed an operations agreement with the Luzerne County Rail Commission from Wilkes-Barre through Pittston Junction, Yard Limit, Coxton Yard, Duryea.

An agreement with Reading and Northern, a private carrier would be required for the use of the rail corridor between Coxton Yard and Old Forge. The now single track line once carried two to three tracks and therefore can physically accommodate dual use with fencing and buffers. There are several bottlenecks at the McAlpine Street/Main Street overpass intersection and in the vicinity of rail structures in Pittston Junction.

Analysis: This route is the preferred alternative due to its direct connection to the Luzerne County trail network and the Delaware and Lehigh Heritage Corridor. Due to the physical problems in the lower Duryea Coxton Rail Yard area some alternative routing along roadways or through adjacent private parcels may be necessary. LRCA and LHVA may consider support for the Pittston trail partners as they continue the lead in advancing the overall development of this route. Regular contact between LRCA/LHVA and the Pittston group is recommended to facilitate the implementation of this trail segment during the near to mid-term — four to eight years.

Alternative routes: Old Forge to Pittston has several route alternatives which may be considered in their entirety, in portions or as side trails for future access to the confluence area pending development of a confluence park or open space management area as originally envisioned in the *Plan for the Lackawanna Heritage Valley*. These routings are described from north to south assuming a link-up with the LRHT at Union Street Bridge, Old Forge, one-thousand feet north of the county line along Main Street.

Alternative OF/P2: Three miles along abandoned rail corridors west of the Lackawanna River. This route originates at Connells Patch near Union Street, Old Forge and follows the route of the abandoned Lehigh Valley Sibley Branch south to Stephenson Street, Duryea. Two sub alternatives are available here: OF/P2A

continues along the Lehigh Valley right-of-way to Coxton Road and then into Coxton Yard or along adjacent parcels to the rail yard access road back to Coxton Road and Main Street, Pittston Junction. OF/P2B leaves the rail corridor at Stephenson Street and follows a new right-of-way to be created through undeveloped private parcels and flood control levees from Stephenson Street along the west bank of the Lackawanna River to Coxton Road and Main Street , Pittston.

Alternative OF/P3: From Coxton Road follows the Coxton Rail Yard confluence access road to the Coxton rail bridge, the route accesses the rail corridor and uses the rail bridge to cross to the east bank of the Lackawanna proceeding along the rail yard service road to the Main Street rail with trail corridor.

Alternative OF/P4: Proceeds from Coxton Road along the Coxton Rail Yard confluence access road to the former Coxton Roundhouse site and then utilizes an abandoned truss rail bridge which crosses the Susquehanna River to PA 92 in Exeter. The route then would follow the abandoned rail corridor to the West Pittston flood levee and then proceed along Susquehanna Avenue to the Fort Jenkins Route 11 bridge.

Alternative OF/P5: Proceeds from Coxton Road along the Coxton Rail Yard confluence access road to the confluence of the Lackawanna and Susquehanna rivers. This route requires the construction of a pedestrian/ bicycle bridge across the Lackawanna River within 1,000 feet of its confluence with the Susquehanna. The route then proceeds across undeveloped private parcels containing abandoned gravel pits and coal strippings. The route passes under the east abutment of the DL&W Coxton/West Pittston truss bridge and follows the flood plain of the Susquehanna to the vicinity of Pittston Lumber where it rejoins the Rail- with-Trail OF/P1 alternative.

Alternative OF/P6 is routed along Main Street from Union Street, Old Forge to Marcy Street, Duryea then along Marcy Street and the Duryea flood protection levee to Stephenson Street then to Church Street, Crittenden Street and the balance of the levee to Canal Street at Main Street then along Main Street into Pittston Junction where Alternative OF/P6 follows OF/P1 along the Luzerne County rail corridor from Coxton Yards to Pittston.

Analysis: Alternatives OF/P2 and OF/P2A seem to offer the most viable alternative to OF/P1 for the upper portion of the route, these routes tie into the recommended Old Forge to Taylor alignment (see next section). They have the least amounts of interface with traffic, with the exception of the Coxton Road intersections and rail underpass.

Due to the complexity of the road and rail infrastructure in the Pittston Junction/Coxton Road reach, all alternative routes may require some type of bridging to safely carry trail traffic over and through the impeded sections. All alternatives are viable to develop side trails, loop trails and interpretive trails in and through the confluence area. The creation of a state, regional or municipal park or open space managed natural area or the development of a wetlands mitigation scheme for treatment of acid mine drainage all offer opportunities for trail development in this area.

Trailheads and Heritage Landings , three trailhead sites and/or heritage landings are suggested in the Pittston - Old Forge Corridor:

- The River Front Park in the City of Pittston is the anchor heritage landing site and major point of junction for the Delaware/Lehigh, Wyoming Valley greenways and Lackawanna Heritage Corridors and Trail systems. As this park is developed it is recommended that Lackawanna and Luzerne county partners collaborate on signage and programming to thematically relate the heritage regions and trail systems to maximize the public usage of the trails and heritage resources by both local and visiting publics.
- There may be an opportunity to develop a trailhead and heritage landing in the Pittston Junction area. This site could be developed to access alternate trail corridors, interpretive and activity sites in the confluence area which may be developed in future years.
- The Duryea Borough may consider a trailhead /landing site at Canal Street to interpret the Pennsylvania Canal or a smaller trailhead could be developed near Marcy and Main streets either along the levee or adjacent to the rail corridor.

2. Taylor to Old Forge, T/OF:

Discussion: The Taylor to Old Forge corridors are all partially compromised with active rail corridors, the need to pass over or under the Pennsylvania Turnpike , the concerns of trail routing along legislative routes and municipal roads, the challenges of developing new rights-of-way through vacant land and reestablishing abandoned rail rights-of-way impaired by encroachments.

The opportunities in the Taylor/Old Forge reach should offset any challenges. The opportunities may be considered as follows:

- All routes will offer opportunities for recreation and communication to two large down-valley communities.
- Strategic trail link between Scranton and Pittston.
- Potential to tie the trail into Riverside and Old Forge School properties and improve public safety and access for commuting students from adjacent neighborhoods.
- Potential to tie the trail into Main Street business districts.
- Strong potential to tie the trail into newly created or upgraded recreational sites.

Alternatives Description:

T/OF1, this route would run along the river and rail corridor southward from the termination of the former Central Railroad of New Jersey right-of-way presently owned by LHVA between Depot Street and the pylons of the Davis Street/Union Street bridge. From this point bridging would be necessary to carry the trail over the active rail corridor for several hundred feet. The bridge would terminate on a parcel of property at the intersection of Cooper Street and High Street. The trail would follow Cooper Street for three blocks to East Atherton Street then proceed down through the perimeter of the Taylor Cemetery to the Reading and Northern

Rail corridor, the T/OF1 route would follow the rail corridor through Old Forge and into Luzerne County.

T/OF2 is routed along Depot Street from the CNJ trailhead at Keyser Creek confluence, across the existing public rail crossing at the Taylor Rail Yard and out to Main Street. T/OF2 follows Main Street through Taylor to Sibley Avenue at the Taylor - Old Forge border. The T/OF2 route follows Sibley Avenue to the St. Johns Creek corridor and then follows the St. Johns Creek and an abandoned Lehigh Valley Rail Corridor into Old Forge to the vicinity of the Rose Mount Estates subdivision. The T/OF2 route continues along the Lehigh Valley Rail / St. Johns Creek corridor to the T/OF2 terminal at the recreation site. This corridor also contains the St. Johns Creek branch of the Lower Lackawanna Sanitary collection interceptor sewer. Greenway improvements could facilitate improved management of this infrastructure and involve the Sewer Authority with the greenway development process. From this site T/OF2 can link with the Old Forge/Pittston OF/P2 routes directly. T/OF2 route links with OF/P1 route by following Foundry Street and Connell Street to Union Street and Main Street. A trailhead or landing site would be needed and appropriate in this vicinity.

T/OF2A alignment originates at the Main Avenue Turnpike bridge and secures easements across commercial property, parking lots and along gas transmission pipeline rights-of-way parallel to the Turnpike to the alignment of St. Johns Creek corridor where it rejoins the balance T/OF2 alignment. T/OF2A can also intercept T/OF3 alignment under the Turnpike bridge.

T/OF3 would follow T/OF1 as far as East Atherton Street but would then follow undeveloped land from the vicinity of Taylor Cemetery adjacent to but not directly on the Reading and Northern Rail corridor and Main Avenue. T/OF3 would continue along these undeveloped parcels passing under the Turnpike and proceeding to the dead-end of Sibley Avenue where it resumes along the T/OF2 alignment.

T/OF4 continues from the T/OF1 and T/OF3 along the river corridor by developing a trail on undeveloped land adjacent to the following neighborhoods, River Street, Butler Street, Smith Street and Lincoln Street. T/OF4 then follows a remnant of an abandoned Erie Rail corridor to Moosic Road. T/OF4 proceeds along Moosic Road, Louis Drive and Orchard Street with signage and pavement markings. From the intersection of Orchard Street with Bridge Street, T/OF4 proceeds across the Reading & Northern Rail right-of-way and secures a right-of-way along Main Street through a private parcel containing a former railroad station. The acquisition of this station may be considered as a trailhead or landing location. The station building offers an opportunity for adaptive reuse and economic development related to trail use and heritage tourism.

T/OF4 links south along Main Street or the rail corridor to the various Old Forge / Pittston (OF/P) trail alignments.

T/OF5: This alignment follows Depot Street to Main Street where it crosses Main Street and is routed on a to-be-secured right-of-way around the perimeter of the former Moffat Breaker site to Church Street at Washington Street. It then proceeds along Washington Street and into the Riverside School District campus. A pedestrian bridge approximately 180 to 220 feet in length would be required to carry this alignment across the Turnpike in the vicinity of the Keyser Avenue toll

booth to reach the gas transmission right-of-way and the T/OF2A alignment to the St. Johns Creek / Sibley Avenue intersection.

Analysis: The Taylor to Old Forge preferred alternative is the T/OF2 alignment with the T/OF5 alignment to Riverside School District and the T/OF2A alternatives recommended as modifications to reduce road/Trail traffic interface along Main Street. This alignment makes use of existing public rights-of-way or acquirable rights-of-way along abandoned rail corridor, gas transmission easements and sewer easements. It links with the CNJ trailhead, the Taylor business district, Riverside School campus, a proposed Old Forge Borough Recreation complex at Sibley Avenue, proposed the St. Johns Creek Greenway Corridor / Lehigh Valley Rail Trail alignment, an existing Old Forge Borough Recreation site at Connells Patch, a proposed Old Forge Borough Recreation site at Milwaukee Avenue and Main Street and the Union Street / Old Forge Bore Hole area, the vicinity of the Old Forge to Pittston OF/P1 preferred alternative point of origin.

The T/OF1 alignment may be feasibly developed in part if dual use agreements are developed with the Reading and Northern Railroad through the Luzerne County / City of Pittston Rails-with-Trails project. Lackawanna Heritage Valley Authority and/or the Borough of Old Forge may wish to develop similar agreements. The rail junction at Taylor presents a public safety problem and is physically constrained so as to limit options available for trail passage to a pedestrian overpass as is suggested.

Portions of the T/OF4 alignment may also be considered by the Borough of Old Forge for local trail/greenway park land development. The ridge line above the river adjacent to the Lincoln Street neighborhood has some outstanding scenic views of the Old Forge/Moosic/Taylor river corridor not generally accessible to the public. A managed park land in this corridor would help preserve this scenic viewshed.

Trailheads and Heritage Landings: The Taylor/Old Forge trail alignments all present opportunities for and have needs for trailhead parking facilities, access points and heritage interpretive landings. Suggested locations in Taylor are:

- Depot Street at the CNJ/river corridor
- at the entrance to the former Moffat Breaker, Main Street
- Riverside School Campus

The Moffat Breaker site is recommended for its visibility and accessibility due to its location at Main Street and Depot Street. It also offers opportunities for historical heritage interpretation and integration with an appropriate economic redevelopment of the Moffat site.

The Riverside Campus offers an alternative secondary site with existing parking facilities in place. A use agreement with the school district would be required for any trail involvement on district property.

The Depot Street CNJ site while accessible to the trail is not visible from Main Avenue and has access constraints and other security concerns which limits its viability as an adequate trailhead site.

Suggested trailhead / heritage landing sites in Old Forge are:

- **The Sibley Avenue Recreation site**
- **Old Forge High School campus**
- **Connells Patch recreation site**
- **Milwaukee Avenue recreation site**
- **Old Forge Bore Hole / Max's Bar site**
- **Union Street / Main Street lot**
- **Old Forge Depot, Bridge Street (Serafini property)**

The three municipal recreation sites, one existing and two under development are recommend as initial trailheads for Old Forge. An Old Forge Bore Hole interpretive site could be developed with at least some interpretive panels.

The Old Forge Rail Depot site (Serafini Building) offers outstanding opportunities for a major Heritage Valley interpretive site and landing at the southern gateway to Lackawanna County. A public-private partnership with the Serafini family could be a vehicle to reutilize this building.

3. Scranton Greenway , SCR Bridge 60 (the Steamtown Rail Bridge) Scranton to the Mulberry Street/McDade Expressway Bridge, Scranton: .75 miles

Description: This primary route follows the alignment of the terminal and interchange trackage of the Central Railroad of New Jersey (CNJ) and the New York Ontario and Western Railroad (NYO&W). It lies entirely on the west bank of the Lackawanna River immediately adjacent to the central business district of the City of Scranton, Steamtown National Historic Site, the Lackawanna County Trolley Museum, Steamtown Shopping Mall, the proposed multi modal transit center, the historic Central Railroad of New Jersey Terminal and the new Scranton High School. The SCR alignment begins on the south at the present upper end of the CNJ Trail at Railroad Avenue and Bridge 60. Between Bridge 60 and Lackawanna Avenue Bridge the former CNJ right-of-way has been filled from its former elevation with approximately 2000-cubic-yards of waste soil excavated from the rear of the adjoining Verrastro Beer Distributor warehouse.

From Lackawanna Avenue Bridge the alignment runs downgrade to the river flood plain and riparian corridor passing under the Linden Street Bridge on a Scranton Sewer Authority easement.

From Linden Street the alignment continues along the sewer easement to the easement's intersection with the alignment of Love Road at the Mulberry / Expressway Bridge. At this point, SCR links to section number 4. NS, North Scranton.

Discussion: The major acquisition considerations along SCR are waste management, engineering and property ownership.

Waste management may be a cost-related issue with removal or regrading of the excavated soils between Bridge 60 and Lackawanna Avenue. This issue will also be a concern along adjacent fill slopes at the grade separation along the property elevations between the CNJ terminal and the Redners Supermarket at Linden Street.

Property ownership issues may provide a positive cost variable through the SCR alignment. All three property owners are aware of and are supportive of the project. Verrastro Distributors owns the Bridge 60 to Lackawanna Avenue reach, The Business Group owns the CNJ Terminal from Lackawanna Avenue to Linden Street, The Shopco Group and Redners Markets owns the Linden Street to Mulberry Expressway reach.

All three owners have offered to donate easements for the trail and greenway and related access points. The Business Group has secured TEA 21 funding to restore and redevelop the National Register eligible CNJ Terminal building. They are interested in collaboration to fully develop the greenway and utilize a portion of the CNJ Terminal property as part of a landing/interpretive site/access point for the Lackawanna River Heritage Trail.

The Shopco Redners Market interests have offered an easement for the LRHT as part of their approval process with the City of Scranton Planning Commission and Zoning Hearing Board (correspondence to LRCA from consultants and project principles and testimony before Scranton Planning Commission, 1998).

The SCR alignment links to the NS alignment on the north side of the Mulberry/Expressway Bridge at the point where the Scranton Flood Protection Levee terminates along the Expressway berm adjacent to the alignment of Love Road.

Greenway links and gateways: The Scranton Greenway portion of the Lackawanna River Heritage Trail is a strategic trail gateway for the entire region. It can become an important economic generator. The LRCA recommends that the CNJ Station be developed to include a Heritage Landing as the major gateway to and from the Lackawanna River Heritage Trail and the Downtown Scranton historic, cultural and commercial district. The following discussion highlights some supplemental trail gateways or access ports and related links to downtown Scranton and adjacent sites.

SCR access port 1 consists of ADA graded ramps to allow passage from the CNJ Trail at the Railroad Street trailhead lot the grade of the former Cliff Street/Scranton Street Bridge. A prefabricated pedestrian bridge or a relocated historic bridge could be installed at the site of the previous Cliff Street Bridge crossing of the Lackawanna River. This alignment provides access to Steamtown National Park and a potential redevelopment of the Cliff Street Gas Works and other properties on the east bank of the Lackawanna between Cliff Street and Olive Street along the Lackawanna County Rail Authority's (LCRA) Carbondale line and Strawberry Hill lines.

SCR access port 2 would allow access from the trail to Lackawanna Avenue and the Central Railroad of New Jersey Terminal building. One access ramp is recommended from the trail to street level as part of the regrading of the area between Bridge 60 and Lackawanna Avenue along the Verrastro Distributing

Company property. Another set of access ways is suggested to tie the trail and river corridor to the CNJ Terminal restoration. These access ports may consist of trestle-type ramps similar to the Steamtown NHS/Steamtown Mall bridge and ramps and stairways graded into the slopes between the CNJ building at street grade and the trail/river corridor grade.

SCR access port 3 is an additional bridge crossing alternative to install a prefabricated or historic bridge at a new crossing just above the 100-year flood elevation between the Lackawanna and Linden Street bridge sites. This crossing would facilitate access to the east bank site of an electric generation station once operated by Scranton Electric Company. This site on the riverbank could tie into access points at the Strawberry Hill-Mifflin Avenue area, a potential greenway link to the Lackawanna Avenue Mall area or the Spruce Street corridor into the central business district.

SCR access port 4 would lead from the trail corridor adjacent to the southwest side of the Expressway bridge upgrade to the elevation of the parking lot for the Redners Supermarket site, the rear of the CNJ Terminal site and at grade to Seventh Avenue at Linden Street.

SCR access port 5 and 6 are located at the upstream end of the SCR greenway reach and the downstream end of the Corps of Engineers' Weston Field flood control levee, the North Scranton, NS section. At this point the levee terminates into high ground at the northwest berm of the Expressway bridge approach fill. SCR port 5 links the SCR greenway section to the NS section and the campus of the new Scranton High School. A trail system through the school campus is suggested to link to the Seventh Avenue, Olive and Carbon Street, Providence Road intersection at Memorial Stadium.

SCR access port 6 leads from SCR 5 and suggests the installation of a footbridge (historic or prefabricated) using the remnant west bank pier footer of the former Mulberry Street Bridge and a new east bank abutment to link across the LCRA tracks and Strawberry Hill branch to reach the Vine Street corridor which provides access to the Scranton Cultural District and Hill Section using Gordon Avenue.

SCR summary: The Scranton Greenway has the potential to offer numerous economic development and brownfield site reuse opportunities. It will provide important links from the Lackawanna River Heritage Trail to major cultural, commercial, educational and transportation resources in Central Scranton. A development of a greenway through this reach of river corridor can also provide important links from the downtown area to the new high school campus. The Scranton Greenway can serve as a significant regional attraction on its own by engendering a redevelopment and recommercialization of adjacent private properties.

4. North Scranton, NS: Mulberry Expressway Bridge to Green Ridge Street Bridge, Scranton 1.75 miles.

Description: The preferred alignment of trail along this reach is on and along the flood protection levee system under development by the City of Scranton and the United States Army Corps of Engineers. At the time of this report, January 2001, the levee is proposed to run along the west bank of the Lackawanna River beginning at the berm of the McDade Expressway along the alignment of Love Road, a city

right-of-way to Olive Street. At Olive Street access ramps (redesigned by the Corps to meet ADA requirements) lead from street grade to the top of the levee.

North of Olive Street, the levee continues to the rear of the City DPW complex to the area of the Farmers Market near the Middle Street Pumping Station operated by the Scranton Sewer Authority.

Upstream of Middle Street at the rear of the Farmers Market and the Crystal Soda Works, the levee protection transitions into flood walls for approximately 1,000 feet towards Poplar Street. This section of flood protection may not be physically accessible for trail use. Several alternatives are suggested. With all alternatives, LRCA recommends that the Corps design and locate an access ramp to terminate in the public right-of-way of Middle Street. This will facilitate the development of an access port or trailhead with links to the Farmers Market, and Providence Road sites such as the Glider Diner, Memorial Stadium and Weston Field.

Alternative routes to bypass the Crystal Soda Works (CSW) flood wall are:

- **NS/CSW alt 1:** Work with the Corps to determine if ramps and maintenance / trail right-of-way can be aligned on the river side of the MSE Flood wall or along the CSW property inside the flood wall. This is the preferred alternative as it provides continuity with the levee alignment at Poplar Street and upstream levee points. An additional solution would be to cantilever a walkway—catwalk along the top of the MSE wall.
- **NS/CSW alt 2:** This route proceeds down the Middle Street ramp and by easements, follows the OSC Rail right-of-way through the Farmers Market property and a property owned or leased to Shea Demolition adjacent to North American Manufacturing. From this point at the intersection of Poplar Street and von Storch Avenue the alternate continues on OSC right-of-way to Grove Street and rejoins the levee at the upstream end of the former Jaunty Textile site. A ramp will be needed at this location. Note: The Jaunty Textile site will be acquired and demolished as part of the Corps' Scranton levee project. This property should be considered for open space greenway management.
- **NS/CSW alt 3:** This route proceeds from Middle Street and runs along Barring Avenue past the front of the Farmers Market and North American Manufacturing. An easement or acquisition will be needed to continue from the Barring Avenue alignment past North American on Ward Place and the OSC parcel at Grove Street and von Storch Avenue. This route then follows NS/CSW alt 2 and resumes alignment on the levee via a Grove Street ramp at the upstream end of the Jaunty site.

At Albright Avenue the levee is again breached with a closure gate, and ramps bring the trail from top of levee grade to street grade to allow for a pedestrian crossing of Albright Avenue. The trail continues upriver from Albright Avenue to Wood Street and Diamond Avenue along the top of the levee which ties into the street grade at the dead end of Diamond Avenue.

This parcel, where the levee project terminates and the next parcel were both part of the New York Ontario and Western right-of-way, also known as the OSC or OCS, the Ontario Carbondale and Scranton Railway. The next parcel is owned by

Peter Bonacuse. It extends to meet the North Scranton section of the Phase 2 Heritage Trail acquisition project at the Green Ridge Street Bridge. Mr. Bonacuse and friends have removed debris from the property and constructed a bocci court.

The LRCA recommends the acquisition of the Bonacuse property due to its strategic position in providing access to the Green Ridge to West Market Street reach of trail with the Green Ridge Street Bridge creating an underpass for trail traffic and the proposed Market Street Culvert providing the same. The reduction of auto/pedestrian crossings at these two busy streets are vital public safety goals for the trail project.

The LRCA recommends the acquisition of the Bonacuse property due to its strategic position in providing access to the Green Ridge to West Market Street reach of trail with the Green Ridge Street Bridge creating an underpass for trail traffic and the proposed Market Street Culvert providing the same. The reduction of auto/pedestrian crossings at these two busy streets are vital public safety goals for the trail project.

The secondary public benefits to maintaining the main trail route on the west bank are in addition to aesthetics improvements and public safety, a clean up and environmental restoration of the 1/2-mile of river corridor between Green Ridge Street and East Market Street. This includes removal and regrading of a 5,000-cubic-yard fill of masonry debris, scrap metal, tires and auto parts. The reuse of the Rudy's Junkyard parcels at East Market Street will also be encouraged with the development of the main trail route on the west bank.

Summary: The preferred route for the North Scranton (NS) trail runs along the flood control levee from Mulberry Street/Expressway Bridge through Olive Street, Middle Street, Farmers Market, Poplar Street, Albright Avenue, Wood Street and Diamond Avenue to Green Ridge Street. This route is consistent with long term goals for river restoration, public safety, and trail continuity. This route provides the most direct and safest link from the Phase 2 trail project in North Scranton and Throop to downtown Scranton.

5. Throop to Olyphant/Blakely, TO/BY: Boulevard Avenue, Throop to Condella Park/Mellow Park, Olyphant/Blakely: 3.75 miles

Description: Section 5, the TO/BY Trail link is separated by physical conditions into four reaches. The first reach is the primary preferred alternative in Dickson City along the flood control levee from the Boulevard Avenue Bridge where it picks up the Scranton/Throop link of LRHT Phase 2 to Polonia Park at Enterprise Street where the levee ties out to high ground.

The second reach proceeds by two alternatives to the Lackawanna County Services Building at Enterprise Street and Eagle Lane.

The third reach links Eagle Lane to the Olyphant Eddy Creek Colliery. It has several routes on either side of the river to South Valley Avenue on the east or Blakely Corners on the west.

The fourth reach proceeds from Lackawanna Avenue to Mellow Park on the west or Condella Park on the east using three alternative routes.

From Condella/Mellow parks the trail proceeds up valley through the parks to the upper entrance to Mellow Park at the corner of Keystone Avenue and River Street, PA Route 247. The trail follows River Street north for 2 blocks to Depot Street and the trailhead of the Blakely to Archbald reach of the O&W Trail acquired and developed in 1998 through the LRHT Phase 1 project.

Note that signage and pavement stripping is still needed to link Mellow Park to the trailhead along River Street.

Preferred alternative: TO/BY1: This route as is common to all TO/BY routes begins at a trailhead to be developed in the Elm Street Park or on a lot adjacent to the Dickson City flood levee at the Boulevard Avenue bridge. The route follows the Borough of Dickson City owned levee for 1 mile upstream to another suggested trailhead area at Polonia Park. Polonia Park a multipurpose field is owned by St. Mary Assumption Parish. A public use easement and agreement would be developed with the parish for a trailhead /access area at this site.

TO/BY1(2): The second TO/BY1 reach has three alternative routes. The preferred alternative TO/BY1(2)a departs the levee at the confluence of Scotts Creek with the Lackawanna River. It crosses Scotts Creek on a small 20' to 40' pedestrian bridge and proceeds upstream along a sewer line easement of the Lackawanna River Basin Sewer Authority (LRBSA). This easement runs within the 100-year flood plain of the river along the top of the riverbank to the rear of eight commercial/industrial lots which front on Enterprise Street.

The development of these properties has caused coal mine waste material to be placed on the balance of the flood plain. There is a 10' to 15'-wide grade of level flood plain along the riverbank to the toe of the 20'-deep fill slope which lies at a 45° angle of repose. Some urban debris such as supermarket deli lockers and tires have been deposited along the fill slope at various locations.

TO/BY1(2)a terminates at the Lackawanna County Services Building with several options to route the trail around the perimeter of the county facility.

TO/BY1(2)b departs Polonia Park by following the levee to its tie-in to the curb line at Enterprise Street. The route proceeds up Enterprise Street with signage and pave stripping. Note that since Enterprise Street has curbs but no sidewalks, some improvements would be desirable. At the intersection of Enterprise Street and Eagle Lane the TO/BY1(2)b route follows the most appropriate perimeter course around the County Services site to a suggested trailhead/access point at the rear of the County Building now known as Trestle Hole Fishing Access site.

TO/BY1(2)c follows a potential flood control or stream channel restoration project along Scotts Creek, crossing the LCRA's Carbondale line with the creek project to Eagle Lane where the route turns along Eagle Lane back to the County Services Building and Trestle Hole Fishing Access area.

Alternatives TO/BY1(3): The third reach: from Trestle Hole the preferred alternative TO/BY1(3)a follows the alignment of the LRBSA sewer easement through the Olyphant Colliery site, crossing the LCRA's Carbondale line at the twin truss spans and continuing on the LRBSA easement to intersect with a remnant of the NYO&W (OSC) right-of-way to the rear of the Pawnee Pants property. TO/BY1(3)a then proceeds by easement to the Lackawanna Avenue

Bridge adjacent to the drive through lanes of the Rite Aid drugstore at Blakely Corners.

Two alternatives depart from TO/BY1(3)a at separate points in the Olyphant Colliery. The first TO/BY1(3)b crosses the river on the historic Lokie rail bridge and follows an access road which is a remnant of the D&H Gravity to the intersection of South Valley Avenue and the Burke Bypass in Olyphant. This route then crosses the LCRA line by the South Valley Avenue grade crossing and terminates at Station Square.

The second alternative TO/BY1(3)c departs TO/BY1(3) at the LCRA Twin Trusses and utilizes the abandoned 1906 Truss to cross into Olyphant to South Valley Avenue and Lackawanna Avenue at Station Square.

Additional TO/BY1(3) routes: In addition to the preferred alternative and its two variants, there are other routes which may be considered in this reach. They may be considered as part of overall site redevelopment of the Olyphant and Eddy Creek Colliery properties.

These routes are:

- TO/BY1(3)d as part of additional storm drainage improvements for Scotts Creek and Hufnagle Flats, create new or improve existing stormwater drainage swales and easements from Eagle Lane and Scotts Creek north along Freda, Mary and Petit streets and along remnants of the NYO&W Rail corridor to east of Main Avenue through the Olyphant Colliery property from Pancost Street to Lackawanna Avenue at the Rite Aid drive-in lanes at Blakely Corners.**
- TO/BY1(3)e from Eagle Lane along surplus right-of-way to the west side of the track of the LCRA Carbondale line to Pancost Street then follows the balance of TO/BY1(3)d to Blakely Corners.**
- TO/BY1(3)f follows TO/BY1(3)a from Trestle Hole access along the LRBSA sewer easement alignment to the colliery rail bridge, then turns west utilizing the underpass under the LCRA tracks to Railroad Street. It then proceeds along the street westerly to the NYO&W corridor and along that corridor to Blakely Corners.**
- TO/BY1(3)g departs from Trestle Hole crossing the Lackawanna River on a new or relocated historic bridge to the east bank. The route follows an abandoned D&H Gravity Railroad grade, crossing Eddy Creek on a new bridge or culvert and proceeding to the intersection of South Valley Avenue and the Olyphant Bypass and then on to Station Square and Lackawanna Avenue, Olyphant.**

Note: Trestle Hole Fishing Access area in Dickson City is a Lackawanna Valley Historic site once known as Valley Junction. The site evolved from the 1859 extension of the Delaware and Hudson Canal Company's Gravity Railroad from Archbald to Olyphant. Gravity railroad tracks and operations were also extended from Olyphant south to Providence in 1859. This portion of the Gravity Railroad utilized steam locomotives to move trains to and from Providence and Valley

Junction on the banks of the Lackawanna River where the present day Boroughs of Olyphant, Throop and Dickson City meet.

At this junction the trains were coupled to cables along the inclined planes to be hoisted along the inclines to Archbald, Carbondale, then over the Moosic Mountain at Rix's Gap to Waymart and Honesdale where coal freight and passengers were transshipped via the Delaware and Hudson Canal to Tidewater on the Hudson River at Kingston, New York.

The Gravity connection by locomotive railroad to Providence is still evident there, in the Plot Section of the 2200 block of North Main Avenue, an imposing canal era D&H depot office building at Depot Street and Wurtz Avenue fronts the railroad tracks which are today operated by the LCRA as its Scranton to Carbondale line. The D&H Depot Street site adjoining the LRHT Phase 2, Scranton to Throop segment.

Summary: The preferred route through Dickson City is TO/BY1 along the levee from Boulevard Avenue to Palonia Park; TO/BY1(2)a cross the confluence of Scotts Creek from the levee at Palonia Park on a footbridge and along the flood plain/sewer easement to the County Services Building and Trestle Hole. TO/BY1(3)a follows the sewer easement on the west bank of the river through the Olyphant Colliery site to the NYO&W right-of-way and out to Lackawanna Avenue at Blakely Corners adjacent to the drive-in lanes of the Rite Aid drugstore terminating at the sidewalk of the Lackawanna Avenue Bridge.

All alternative routes described in this section need to be incorporated into municipal planning and zoning considerations for future development as part of public works projects and/or private redevelopment of the adjacent abandoned mine land properties.

Alternative TO/BY1(4)a, the fourth reach: The LRCA preferred route begins at the intersection of Lackawanna Avenue and River Street in Olyphant where the trail alignment picks up from the TO/BY1(3)a preferred route at Blakely Corners and the Lackawanna Avenue Bridge or any alternatives from Dickson City which are routed towards South Valley Avenue and Station Square on the east side of downtown Olyphant. Lackawanna Avenue serves as the central connector for all trail alignments between reach 3 and 4.

The LRCA preferred alignment follows the new flood protection levee along River Street northward into and through Condella Park. Note: In order to properly reflect citizen concerns and Borough of Olyphant concerns, an alternative to the levee route may be required. LRCA recommends that the trail alignment be routed with signage and pavement markings along River Street to North River Avenue and then onto the levee at the earliest practical location.

Other alternative routes through Olyphant may be routed along Susquehanna Avenue from Lackawanna Avenue to Condella Park.

Alternative TO/BY1(4)b is routed along the former New York Ontario and Western rail corridor along the west bank of the Lackawanna River after crossing over from Dickson City or Olyphant at Blakely Corners at the western end of the Lackawanna Avenue Bridge. The TO/BY1(4)b route continues on the rail corridor

into Peckville to Lillibridge Street, at that point the trail is routed by signage and pave markers along Lillibridge and Railroad streets to Robert Mellow Park.

Note: This section of rail corridor has been segmented and a modular home has been constructed on the right-of-way at O'Hara Street in Blakely. North of this home there is a potential mine reclamation, acid mine drainage remediation site along the Lackawanna AMD outfall channel.

Summary: The LRCA preferred route for TO/BY1(4)a runs along the levee from Lackawanna Avenue, Olyphant for approximately 2 miles to and through Condella Park to the Lackawanna Heritage Valley Crossing pedestrian bridge and into Mellow Park. An interim alternative follows River Street instead of the levee to North River Street and rejoins the levee at an appropriate location prior to entering Condella Park.

6. Jermyn to Carbondale, J/CAR: Rushbrook Street , Jermyn through Mayfield to the NIER Campus to Meredith Street, crossing to the east bank to Pike Street, LCRA Rail Corridor to 6th Avenue and North Main Avenue, Carbondale: 4 miles.

The preferred route, J/CAR1 begins at Rushbrook Street and Washington Avenue, Jermyn and (the end point of the LRHT Phase 2, Section 2 from Archbald to Jermyn) ends at the Ben Mar Restaurant in Carbondale (the beginning of LRHT Phase 2, Section 2).

Alternative J/CAR1: follows the remnants of the NYO&W Railroad right-of-way from Rushbrook Street to the intersection of Glenwood Street with Main Street in Mayfield. From this point, LRCA suggests that the trail be routed along Main Street to Poplar Street since several portions of the NYO&W have been parceled out affecting the continuity of this reach. At Poplar Street signage and pave stripping can direct the trail back onto the adjacent NYO&W right-of-way. This location may be appropriate for a trailhead site.

The J/CAR1 route continues on the rail corridor through the intersection of Chestnut Street and Plank Road. The route continues further on the rail corridor through the National Institute for Environmental Renewal campus to Meredith Street. A trailhead may be appropriate at Meredith Street.

Note: Mayfield Borough and its zoning/planning boards should prevent any further parcelization or creation of non-conforming lots on the OSC Railroad property (the NYO&W Railroad right-of-way).

At Meredith Street, J/CAR1 enters Carbondale Township, the preferred route crosses to the east side of the Lackawanna River on the Meredith Street Bridge. The route needs to cross to the upriver side of Meredith Street with a pedestrian crossing. The route then follows the exit ramp and the PPL Service Center driveway and then along a new right-of-way to be developed through the balance of the PPL parcel and an abandoned mine property adjacent to the PPL property.

Following the trail alignment along the river corridor the J/CAR1 route proceeds onto the off-track betting facility and along that property's driveway corridor to intersect with Pike Street in the City of Carbondale.

North of this point the LRCA recommended preferred alternative is routed east along Pike Street to the LCRA Carbondale line rail grade crossing. Since the active

rail corridor provides the most direct and physically accessible route from Pike Street into the downtown Carbondale area, it must be considered as the preferred alternative.

The rail right-of-way once carried four main tracks and presently hosts only one which is used for daily but local freight car delivery and pickup. The right-of-way also carries a high pressure gas utility pipeline. There is adequate room for a trail corridor with opportunities for fencing, grade separation and vegetative berms to separate the uses. There is additional space for a trail passage over a truss bridge over the Lackawanna River adjacent to the 8th Avenue (Business US Route 6 & Brooklyn Street) grade crossing.

The recommended J/CAR1 route continues along the LCRA rail corridor to the Heritage Valley/Carbondale Pioneer Station at Mill Street and 6th Avenue. A Heritage Landing trailhead is recommended for development at this location as the Rail Passenger Platform, interpretive signage and parking are all available and in local regular use.

From Pioneer Station the J/CAR1 route is designated to run along 6th Avenue to River Street. Crossing the river on the 6th Avenue Bridge to City Hall and Pioneer Square. The trail follows Main Street to the Ben Mar Restaurant to link up with the Carbondale section of Lackawanna River Heritage Trail Phase 2.

Alternative J/CAR2: Follows J/CAR1 or 3 to Pike Street grade crossing then continues with signage and pavement stripping along Pike Street, South Main and North Main to the Ben Mar Restaurant.

Alternative J/CAR3: Follows J/CAR1 to Meredith Street and then continues on the former NYO&W/OSC Railroad right-of-way and LRBSA sewer easement to Cottage Street. It then proceeds to the Cottage Hose Company and turns left up Bridge Court to again meet the rail corridor to its intersection with Brooklyn Street. From this point J/CAR3 follows the right-of-way of Brooklyn Street, (US Business Route 6) to meet North Main Avenue at Eighth Street.

Alternative J/CAR4: Follows J/CAR1 and 3 to the Brooklyn Street intersection. This alternative suggests a trestle to carry the trail over Brooklyn Street to continue on the NYO&W/OSC rail corridor to the Carbondale Elementary/Secondary campus. The trail is routed around the campus to Westside Drive and then it follows 7th Avenue to the LCRA rail grade, River Street and North Main Street.

Summary: The J/CAR1 alternative is the preferred route because it incurs the least interface with road and highway corridors. While this route does utilize the active rail corridor, there is ample room for dual use and separational structures to be installed. This route also provides for a bridged crossing of the Lackawanna River and a Heritage Landing Trail Head at the Pioneer City Station on existing Heritage Valley facility.

The other J/CAR alternatives require extensive, road and grade crossings, signage and pave stripping, sidewalk and right-of-way improvements along busy roads, Brooklyn Street, Pike Street, South Main Street.

7. Carbondale City to Fell Township, CAR/Fell, 1 to 2 miles: There are three main alternative routes and several variants of each between Downtown Carbondale and

the D&H and O&W trailheads adjacent to the PA Route 171 Bridge in Simpson, Fell Township. Additionally, 6500-linear feet of D&H needs to be acquired north of the rail bridge at Panther Bluff Creek from the OSC Corporation.

Description: CAR/Fell 1 is the preferred route. CAR/Fell 1 originates from the LRHT Phase II 4000-foot OSC parcel north of the Ben Mar Restaurant adjacent to John Street and the 1909 John Street Truss Bridge, a D&H rail branch line bridge which accesses the Gravity Railroad Shops area at the Ben Mar Restaurant parking lot and the Carbondale Rail Yards Industrial Park at the Thorton Recycling Business property.

The CAR/Fell 1 route suggests a Heritage Landing Trail Head be developed at the Gravity Shops site and the John Street area be developed as community park and open space in conjunction with the adjacent LRHT Phase II OSC parcel. This also provides trail access to Belmont Street and Main Street, Simpson at the Gentex Company site. The LRHT Phase II parcel also accesses the historic Maplewood Cemetery and the northeast neighborhoods of Carbondale. The John Street tract and bridge are presently owned by the Carbondale Industrial Development Authority (CIDA).

The Gravity Shops Trailhead and Heritage Gateway could also serve as a gateway for a D&H Gravity Rail / Trail Heritage Corridor link to the Gravity Trail and D&H Canal through Waymart, Honesdale, Lackawaxen, Port Jervis and Kingston, New York.

From the Gravity Shops/Ben Mar site Heritage Landing Trail Head the CAR/Fell 1 route follows John Street to the 1909 Bridge. The bridge will need an improved deck and an engineering assessment. Upon crossing to the west side of the Lackawanna River on the 1909 Bridge, an easement of sufficient width for trail and buffer (40 to 60 feet where possible) will need to be secured from the Thorton Recycling interests. The easement would run along the river at the rear of the Thorton property to intersect with the existing Carbondale Rail Yards Business Park pedestrian trail owned by CIDA.

The CAR/Fell 1 route follows the existing Carbondale Yards Business Park trail to the northern end of the park adjacent to the Morse Street Bridge in Simpson. The CAR/Fell 1 route secures a right-of-way along the riverbank through the upper cul-de-sac lot of the business park to a remnant D&H rail corridor from Morse Street to W.C. Cabin underneath the PA 171 Bridge. (W.C. Cabin is the northern terminus of LCRA trackage.) At W.C. Cabin CAR/Fell 1 crosses over to the D&H/O&W trail head on Homestead Street on a new pedestrian or relocated historic bridge placed on the piers and abutments of the old Simpson viaduct.

CAR/Fell 1 continues north along a one-mile reach of the D&H owned by Rail Trail Council of Northeast Pennsylvania and includes acquisition of the 6500-linear-foot remnant of the D&H owned by the OSC Corporation at mile two near the confluence of Panther Bluff Creek, east of the River Street neighborhood in Simpson.

CAR/Fell 1A provides an alternative to route the trail link across the Morse Street Bridge to Main Street/PA 171 Simpson and along Main Street for ¼-mile to Reservoir Road, Homestead Street and the O&W/D&H Trailhead. This is an

alternative recommended if the route through W.C. Cabin cannot be immediately completed.

CAR/Fell 2 and 2A: These parallel alternative routes follow the NYO&W right-of-way or Main Street in Simpson from the northern end of LRHT Phase II parcel at the Carbondale/Fell Township line adjacent to Holt Lumber and Kline Building Supply and Gentex Corporation.

The O&W is now part of the Gentex parking lots and has been parcelized from Gentex to the O&W/D&H trailhead at Reservoir Street and the PA 171 Bridge. CAR/Fell 2 follows as much of the O&W as is possible through the Gentex parking lots and along Rittenhouse Street and other local streets to Reservoir Street and Homestead Street to the trailhead.

CAR/Fell 2A uses signage and pavement stripping from the Carbondale/Fell line at Belmont/Main Street and along Main Street to the trailhead at Reservoir Road and Homestead Street.

CAR/Fell 3 is routed along Lackawanna County Rail Authority right-of-way north from Pioneer Station in Carbondale to the Dundaff Street grade crossing. At this point the trail crosses Dundaff Street and follows the Carbondale Yards Business Park road to intersect with the Business Park trail to the Simpson trailhead as indicated in CAR/Fell 1.

CAR/Fell 3A continues along the LCRA right-of-way to W. C. Cabin and crosses over to the Simpson Trailhead on a relocated historic or new pedestrian bridge.

Summary: CAR/Fell 1 is the preferred route. It takes advantage of the greatest amount of publicly owned land, involves linking to and through several historic sites, runs extensively along the river corridor, involves the rehabilitation of the historic 1909 Honesdale branch truss and the creation of an easement / buffer area along the river corridor portion of the Thorton "Recycling" property. CAR/Fell 1 also provides a link between the D&H Trail at W.C. Cabin and the D&H/O&W Trailhead across on the east side of the river and on opportunity to install a relocated historic truss bridge.

By further including the 6500-foot D&H link at miles two and three in the acquisition program as part of CAR/Fell 1 through cooperative agreements among LRCA, Rail Trail Council and LHVA, the powers of condemnation through a public authority could be made available if needed.

CAR/Fell 1 also suggests a major River Corridor, Heritage Authority, municipal and private sector partnership with the City of Carbondale, the Carbondale Industrial Development Authority, Lackawanna Heritage Valley Authority and Lackawanna River Corridor Association to develop a Heritage Landing at the Ben Mar/Gravity Railroad Shops (John Street corridor area). This Heritage Landing site could also include the D&H Roundhouse along the west bank of the river. At Heritage Landing development could provide a physical link and a thematic focus between the downtown business district and the Carbondale Yards Business Park.

The Gravity Railroad Shops site is one of the most important historic sites in Northeast Pennsylvania. Its redevelopment as a Heritage Landing or Gateway could engender greater economic growth in the Carbondale area.

Preferred Alternative Summary:

- 1. Old Forge to Pittston, OF/P1:** Along the active rail corridor from Pittston's Riverfront Park development through Pittston Junction, Duryea to Main Street at Bridge Street, Old Forge adjacent to the Old Forge Railroad Station.
- 2. Taylor to Old Forge, T/OF2:** Routed from Depot Street along Main Avenue to Sibley Avenue to St. Johns Creek / abandoned rail corridor to Connells Patch to Main Street and link up with OF/P1. Alternatives T/OF2A and T/OF5 are recommended to enhance this route and reduce interface with Main Street traffic.
- 3. Scranton Greenway, SCR:** This section has only one alternative, the primary route from Bridge 60 along the CNJ corridor to Lackawanna Avenue Bridge and the CNJ Depot, through the depot parcel, along a Scranton Sewer Authority easement, a Redners/Shopco easement to the Mulberry Street Expressway Bridge and a link to the Scranton/Corps of Engineers flood control levee. Several access ports are suggested to link with adjacent sites in Downtown Scranton. A major Heritage Landing is suggested at the CNJ Depot.
- 4. North Scranton, NS:** The preferred alternative is routed along the Scranton/Corps of Engineer flood control levee from Mulberry Street to Diamond Avenue. An alternate route through the Farmers Market and Crystal Soda Works is suggested to bypass a flood wall at Poplar Street. An acquisition of a 1000-foot length of former NYO&W/OSC rail corridor from a private party between Diamond Avenue and Green Ridge Street is recommended.
- 5. Throop to Olyphant/Blakely, TO/BY:** This route TO/BY1, 1(2), 1(3)a, 1(4)a begins at the Boulevard Avenue Bridge at the Throop - Dickson City boundary. It follows an existing Dickson City Borough owned levee to Polonia Park and is then routed along flood plain to the Lackawanna County Services Building at the corner of Enterprise Street and Eagle Lane. The route proceeds from the service building through the Trestle Hole fishing access site (historic site of Valley Junction on the D&H Gravity Railroad) and follows an LRBSA sewer authority easement along the east bank of the Lackawanna River to intersect with a portion of NYO&W/OSC Corporation right-of-way at the Rite Aid store on Lackawanna Avenue at Blakely Corners.

The preferred route then crosses into Olyphant via the Lackawanna Avenue Bridge and then follows an Olyphant/Corps of Engineers flood control levee northward into the trails at Condella Park and the link to Mellow Park, Peckville on the Heritage Crossings Pedestrian Bridge.

- 6. Jermyn to Carbondale, J/CAR:** The preferred route J/CAR1 begins at Rushbrook Street on the west bank of the Lackawanna River in Jermyn. Here a trailhead links to the Archbald - Jermyn reach of trail previously developed. The route follows the remnants of the NYO&W/OSC rail corridor to Main Street, Mayfield then it is routed along Main Street to

Poplar Street and back onto the rail corridor through the NIER campus to Meredith Street, Carbondale Township.

After crossing Meredith Street and the bridge over to the east bank of the river, the trail is routed through PPL utility property and vacant abandoned mine land to the off-track betting site on Pike Street in the south end of the City of Carbondale. The trail runs along Pike Street to and along the Lackawanna County Rail Authority right-of-way, back across to the west side of the river at Brooklyn Street and on to the Pioneer City Station at Mill Street. From there the trail is routed across River Street and the Sixth Street Bridge past City Hall up North Main Street to the Ben Mar Restaurant / Gravity Railroad Shops site.

- 7. Carbondale to Fell, CAR/FELL: The preferred route CAR/FELL 1 proceeds from the Ben Mar / Gravity Shops / LRHT Phase II OSC parcel along the John Street tract and 1909 Bridge owned by Carbondale Industrial Development Authority. After crossing to the west side of the river on the 1909 Bridge, an easement is required along the Thorton Recycling property to an intersection with a CIDA walking trail to the northern end of the CIDA Carbondale Yards Business Park at the Morse Street Bridge in Simpson. From this point the trail continues on an abandoned rail corridor to a point known as W.C. Cabin, the former yard limits of the Carbondale Yards on the D&H Railroad, from this point also underneath the PA 171 Bridge, a pedestrian bridge is suggested to link to the D&H and O&W trailhead owned by the Rail Trail Council on the east bank of the river adjacent to Homestead Street, Simpson.**

Heritage Gateways, Landings and Trailheads

The Lackawanna River Heritage Trail will link twenty municipalities in its 40-miles between Pittston and Uniondale. The trail will provide public access for local residents and visitors to our region to a wide variety of natural areas, historic, cultural, recreational and commercial sites.

The public's interface with the trail can be enhanced by the development of Heritage Gateways, Heritage Landings, and Trailheads at strategic locations.

Heritage gateways are suggested to be created in conjunction with urban park/greenway and economic development projects in Pittston, Scranton and Carbondale.

- Pittston: The development of River Front Park by the City of Pittston can serve as a Southern Heritage Gateway for the Lackawanna Valley. The discussion and development of cooperative agreements with the City of Pittston and the Lackawanna Heritage Valley Authority are suggested as a first step to promote linkages at this site.**
- Scranton: The redevelopment of the Central Railroad of New Jersey Terminal property at Lackawanna Avenue in Scranton by the Business Group offers a tremendous opportunity to create a Heritage Gateway in conjunction with the Scranton Greenway reach of LRHT and all of the related links to Steamtown National Historic Site, the Steamtown Mall,**

Downtown Scranton, the new Scranton High School campus, the Scranton Cultural District and the Intermodal Transit station, site of the New York-New Jersey Rail Corridor Terminal. This site could serve as a multiplier along the Lackawanna Avenue, Linden Street, Seventh Avenue corridor area for related cultural and business development. The development of an active link with the river itself in this area is strongly suggested.

- **Carbondale:** The Delaware and Hudson Gravity Railroad Shops, inclined plane number one and the stream locomotive roundhouse are all located adjacent to the Lackawanna River, Racket Brook and North Main Avenue in Carbondale. The Ben Mar Restaurant building is a Gravity Railroad era structure which served as D&H Company offices. A Heritage Gateway at this site could enhance economic redevelopment and link Downtown Carbondale with the Carbondale Yards Business Park. A themed replication of gravity era structures to house a mini mall adjacent to the Ben Mar and a bridge linking to a performance/public space at the roundhouse site, a hotel/business conference facility are a few of the possibilities for the site. As a property owner with an economic development mission, CIDA would be a strong partner to begin discussions and assessments for a Heritage Gateway at this site.

Heritage Landings could be developed at smaller sites along the trail to involve historical and commercial site enhancements. Heritage Landings can be existing buildings or portions of buildings, Heritage Station platforms or new sites developed with a pavilion and interpretive and informational signage. There are direct links to historic sites and other related facilities at Heritage Landings. Heritage Landings are suggested at the following locations:

- **Old Forge:** The Old Forge Rail Station owned by the Serafini Family and adjacent properties along Main Avenue and Bridge Street, with development of an interpretive site at the Old Forge Bore Hole.
- **Taylor:** Main Avenue and Depot Street adjacent to the entrance to the Moffat Breaker site and Keyser Creek. a small trailhead, pavilion and interpretive signage is suggested. There is a potential to tie a landing into the redevelopment of the Moffat Colliery property.
- **North Scranton:** The historic neighborhood along Market Street, Main Avenue at Providence Square, the Silkman House, Providence O&W Depot, the D&H Depot in the Plot Neighborhood all offer opportunities for a Heritage Landing.
- **Dickson City:** a Heritage Landing is suggested at Valley Junction adjacent to the County Services Building at Eagle Lane and Enterprise Street. Valley Junction was the junction of the D&H Gravity rail operations and locomotive rail operations when the D&H expanded to Olyphant and Providence in 1858.
- **Olyphant:** The Queen City Station previously developed by Lackawanna Heritage Valley Authority and the Borough of Olyphant can serve as a Heritage Landing for Downtown Olyphant. Both the Queen City Station and Valley Junction Heritage Landings could provide links and

interpretation to the redevelopment and reuse of the Olyphant and Eddy Creek Colliery properties.

- **Blakely/Peckville:** a landing is suggested at Mellow Park near the Heritage Valley Crossing or at Keystone Avenue.
- **Archbald:** The Gravity slope colliery shifting shanty and auxiliary buildings at Laurel Street comprise a remnant historic district. The Borough has secured grants to begin assessments at this site. Adaptive reuse can provide some Heritage Landing opportunities to link to other sites Archbald.
- **Mayfield:** The NIER campus may provide a location for a Heritage Landing related to the reuse of the upper portion of the site at Meredith Street and redevelopment of the Meredith Street corridor and the Powderly Colliery.
- **Carbondale:** In addition to the major Heritage Gateway suggested at the Ben Mar site, a Heritage Landing incorporating the LHVA developed Pioneer City Station is suggested.
- **Simpson:** The existing D&H and O&W trailhead developed by the Rail Trail Council should be upgraded to a Heritage Landing.

Trailheads are trail access sites improved with parking lots, landscaping improvements, directional, informational and interpretive signage. In addition to trailheads already developed on previous LRHT and RTC sites as well as the Heritage Gateway and Heritage Landing sites new trailheads for the LRHT are suggested at the following sites:

- **Pittston Junction:** At the entrance to Coxton Yards
- **Duryea:** At the McAlpine Street Shopping Center, at the Stevenson Street grade crossing
- **Old Forge:** At Union Street, at Borough recreation sites at Milwaukee Avenue, Connells Patch, Sibley Avenue and St. Johns Creek
- **Taylor:** Depot Street at Main Avenue, the Moffat Breaker site or adjacent parcels
- **Scranton:** Love Road and Olive Street adjacent to the new Scranton High School, the Farmers Market, Albright Avenue Bridge, Market Street (on the Rudy's Junkyard site) and Parker Street at Carter Avenue adjacent to the Marvine site.
- **Dickson City:** Boulevard Avenue Bridge, Palonia Park, near Blakely Corners and the Olyphant Colliery site
- **Olyphant:** Near Lackawanna Avenue and River Street and at Condella Park
- **Blakely:** Mellow Park, Depot Street

- **Jessup:** In Winton
- **Archbald:** Laurel Street, Maslar Park, Borough Building
- **Jermyn:** Off Delaware Street, River Street, Rushbrook Street
- **Mayfield:** Poplar Street, Cemetery Street and Plank Road
- **Carbondale Township:** Meredith Street
- **Carbondale City:** Pike Street at the OTB facility, along Brooklyn Street, Pioneer Station, Ben Mar site, Carbondale Yards
- **Simpson**

The recommendations for preferred alternative routes, Heritage Gateways, Landings, Trailheads, links to related cultural and commercial sites in this plan represent a detailed consideration of choices to support further development of the Lackawanna River Heritage Trail.

These recommendations should be considered a starting point for subsequent development proposals. Each of the preferred alternatives and the additional alternatives should be considered with flexibility. The experience gained with the development of the Lackawanna River Heritage Trail to date has shown that the numerous variables which affect the endeavor to develop a continuous 40-mile trail are in constant flux. Time and circumstance will often factor into the feasibility of using a particular route or site. Flexibility and the ability to adopt modifications to a particular route or site location are key to the ultimate completion of the 40-mile trail.

The LRCA suggests that municipalities act to include both the concept of trails as well as the various preferred and alternative routes, Gateways Landings and Trailhead sites in their comprehensive plans. We also suggest municipalities consider modifications to subdivision and land development ordinances to reflect requirements to include trail rights-of-way and buffers in development projects as part of their open space, recreational and storm water management systems.

There are additional recommendations for trails and greenways along tributary streams contained in other sections of the Lackawanna River Conservation Plan. We suggest that these recommendations be considered as well by the municipalities, county agencies and community organizations.

The greenways and trails we develop along the river and tributary streams will provide multiple benefits for our community and watershed.

- **Recreational and parkland facilities add to the livability of our community**
- **Publicly owned green space acts to buffer and protect our river, streams and water resources**
- **Public management of these stream corridor lands help protect from flood problems**

- **These corridors are available for emergency services access, water and sewer utility uses**
- **These greenways help to link our communities together and enhance real estate values**

As we strengthen our community consensus and advance development of the trail section by section, we will engage more of our fellow citizens with this process and encourage their pro- active participation in the civic process of community development. With the accomplishments to date, by the Heritage Authority, the LRCA and RTC and with these routing recommendations as a guide, we can expect to see much of the 40-mile Lackawanna River Heritage Trail nearly completed during the next ten years.

Appendix B Mine Reclamation Plan Executive Summary

This plan is a component of a watershed conservation plan prepared for the Lackawanna River Watershed, a sub basin of the North Branch Susquehanna River in northeast Pennsylvania. The plan has been developed by the Lackawanna River Corridor Association, a not-for-profit community-based river conservation organization with the participation of the Lackawanna County Planning Commission, the Pennsylvania Department of Environmental Protection - Bureau of Abandoned Mine Reclamation, and Water Quality, the United States Army Corps of Engineers, local business interests, property owners, community organizations and interested citizens.

The development of this plan component has been funded by a grant from the United States Environmental Protection Agency's Chesapeake Bay Small Watershed Grant Program administered by the National Fish and Wildlife Foundation. The Lackawanna River Watershed Conservation Plan which includes this document has been funded by the Pennsylvania Department of Conservation and Natural Resources, Rivers Conservation Program, the Scranton Area Foundation and community support through the membership of the Lackawanna River Corridor Association.

The watershed conservation plan is an update of the *Lackawanna River Citizens Master Plan* of 1990. The purpose of the conservation plan is to identify projects, programs and partnerships to advance watershed conservation and stewardship.

The purpose of the mine reclamation plan component is to examine the history and impacts of the anthracite coal mining industry in the Lackawanna Valley, to assess past and current reclamation programs and to synthesize the variety of pending programs through this document to maximize the interactive potential of new reclamation work and optimize multi objective outcomes.

This document brings together pending and potential programs, describes the relationships of the various programs, delineates partnerships among the various stakeholders and agencies, inventories near term projects, and proposes priorities for mid and longer term objectives.

This plan suggests roles for public and private agencies and the involvement of economic and community development objectives with reclamation and watershed restoration work.

Lastly, the plan draws together reclamation and economic infrastructure projects which total nearly 60-million-dollars and which will be implemented in the Lackawanna Valley during the next ten years. It is our goal, as an organization representing both the environmental and socioeconomic interests of the Lackawanna Valley community, to insure that this plan and the work it describes will support the economic and environmental sustainability of our community.

On behalf of the Lackawanna River Corridor Association and our interagency partners,

Bernard McGurl, November 2001

Section B.1 Geological and Historical Background

B.1.1 Geology

The Lackawanna River Watershed in northeast Pennsylvania lies on the boundary between two physiographic provinces, the Appalachian Ridge and Valley, and the Allegheny Plateau provinces. The headwaters of the Lackawanna River and its major tributaries are located in the plateau province, the main course of the river lies in the ridge and valley province.

The Lackawanna Valley is the northern portion of a large geosynclinal feature. The Wyoming Valley is the southern portion of the Lackawanna syncline. The syncline is a canoe-shaped feature approximately seventy (70) miles long and five (5) miles in width. The eastern ridge line forms Penobscot and Wilkes-Barre mountains in the Wyoming Valley and Moosic Mountain in the Lackawanna Valley. The western ridge is called the Lackawanna Mountains, West Mountain and Bald Mountain, and the Back Mountain in the Wyoming Valley.

The North Branch of the Susquehanna River cuts through the West Mountain at Pittston, the approximate halfway point in the syncline. The Lackawanna River confluent with the Susquehanna at this point.

The Lackawanna syncline holds the northern anthracite coal field in the Llewellyn geologic formation. The Llewellyn formation lays in the underlying Pottsville, Pocono and Catskill formation like soup in bowl. The anthracite coal beds outcrop at the Llewellyn Pottsville boundary, which runs approximately at the 1400 and 1500' elevation line about half the distance from the Lackawanna - Susquehanna river course to the top of the synclinal ridge line.

The Northern Anthracite Field along with the Eastern and Western middle fields and the Southern Field are the largest concentration of anthracite or hard coal on the planet. Anthracite coal has a higher concentration of carbon and lower levels of volatile organic compounds than bituminous coal. It is less friable and produces less dust than bituminous coal. These properties helped to make anthracite coal a popular domestic, industrial and metallurgical coal in the Nineteenth and Twentieth centuries.

B.1.2 Historical Development

The use of anthracite coal was known by Native Americans but its discovery and exploitation by European settlers did not begin until the time of the American Revolution. By 1820, the use of anthracite as a power and heating fuel was becoming widespread. The coal fields of northeast Pennsylvania were at that time remote from the commercial and population centers of the coastal cities.

As the utility of anthracite grew, investment groups formed to improve transportation into the anthracite region to reach and market the coal resources. The Lehigh Coal and Navigation Canal, the North Branch Susquehanna Canal and, the Delaware and Hudson Canal were all developed to reach the coal fields during the 1820's. These canals soon yielded to the development of railroad technology.

The development of the anthracite coal industry in northeast Pennsylvania and particularly in the Lackawanna and Lehigh valleys was an strategic element in the industrial revolution affecting the economic, demographic and political landscape of the United States.

The northeast Pennsylvania region became a crucible for technological and scientific advances as iron, steel, textile and manufacturing industries developed along with the coal industry. The anthracite coal boom also influenced the advance of the public stock corporation, business organization, management and finance.

The environmental impacts of coal mining became apparent early on as local groundwater supplies became contaminated with mine waste and acidic drainage. In the Lackawanna and Wyoming valley, the physical relationship of geology, hydrology and topography provided a solution to the supply of potable water for a rapidly growing population.

Since the anthracite coal field was well within the physical boundary of the Lackawanna syncline, there were numerous opportunities to develop dams, water supply reservoirs and wells on streams along flanks of the synclinal ridges or on tributaries rising on the adjacent plateaus and entering the syncline through water gaps in the ridge lines.

The topographic and geologic relationship set the parameters for the growth and development of the urban centers of Scranton and Wilkes-Barre, and the pattern of anthracite colliery and smaller villages and boroughs that lie along the river corridors on the floor and lower terraces of the syncline.

The ridge tops and the watershed areas of the adjacent plateau province have remained predominantly in forest cover with some agricultural uses and farming villages developing. In the present these areas are experiencing some tendencies toward suburban sprawl.

By the beginning of the Twentieth Century, the capacity for mining had advanced to allow both traditional underground mining and large mechanized surface strip mining. In the Northern Anthracite Field, anthracite coal beds in the Llewellyn and Pottsville formations lie relatively parallel to the contours of the synclinal fold. This results in the beds being nearly horizontal under the base of the syncline and pitching to 12° ascending towards their outcrop along the Llewellyn - Pottsville - Pocono formation boundary about halfway from the floor of the valley to the synclinal ridge.

B.1.3 Mining Methods and Impacts

Early mining methods consisted of driving a horizontal “drift” or tunnel into a coal bed outcrop where the strata of coal was exposed on a cliff face along a cut of river or tributary stream bank. These surface entries were soon supplemented by slope entries which are tunnels driven into rock and coal strata at a 30° to 40° inclined pitch. Inclined cable tramways would be used to transport miners and coal in and out of the slopes.

Vertical shafts became a predominant form of mine entry by the 1830's. Vertical shafts could penetrate any number of coal and rock strata and were often sunk to a depth of 900 to 1100 feet to reach the deepest seams of coal in the Northern Field.

Once the drift, slope or shaft entries were completed, underground mining proceeded from the point of intersection with each coal seam where active mining operations began. The “room and pillar” method was most common in the Northern Field. With this method, horizontal tunnels were driven into the face of coal perpendicular to the main carriageway, additional headings were then driven off these secondary main ways. This left a roughly rectangular system of rooms where coal was mined with a solid pillar of unmined coal kept in place to provide roof and surface support.

When the mining reached the boundary of a particular mine property, secondary or retreat mining would begin. The remaining coal pillars would be shaved to the limits set by historic mining regulations established in the Pennsylvania Mine Safety Act of 1871. The mined area was then legally closed. It was common for these areas to be illegally mined, a process known as “robbing the pillars.” This often accelerated the fracturing of overlying strata causing surface “cave-ins.”

Where fractures or cave-ins occurred in proximity to the river or tributary stream, infiltration of stream flow into the mines would often result. Mining also disrupted surface groundwater aquifers necessitating a substantial mine drainage or pumping system. The costs associated with pumping eventually contributed to the decline of the anthracite industry in the Northern Field.

Other impacts to water courses and resources were related to the processing and marketing of coal. Run of mine coal was processed to remove rock, shale and slate in multi story structures known as coal breakers. Coal was also sized for different market uses and then loaded into rail cars or canal barges for shipment to market. Early coal breakers used a dry process, young men sat on boards along wooden chutes and picked out rocks and shale which was known as culm. This material was taken out to culm dumps, which gradually became noticeable landscape features.

By 1900, a hydro mechanical or wet process was introduced to separate coal from impurities. Run of mine coal was introduced into large metal cylinders or cones where water was circulated. The centrifugal force of circulating water worked with differences in the specific gravity of coal and culm to separate and draw off the coal, and then discharge the culm.

Mining activities, mine drainage and the wet process consumed and polluted billions of gallons of water on a daily bases across the anthracite region from the early to mid Twentieth Century.

B.1.4 Peak and Decline of Anthracite

Anthracite coal production peaked in 1917 as did total railroad mileage in the United States. By the early Twentieth Century surface excavation technologies such as the steam shovel and narrow gauge mine rail ways enabled an expansion of anthracite mining by surface strip methods. Open surface strip mines were more common for coal veins near the surface along outcrops on stream corridors or

outcrops along the geologic boundaries of the Northern Field. By the 1930's diesel electric drag line excavators and motorized dump trucks increased the capability of strip mine methods to reach seams to a depth of two-hundred feet.

With the onset of the Second World War and the need to increase coal production for the war effort, strip mining soon exceeded underground production in the Lackawanna Valley. Much if not all of this stripping was performed without backfilling or reclamation. Coal stripping operations would often interface with coal seams which had previously been mined by the underground room and pillar method. The strip mine excavations were often abandoned with exposed pits and high walls surrounded by huge piles of overburden.

Strip mines would often disrupt the flow of tributary streams. Many water courses had been diverted around the workings or run through flumes. Subsequent to abandonment of the strippings, the temporary water courses and flumes would fail and stream flow would enter the strippings and infiltrate into the underground workings.

By 1950 the flanks of the Lackawanna Valley were extensively and rudely corrugated by strip mines, the water courses of many tributary streams were interrupted by pits and overburden piles, coal breakers and their associated culm banks and rock dumps blossomed along the Lackawanna River and its tributary streams like bad apples on a long abused tree.

The costs for electricity to power the pumps to dewater the mines in the Northern Field and other costs of coal production intersected with the market price obtainable for anthracite per BTU when compared to competing fuels for domestic heating in 1957.

This economic intersection was the beginning of the end for the anthracite coal industry. The depression of the 1930's had accelerated a decline in fuel market share, which briefly leveled during the Second World War only to decline steadily into the 1960's.

The Knox Mine Disaster of January 29, 1959 was a sad metaphor for all that was wrong with the anthracite industry. The Knox Coal Company, a subcontractor for the Pennsylvania Coal Company was mining coal illegally beneath the bed of the Susquehanna River at Pittston. The river broke into the mines taking the lives of 12 miners, nearly sixty others escaped and lived to tell very harrowing tales of life and death in a rapidly flooding coal mine.

The sight of nearly one-hundred railroad cars, and chunks of ice as large as houses disappearing in the swirling vortex of river water as it flowed into the mine voids that bitter January remains both sobering and awesome to this day. The Anthracite Heritage Museum at McDade Park in Scranton features a dramatic photographic and archival exhibit on the disaster.

The clean up after the disaster necessitated building a coffer dam to divert the river away from the fracture while an extensive reinforced concrete cap was installed in the river bed to seal the fracture.

State and Federal investigations into the disaster uncovered a conspiracy of greed and racketeering which demonstrated that organized criminal activity had become endemic in the anthracite industry. The costs to the federal and state governments to respond to the disaster were in the tens of millions of dollars. The Knox Disaster effectively ended underground mining in the Northern Field.

By 1961 all mine pumping in the Lackawanna Valley had ended. This resulted in the creation of a huge underground water body known as the Northern Anthracite Mine Pool. In the Lackawanna, the pool is divided into two large basins and several smaller sub-basins. The cresting of the mine pool in 1961 began to cause basement and hillside flooding as mine water began to flow from numerous bore holes and seeps along the Lackawanna Valley.

The Commonwealth of Pennsylvania, Department of Forests and Waters designed and constructed the Old Forge Bore Hole to relieve the pressure and control the level of the main basin of the Lackawanna pool between May and September 1962. All underground mining ceased on November 1, 1966 with the closure of the Continental Slope in the Keyser Valley West Mountain section of Scranton. The Continental had operated in coal seams above the level of the flooded voids. (Note: The Continental Slope is today open as the Lackawanna Coal Mine Tour at McDade Park.)

By 1970 the mining activities in the Lackawanna Valley consisted of a half-dozen strip mines and several culm bank reprocessing projects. The mining companies and subcontractors were also engaged in federal and state funded reclamation work.

An investment scheme created a holding company known as The Great American Coal Company in 1968. During the next few years, Great American acquired the Glen Alden 'Blue Coal' Corporation, one of the largest Northern Anthracite operations as well as many other Northern Field properties. By 1972, the Great American/Blue Coal combination had achieved a monopoly in the Northern Field.

The real purpose of Great American / Blue Coal may not have been coal mining. The complex house of cards began to default on mortgages, loans, royalty payments, and taxes in 1973. By 1976 it became the largest and most complex bankruptcy ever filed in the United States District Court for the Middle District of Pennsylvania. The details of the Blue Coal bankruptcy are covered in the records of the U.S. Department of Justice, Project Leviticus, an investigation into organized criminal activity and racketeering in the coal industry. Other related information is contained in the 1980 report of the Pennsylvania Crime Commission.

The bankruptcy settlement in the early 1990's yielded a liquidation of the properties. The Luzerne County Blue Coal properties were largely (17,000-plus acres) acquired by the non profit Earth Conservancy which has a goal of community revitalization, resource management and environmental protection. The Lackawanna County properties, known as the Raymond Colliery, were acquired by F & L Realty, a private interest (11,000 acres). There are a number of other coal holdings in the Lackawanna: Pagnotti Coal Company, approximately 5000 acres; Silverbrook Anthracite, 3000 acres; Carrier Coal, 3000 acres; Popple Brothers, 800 acres; Kaminsky Brothers, 800 acres. All maintain some aspect or capacity to conduct mining related activities.

The prospect of remining and culm bank fuel recovery remain as latent variables affecting the natural resource and real estate management of significant portions of the Lackawanna River Watershed.

Section B.2 A Review of Abandoned Mine Land Impacts in the Lackawanna Valley

B.2.1 Impact Parameters

The impacts associated with anthracite mining are known as abandoned mine land (AML) impacts. AML impacts are found over 150-square-miles of the 350-square-mile Lackawanna River Watershed associated with the Llewellyn Formation. Serious and physically prevalent AML impacts affect about 20,000 acres or 31.5-square-miles in the watershed. (See *Maps 1 and 2*)

Abandoned mine land impacts have been catalogued in a National Inventory of AML Impacts developed by federal agencies with input from their state agency counterparts. The Pennsylvania Inventory of Abandoned Mine Land impacts is maintained by the Bureau of Abandoned Mine Reclamation of the Department of Environmental Protection.

The Lackawanna River Corridor Association has reviewed and excerpted statistical and spatial data from the PA AML inventory for the Lackawanna Watershed to create a reference base for the Lackawanna River Watershed Conservation Plan.

The data review, the historical document review, the River Reach and Tributary Stream surveys and ongoing meetings of reclamation agency stakeholders have all served to provide information to both this review of AML impacts and for the recommendations for the projects under development or planned and the longer term priorities for reclamation in the Lackawanna watershed.

The physical impacts of abandoned mine lands in the Lackawanna watershed affect the surface topography, subsurface integrity and geo hydrology of the valley.

The surface impacts affect topography, slope, soil and surface drainage, vegetation and natural habitat values, suitability for construction, public health and safety, community socioeconomics and aesthetics.

Subsurface impacts affect surface drainage, stream flow, ground water flow, the generation of acid and alkaline mine drainage and the stability of ground surface to support building or infrastructure uses. Subsurface impacts also include active or potential mine fires. Underground mine fires are presently burning at two sites near Carbondale.

B.2.2 Hydrologic Impacts

Geo hydrologic impacts are a combination of surface and subsurface impacts which result in interruption of natural geo hydrologic functions. Partial or complete stream flow loss to subsurface mine voids, interception of base groundwater flows, infiltration of surface drainage all contribute to the generation of mine drainage which re-enters the river at twelve major points (over 1 mgd flow).

There is a consensus that the water budget and geo hydrology of acid (alkaline) mine drainage, AMD in the Lackawanna are major issues affecting the water and

habitat quality of the tributary streams, the river, river and stream corridors. The complete loss of stream flow on several second order tributaries causes a total degradation of these watersheds and exacerbates negative urban storm drainage impacts.

The AMD impacts in the upper watershed are viewed as having limited and localized impacts. Water quality above Carbondale and in the Mid Valley reach of the river is affected as much by urban storm impacts and combined sewer overflow (CSO) discharges as it is by AMD. (See *Map 3, Major AMD Point Sources on the Lackawanna River*)

The downstream and confluence reach of the Lackawanna is critically impacted by the 100-million-gallon per day AMD flow from the Old Forge Bore Hole and the 40 mgd flow from the Duryea Outfall. This three-mile reach of the Lackawanna utterly fails to meet its designated uses due to the AMD flows. Over 3,000 pounds of iron and several hundred pounds of aluminum and manganese are deposited into the Lackawanna daily from the Old Forge and Duryea AMD's. A good portion of this load makes its way into the North Branch of the Susquehanna River at the Lackawanna/Susquehanna confluence. The metals, which drop out of solution, cause a bright orange coating on the rocks, riverbed and any riparian vegetation or other objects in regular contact with the AMD-laden flow.

B.2.3 Surface Feature Impacts

The surface AML features also contribute to AMD and to the sediment loading of the Lackawanna River. Large acreages of AML's are unvegetated or undervegetated. Several types of coal waste piles contribute various sized particles to the river's bed load. Percolation of storm drainage through coal wastes and sheet flow across unvegetated coal waste and mine spoil horizons adds to the number and size of suspended sediments and increases turbidity. They also contribute larger mobilized coal waste silts, culm and overburden gravels and fines to the river's bed load.

Due to the need for water to clean and process coal for market, coal breakers were often located along stream corridors or the river itself. The processing of coal caused an immediate degradation to the water quality and habitat of the Lackawanna but also left an enduring legacy of pollutant generating rock and soil wastes deposited in and along the river, its tributaries and flood plains.

As early as 1904 government agencies and coal operators recognized the impacts on water quality from coal mining in the Northern Field. W. F. Dodge, a mining engineer was commissioned by the Bureau of Mines to compile a report on water pollution in the Lackawanna and Susquehanna rivers caused by anthracite mining. A map produced by Mr. Dodge to accompany the study illustrates the proximity and density of colliery (coal mining and coal breaker facilities) operations to the Lackawanna - Susquehanna rivers and their tributaries. The original map, a classic engineers document, hand drawn in colored inks on starched linen vellum, extends from Nanticoke, Wilkes-Barre, and Pittston along the North Branch to Old Forge, Scranton, Olyphant, Carbondale and Forest City on the Lackawanna.

The map elegantly shows the rivers and tributary streams with selected adjacent towns shown with a few cross-hatched streets. But starkly, along the streams are the numerous black dots representing the collieries, coal breakers, and washeries. (See *Figure 1*)

B.2.4 Stream Morphology Dysfunctions

Nearly 100-miles of tributary streams are affected with a partial or a total loss of stream flow to the mine pool. Significant reaches of the following streams loose total flow to the mine pool. The remnant stream channels are morphologically dysfunctional, urban storm surges transport large amounts of erodible coal waste and urban debris through these channels and into the Lackawanna River.

Streams with total flow loss:

	Mill Creek	Sulphur Creek	Grier Creek
	St. John Creek	Eddy Creek	Storrs Creek
	Greenwood Creek	Sterry Creek	Fall Brook
Creek	Keyser Creek	Tinklepaugh Creek	Wilson
	Meadow Brook	White Oak Run	Coal Brook
	Carter Creek	Calendor Gap Creek	

Streams with measurable flow loss:

Creek	Spring Brook	Powderly Creek	Grassy Island
	Roaring Brook	Leach Creek	Lackawanna River

Streams with stream reaches completely obliterated by mining and post mining development impacts:

	Campbell Ledge Run	Carter Creek	Meadow Brook
Creek	Red Spring Run	Sulphur Creek	Calendar Gap
	Greenwood Run	Eddy Creek	Coal Brook
	Pine Brook	Tinklepaugh Creek	

Several of the tributary streams have extensive deposits of culm and silts from mining operations deposited in piles or spread across their flood plains. The creeks with the most extensive depositional impacts are:

Mill Creek	Storrs Creek	Eddy Creek
Greenwood Creek	Sterry Creek	Coal Brook
St. Johns Creek	Grassy Island Creek	
Keyser Creek	Powderly Creek	

Due to the location of coal breakers and washeries at sites along tributary streams and on terraces and flood plains along the Lackawanna, there are nineteen culm dumps, silt basins and generalized coal waste sites and piles in, adjacent to or in close proximity to the water course and flood plain of the Lackawanna and several tributaries. These sites are listed and their locations are shown on *Map 5, Priority Culm Bank Removal*.

Other areas on Map 5 are generalized areas where coal wastes constitute a majority of the elements in the soil horizons. Many of these areas have been redeveloped to some degree with a variety of commercial, industrial or residential uses superimposed over previous mining uses during the past fifty years. In most cases, these developments were not designed with environmental reclamation or restorative considerations. Coal wastes have been regraded across the sites often with encroachments of coal waste materials into flood plains and water courses. The practice is problematic and continues to occur particularly on small private land developments.

B.2.5 Socioeconomic and Aesthetic Impacts

Abandoned mine land impacts in the Lackawanna Watershed also affect socioeconomic decision-making, individual and community attitudes and landscape aesthetics.

The redevelopment and appropriate site preparation, geo technical and environmental considerations for an abandoned mine site add substantially to the cost of many projects. This has precluded many economic and community development projects or presented undesirable alternatives such as building in a green field area contributing to urban sprawl or a decision to build and invest in another region or state.

The aesthetics of abandoned mine land are also a factor in public perception of the Lackawanna Valley both on the tourist or visitor and on the local citizens. The legacy of environmental abuse encourages some individuals to add insult to injury by engaging in littering and illegal dumping. Abandoned mine sites are often chosen locations for illegal dumping of auto tires, construction debris and household trash. Malicious vandalism and arson often cause trash fires to ignite nearby coal waste on these sites. An underground fire near Russell Park in Carbondale was ignited from a trash fire. It continues to burn five years later after nearly two-million in efforts by the federal Office of Surface Mines to extinguish it. The present best management strategy is allowing the fire to burn out towards the outcrop. Monitoring bore holes and control trenches are reminders along with combustion gas vents that the fire continues to burn.

It is fortunate in many respects that most of the mine voids under the Lackawanna Valley are flooded. This reduces the susceptibility for mine fires greatly. The hydrostatic pressure of the mine pool also aids in subsurface stability.

Another socioeconomic impact of AML's is the propensity of AML's to attract both larger waste stream businesses and marginal local disadvantaged business enterprises. AML's in the Lackawanna Watershed host two municipal solid waste landfills, Keystone in Dunmore and Throop, Alliance at Taylor, Old Forge and Ransom. These sites accept nearly 8,000 tons of municipal solid waste each day. Ninety percent of this waste stream comes from other states or other regions in Pennsylvania. Each site occupies four to eight-hundred acres and both are very visible from nearby interstate highways.

Other AML's host auto salvage yards. There are both permitted or grandfathered auto salvage yards and scrap yards covering approximately 1,000 acres between Duryea and Carbondale. Five of these sites directly abut the Lackawanna River and one DeNaples Auto Parts, the largest in the area lies along two miles of Roaring Brook in Dunmore. All of these sites are formerly AML's.

The cumulative negative affects of the anthracite industry are an ongoing challenge to environmental reclamation and economic development of the Lackawanna Valley. The recommendations and assessments being developed now will build on previous efforts during the past fifteen years to maximize the restoration efforts now being identified through strong public-private partnerships. This plan will synthesize these efforts and will demonstrate that there is daylight at the end of the tunnel.

Section B.3 Assessment of Previous Reclamation Programs and Studies

B.3.1 Historical Impacts and Regulation

The detrimental effects of large scale anthracite coal mining and related industrial activities on the environment of Pennsylvania became increasingly evident after the Civil War. The increasing toll on the human community was brought to the public's attention with the catastrophe of the Avondale Mine Disaster in 1869.

At Avondale, across the Susquehanna River from Wilkes-Barre, a coal breaker located directly above the mine shaft caught fire. Fire, smoke and noxious gas were drawn down the mine shaft and into the mine workings. Over 120 miners, men and boys, fathers and sons, uncles and nephews, brothers and cousins were suffocated to death by the poisoned air.

For the families it was a tragedy of unmitigated proportions. All males in several families were lost. The shock waves to the northeast Pennsylvania community rippled across the state and nation. The Avondale disaster catalyzed the Pennsylvania legislature into adopting the nation's first regulations on mining, The Mining Safety and Inspection Act of 1871.

This act began a slow process of regulation, inspection, data collection, analysis, and enforcement. In the interests of mine safety, the act regulated the standards and practices of mining, breakers were no longer allowed to be located directly over a mine entry, procedures for ventilation and emergency egress were instituted, air quality related to mine gas safety requirements were established, roof and surface support practices were instituted, inspections and reports of all incidents and accidents were required.

The state appointed and employed professional mine safety inspector engineers to inspect, record data and information on all mining activities and practices, and to publish annual reports. The annual reports of the Pennsylvania mine inspectors are an eminently valuable record of the anthracite mining industry.

By the beginning of the Twentieth Century, with the advance in science and technology, and the advance in labor management relationships and the onset of the Progressive Era, the time of the coal barons and the rapacious exploitation of human and environmental resources was gradually ending.

The political power of the coal industry to evade environmental regulation continued well into mid-century. While the socio-environmental damage caused by more intensely mechanized mining activities increased. It is obvious from the reports of the Pennsylvania mining inspectors and from studies like the 1904 W. F. Dodge report on water pollution in the Northern Anthracite Field that there was some awareness and understanding of the problems anthracite coal mining was causing.

The unwillingness of the mining companies to broadly modify some of their more odious practices and their ability to thwart public, court-based or legislative controls meant that negative mining impacts continued. The Pennsylvania Clean Streams Act of 1937 was the beginning of more effective control of pollution from

both industrial and municipal sources, including for the first time coal mining activities.

B.3.2 Modern Regulations and Early Reclamation

After a reprieve from regulation during the Second World War, the examination of mine related problems as well as publicly funded and regulatory required reclamation increased.

Mining regulations in Pennsylvania gradually required more surface regrading and drainage control for strip mines. The costs associated with underground mining gradually reduced the number of underground operations.

The Pennsylvania Department of Health, Sanitary Water Board began requiring AMD prevention and control through a mine drainage permit system based on the 1937 clean stream legislation. A publication on the Best Management Practices to Control Acid Drainage from coal mines was published by the Board in September 1952.

The U. S. Bureau of Mines published a definitive assessment of mine drainage and surface infiltration in the Lackawanna Basin in 1952. This document, Bureau of Mines Bulletin 518 examines the physical aspects of infiltration of surface water into the then operating mines in the Lackawanna Basin. It describes and assesses various control and prevention measures. Bulletin 518 also assess the issue of pumping related to coal production and offers a number of physical and policy suggestions relating to mine pumping.

The issues assessment reported in Bulletin 518 became part of the policy basis for the federal government to fund a mine water control program in the anthracite region between 1955 and 1961. The history of this program is reported in Bureau of Mines Information Circular 8115 published in 1962. This program and an interrelated Pennsylvania funded program were designed to pro-actively engage the then still active mining companies in partnerships to control and reduce mine drainage.

The program was essentially a grant program whereby the Bureau would entertain proposals for control, reduction and pumping projects. The philosophical view of the legislation enacting the program was focused on protecting and sustaining access to anthracite reserves as a public health and national security value rather than a concern over environmental degradation. The positive environmental impacts generated by the program were ancillary to the national security aspect which was the ostensible impetus for the legislation.

The program implemented a variety of surface mine reclamation projects to back fill and regrade abandoned strip pits, to direct surface drainage away from infiltration sites and back into streams. Stream channels were also addressed with the installation of various types of flumes and earthen and concreted channels and culvert systems. New deep water pumps were installed to assist the economically beleaguered mining companies in their dewatering efforts. The mining companies were required to operate and maintain the pumps.

This program is interesting for a number of reasons; it involved interrelated federal and state legislation and a 50/50 federal/state appropriation. It required mining companies to participate by developing proposals including the design of projects. It further required some commitment to ongoing operations and maintenance of completed projects by the mining companies.

The program only accomplished a few of its objectives, several thousands of feet of stream corridor were flumed, excavated, diked or culvertized to limit stream flow loss; several hundred acres of strip pits were regraded to direct surface storm run off to rechanneled or flumed streams; several dozen high capacity electric turbine pumps were installed at various deep mines.

The economics of costs versus market share and the calamitous Knox Mine Disaster of 1959 undercut the effectiveness of the program. When it terminated in 1961, it had expended only 40% of the 17-million in available funds.

The program's salient benefit seems to be that it broadly demonstrated techniques effective in controlling surface infiltration into mines and showed positive cost-benefit ratio for several environmental factors:

- restored surface grading and drainage; encouraged a more natural ecological succession on abandoned strip mines**
- restored or culvertized stream channels carried less mine waste bed load to the rivers**
- stream improvements lessened local flood damages**
- surface and stream projects addressed some negative aesthetic issues.**

B.3.3 Post Closure Activities and SCAR LIFT

With the cessation of most underground mining in the anthracite region by the 1960's, greater attention was focused on addressing and solving the problems of acid mine drainage AMD. In the mid 1960's, the Sanitary Water Board commissioned a study to address AMD at the confluence of the Lackawanna and Susquehanna rivers. This plan proposed a series of bore holes and diversion conduits to convey AMD from the Old Forge Bore Hole, the Duryea Outfall and the Butler Mine Tunnel to a proposed AMD treatment plan to be constructed at the rivers' confluence. Due to installation, operation and maintenance costs and a change in political leadership in Harrisburg, the proposal was never implemented.

The Federal/State Appalachian Regional Commission (ARC) funded a study of AMD in Appalachia by the U.S. Army Corps of Engineers and the U.S. Bureau of Mines in 1969. The study included a sub-area report on the anthracite region including the Lackawanna Basin. This study recorded AMD flows at the confluence to be 58-million gallons per day with 66-tons per day of net acidity and iron loading of 31-tons per day.

The report suggests that effects of the smaller AMD in the Upper Lackawanna are balanced by the river's net alkalinity but the Old Forge and Duryea AMD's surpass the river's alkaline capacity and result in a 23.5-ton per day discharge into the Susquehanna.

While no specific AMD or reclamation program developed from this study, it serves as a useful benchmark to look at successive study data. The 1969 ARC study did work to inform later state and federal reclamation policy.

The most comprehensive AMD assessment program in the Lackawanna Basin was the two-phase operation SCAR LIFT Study funded through the Pennsylvania Department of Environmental Protection between 1970-78.

The SCAR LIFT assessments were extremely thorough and well developed. The study assessed all of the river's reaches and tributary streams to measure flow loss and determine the extent of loosing reaches. The study also looked at upland areas in each subwatershed , assessed and recommended strip pit backfilling and surface reclamation projects.

SCAR LIFT AMD studies continue as a basis to measure ongoing and proposed projects in the Lackawanna Basin. The SCAR LIFT AMD recommendations for stream reach flow loss have helped to prioritize several recently completed and proposed stream channel restoration projects. SCAR LIFT also continues to guide many of the surface reclamation projects being conducted by the PA DEP/BAMR.

Other federal and state mine reclamation initiatives during the 1950's through the 1970's were focused on public health and safety problems. Surface stability and mine-cave problems affected many built up areas where commercial, industrial and residential properties were threatened with structural failure from subsidences into collapsing abandoned mine voids. This situation was occasionally wide spread in some communities or neighborhoods where illegal mining had removed coal pillars needed to maintain surface support. To help stabilize some of these areas, particularly areas under important commercial, institutional or residential areas,

the federal and state governments funded extensive abandoned mine flushing programs.

Mine flushing programs usually employed contractors and staff who had experience in mining operations. These projects used a hydraulic process to flush pulverized coal waste, culm mixed in a slurry down boreholes drilled throughout a selected neighborhood to fill mine voids. Larger man-sized bore holes, still accessible slope or shaft entries were utilized to send crews into the perimeter of the area selected for flushing. The crews would erect brattices, or underground bulwarks to serve as coffer dams to direct and confine the slurry mixes. The containments would allow the discharge of drainage while concentrating the crushed culm aggregates to fill upwards of 75% of the volume of the selected voids. This would serve to buffer the scale and extent of future subsidence damages.

These techniques, augmented with the addition of cementitious or polymeric grouting materials are utilized today by the U.S. Department of Interior - Office of Surface Mines (OSM) to address emergency subsidence response needs in the anthracite region.

The other major public health and safety need during this period was the control and elimination of underground mine fires and culm bank fires. Left unaddressed, bank fires can burn for upward of 75 to 100 years. Underground coal mine fires have the potential to burn for thousands of years or until a geologic or hydrologic limit is reached.

Major multi-year programs were required to extinguish underground and culm bank fires in the Lackawanna Basin with the SCAR LIFT program during the 1970's . The larger culm bank fires at the Baker Colliery in Scranton and Taylor, the Marvine Colliery in North Scranton and at the Eddy Creek Colliery in Olyphant and Throop each took several years and several million dollars to extinguish.

Underground mine fires in Scranton and Carbondale required the condemnation and removal of several-hundred homes and businesses and the excavation of millions of cubic yards of earth and rock to extinguish.

The Carbondale fire took over ten years to be extinguished and have the final surface reclamation work completed. Two underground mine fires continue to burn in Carbondale today. The older fire along Greenfield Road is monitored and is burning out toward the outcrop boundary. A newer fire near Russell Park referenced in Section I of this document continues to burn. A containment trench and monitoring network of boreholes has been installed by OSM.

B.3.4 SMCRA and BAMR Reclamation Work

The surface Mine Control and Reclamation Act of 1977 (SMCRA) created the Federal Abandoned Mine Land Trust Fund, required royalty payments into the fund from active mining operations, established reclamation and bonding requirements and established procedures to fund state operated reclamation programs to address pre-1977 abandoned mine reclamation problems.

Pennsylvania has previously enacted similar state legislation requiring bonding and reclamation, the federal law reinforced these provisions and added to the funding mechanism.

Through the AML reclamation fund, Congress appropriates funds through OSM to state reclamation agencies. With funding from this source, the Pennsylvania Bureau of Abandoned Mine Reclamation began the design and implementation of reclamation projects. By 1993, the Bureau had completed twenty-three projects in the Lackawanna Valley reclaiming over 1100 acres, primarily addressing public health and safety hazards such as backfilling and regrading strip mine pits and highwalls, filling and capping shafts and mine entries, removing hazardous structures and equipment.

Many of these projects were designed with attention to SCAR LIFT recommendations to limit surface water infiltration into the deep mine pool. Other state-funded infrastructure projects such as local flood control and stream maintenance work, road, bridge and highway drainage projects were also designed with SCAR LIFT recommendations in mind to reduce or eliminate mine drainage infiltration. These infrastructure projects have succeeded in their narrow purposes but they are designed with the traditional civil engineering objectives. These objectives in the 1970's through the 1990's did not include comprehensive environmental goals such as habitat restoration and the engineering techniques did not include analogous natural system engineering.

The Lackawanna County Conservation District (LCCD) was also involved with mine reclamation during this period. Through the Rural Abandoned Mine Reclamation Program (RAMP), LCCD partnered with the then Soil Conservation Service, (SCS, now Natural Resources Conservation Service, NRCS) a U.S. Department of Agriculture agency, on several successful multi objective RAMP projects during the 1980's. This partnership had been side-tracked with the curtailment RAMP in the mid-1990's. However, LCCD-NRCS partnership projects have continued using Section 319 program funds, and currently *Growing Greener* funds.

B.3.5 LRCA and Recent Work

With the creation of the Lackawanna River Corridor Association by local citizens in 1987 and the completion of the LRCA's *Citizens Master Plan for the Lackawanna River* in 1990, the citizens of the Lackawanna watershed began a more proactive involvement with and advocacy for watershed conservation including AMD and AML issues.

The Bureau of Water Quality, the Pennsylvania Fish and Boat Commission, the U.S. Geologic Survey, the Susquehanna River Basin Commission all conducted water quality assessments during the 1980's and 1990's which included the Lackawanna River and the effects of AMD's and AML's on the Lackawanna.

The LRCA was involved with the 1990 PA DER, BWQ assessment and the 1992 PA F&BC fisheries habitat studies. This work has helped to inform LRCA's continuing advocacy for more attention to AMD/AML problems in the Lackawanna.

The LRCA sought to build on recommendations in the Citizens Plan of 1990 and develop a partnership with county, state, federal agencies, community and business interests. LRCA secured federal funding between 1991 and 93 to enable the U.S. Army Corps of Engineers to work with LRCA and other non-federal interests to develop a Reconnaissance Study for a Lackawanna River Greenway. This study provided a comprehensive set of proposals for several-hundred interrelated multi objective projects to promote environmental restoration, water quality improvements, habitat enhancements, recreation and infrastructure improvements.

The Greenway Study updated some assessments from previous studies such as SCAR LIFT to provide a basis for project recommendations to address various reclamation typologies. With the completion of the greenway study in 1993, LRCA, Lackawanna County, the Corps of Engineers and Pennsylvania DER began a series of discussions on development of feasibility studies to implement some of the greenway reclamation projects. State and federal agencies could not reach a consensus on methods to allow joint projects. In 1994, Congress adopted an amendment to an appropriation bill sponsored by West Virginia Senator Robert Byrd which required federal and state agencies to allow mine reclamation trust funds to be classified as part of non-federal matching fund requirements. There were philosophical and financial policy differences between Corps and DER staff which mitigated against the creation of a stronger partnership in the Lackawanna watershed at that time.

Subsequently, changes in organizational structure, policy and funding on both the state and federal level have made partnerships such as the one currently developing on the Lackawanna more common.

Since there was a need to advance reclamation at that time however, Lackawanna County and the LRCA worked with then Congressman McDade to secure mine reclamation and sanitary sewer program funds. A 30-million-dollar grant program line item for AMD and CSO work through Lackawanna County was included in the US EPA budget appropriation in Fiscal Year 1994.

In 1997 after three years of negotiation regarding scope and matching fund sources, EPA agreed to support the initiative of a watershed-based AMD and CSO implementation project by Lackawanna County. This program known as Lackawanna River Watershed 2000 is supported through a partnership involving county, state, federal and private agencies including the LRCA.

Administrative differences between federal and local participants caused a delay in the Watershed 2000 program between 1998 and late 2000, but by the beginning of 2001, the program had been reinitiated with some modifications in scope from a watershed scale program to a project-based program.

Section B.4 Lackawanna River Watershed Reclamation Programs

B.4.1 New Policy Initiatives

Environmental policy in Pennsylvania during the later 1990's and through the beginning of the Twentieth-first Century has experienced a sea change. The legislature and the administration of Governor Tom Ridge reorganized the former Department of Environmental Resources, PA DER into two new Departments, Environmental Protection (PA DEP) and Conservation & Natural Resources (PA DCNR). Programmatic, organizational and funding priorities changed drastically.

The Clinton administration developed the American Heritage Rivers Program in 1997-98. The LRCA participated with other watershed interests in nominating the Upper Susquehanna - Lackawanna River watershed as a unit in the Heritage Rivers Program. This designation covers a watershed region from Bloomsburg through Wilkes-Barre to Pittston on the North Branch Susquehanna and up the Lackawanna River through Scranton and Forest City to its headwaters. To date the designation has been largely thematic. It has involved a broad dialogue of watershed interests, particularly related to mine reclamation. There are several technical programs being developed for GIS resources. There is further potential for programs to develop related to the designation. LRCA and Lackawanna County continue to participate from time to time in meetings of the Heritage River Steering Committee.

In response to a recognition statewide of issues related to watersheds, water resources, economic and community development, abandoned mine lands and industrial sites, there has been an increasing frequency of watershed initiatives and partnerships forming to bring governmental, community and private resources together to comprehensively address these issues.

The work of non profit organizations across the Commonwealth such as the Pennsylvania Organization for Watersheds and Rivers (POWR), the Eastern Pennsylvania and Western Pennsylvania coalitions for abandoned mine reclamation (EPCAMR and WPCAMR), Trout Unlimited, and the growing number of watershed organizations has begun to reap success as watershed conservation and mine reclamation projects of all sizes and types are now being implemented.

Through a grant program known as *Growing Greener*, the Commonwealth of Pennsylvania is funding over 450-million-dollars into watershed and reclamation programs. The PA DEP is reorganizing itself to function more effectively at the local watershed level.

B.4.2 Lackawanna River Partnership and Watershed 2000

In 1990 as part of the Citizens Master Plan, the LRCA recommended the creation of a Lackawanna River Partnership composed of various governmental and private agency participants to act as a coordinating and implementing body to guide the restoration and appropriate stewardship of Lackawanna River resources.

This partnership gradually and informally coalesced and has acquired greater importance with the inception of the Watershed 2000 project by Lackawanna

County. A steering committee known as the Lackawanna River Watershed Coordinating Group has been formed to advance the principles of the Lackawanna River Partnership concept. The committee, consisting of staff representing the member agencies have been meeting bimonthly to share information, coordinate watershed assessment and project ranking and to coordinate project development and implementation.

The following agencies are represented:

Lackawanna County Regional Planning Commission

Lackawanna County Conservation District

Lackawanna River Corridor Association

PA Department of Environmental Protection, Bureau of Abandoned Mine Reclamation

PA Department of Environmental Protection, Bureau of Water Quality

USDA, Natural Resource Conservation Service

U.S. Army Corps of Engineers

Since 1998 the partnership agencies have cooperated to integrate state and federal programs on a watershed basis. A major programmatic challenge has been gaining the acceptance by a strategic funding partner, US EPA-Region 3, that approximately 20-million-dollars of stream improvement and abandoned mine reclamation funds provided through PA DEP-BAMR, constitutes an effective match for the \$20-million in mine drainage project funds being provided by EPA for the Watershed 2000 Program. Another \$10-million in this grant program for CSO projects will be matched by local sewer authorities.

The goals of this mine reclamation plan are to integrate the work of public and private agencies in a watershed context. Assessment and project development work is continuous. Somewhat different assessment procedures and assessment criteria are being utilized by different agencies. The major goal is the progressive improvement of water and habitat quality in tributary streams and the river. This goal suggests an upstream to downstream approach.

B.4.3 Current Project Assessment and Prioritization Methods: Watersheds

Two watershed-wide assessments have been or are being completed and form part of the basis for project ranking, selection and development. Three other project-focused assessments have been completed or are underway.

The watershed-wide assessments are the LRCA's River Reach and Tributary Stream Survey Report (Appendix C) being completed as part of this plan and a water quality and riparian habitat assessment being conducted by PA DEP, Bureau of Water Quality during 2001 in the Lackawanna watershed, as part of the statewide water quality assessment.

Project related assessments are in progress for PA DEP BAMR projects, Watershed 2000 and Corps of Engineers projects.

Some assessment criteria and variables which eventually affect the nature and scope of projects are:

- **Location of subwatershed in the watershed**
- **areas and scope of flow loss**
- **size, location and effect of AMD discharge**
- **size and scope of AML impacts in subwatershed or river reach**
- **cooperation or potential for cooperation of property owners**
- **previous work done in subwatershed or river reach**
- **potential for sustainability of habitat restoration**
- **morphological characteristics, storm and flood drainage**
- **potential or predictive water quality improvement**
- **probable future adjacent land uses**
- **potential economic and community development impacts**

These and related criteria can be grouped into four categories:

- **water quality**
- **tributary flow**
- **biological and habitat**
- **socioeconomic.**

Based on current understanding, review of historical assessments and plan recommendations and subjective application of criteria, LRCA and PA DEP BAMR have developed two priority project lists for subwatershed reclamation work. LRCA's selections are weighted towards flow loss and overall habitat degradation, while BAMR's list is weighted towards flow loss and water quality improvement by reduction in AMD generation. Despite these differences there are a majority of streams common to both rankings.

Watershed Restoration Priority List

LRCA Priority List

PA DEP BAMR Priority List

Grassy Island Creek, Jessup	Grassy Island Creek
Eddy Creek, Olyphant / Throop	Eddy Creek, Olyphant
Powderly Creek, Carbondale	Powderly Creek
Sterry Creek, Jessup	Keyser Creek
Keyser Creek, Scranton / Taylor	St. Johns Creek
St. Johns Creek, Old Forge	Spring Brook, Moosic
Greenwood Run, Moosic	Roaring Brook, Scranton
Coal Brook, Carbondale	Laurel Run, Archbald
Wilson Creek, Fell Township	White Oak Run, Archbald

B.4.4 Culm Dump Sites

LRCA had identified culm dumps on and along the river and tributary streams as a major source of water quality and riparian habitat degradation. Culm dump issues were further assessed in the 1993 greenway plan and in subsequent discussions among state, federal and local partners during 1994. The channel failure at Grassy Island Creek and related washout of the Rose Pile during the flood of 1996 is an example of the detrimental impact the culm dumps have on this watershed. LRCA recommends culm bank removal or capping to control the negative impacts of these dumps. Removal is the preferred solution with subsequent, flood plain riparian and upland habitat restoration and conservation at most sites. Some sites are appropriate for economic redevelopment on upland portions of the site.

The following list summarizes LRCA recommendations and/or most probable likely future uses of culm dump sites in close proximity to water courses starting upriver. In all cases, the preferred future use of the flood plain and riparian corridor portion of these sites is for conservation and recreation purposes. Upland areas may have a conservation use or an economic development use. (See *Maps 4 and 5*)

LRCA Culm Bank Reclamation Recommendations

Affected Stream	Rank	Site Name	Municipality	Preferred Future Use Upland Area	Project Status
River	13	Hillside Colliery (Yucca Flats)	Forest City	Industrial / Recreation	R/P/C
River	13	Hillside Colliery (Yucca Flats)	Forest City	Industrial / Recreation	R/P/C
River	18	Vandling Drift	Vandling	Recreation	
River	17	Grey Slope	Clinton Twp	Recreation	

River	2	Northwest Pile Fell Coal	Fell Twp	Recreation/Residential	R
Wilson Creek	21	Richmondale	Fell Twp	Conservation/Residential	
Coalbrook	22	Coal Brook	Carbondale City	Conservation/Residential	
Powderly Creek	3	Powderly	Carbondale Twp	Commercial / Conservation	P/R
River	5	Brojack Pile	Jessup	Conservation	
Grassy Island & River	1	Rose Pile	Jessup	Conservation	C
Grassy Island & River	6	Pompey Site	Jessup	Multi use	D
Grassy Island & River	7	Sunnyside	Jessup	Multi use	R
Sterry Creek	9	Sterry Creek	Olyphant	Conservation	D
River	12	Olyphant Colliery	Dickson City	Commercial / Multi use	D
Eddy Creek & River	10	Eddy Creek	Olyphant / Throop	Recreation / Residential	P
River	8	Marvine	Scranton	Multiuse	R
Leggetts Creek	4	Marvine #6	Scranton	Recreation / Residential	C/R
Roaring Brook	14	Coons Pile	Dunmore	Residential	
River	15	Baker	Scranton	Industrial	
Keyser Creek & River	11	Moffat	Taylor	Multiuse	P
St. Johns Creek	20	Sibley	Old Forge	Recreation	R
River	16	Penna. #9	Old Forge	Recreation	P
River	19	Blue Goose	Moosic	Residential/Conservation	
Mill Creek	24	Heidelberg	Avoca	Multi use	
River	23	Popple / Babylon	Old Forge / Duryea	Multi use	

Project Status: R Reconnaissance D Design P Planning C Construction

The ranking criteria applied to the above selections includes:

- immediate contact with stream, frequency and potential volume of erosional occurrences
- proximity to receiving stream
- condition & size of vegetative buffer
- potential for beneficial impacts related to other proposed work
- probability of market / development interest
- municipal interest

Project status indicates an approximation of the status of activities related to all or parts of a particular site that LRCA or project partners are aware of or involved in. Reconnaissance means some level of interest has been indicated by partners, or others, in a project at the site. Planning status indicates that a publicly funded reclamation plan is being developed or a private reclamation plan or redevelopment plan is moving towards a design and permitting phase. Design indicates that all funding and approvals are being secured in preparation of a project in the next two years. Construction indicates that a project is beginning or is underway as of May 2001.

There are numerous sites where culm piles and associated coal waste piles provide significant environmental impacts which are on upland sites not immediately adjacent to water courses. These sites have not been included in this discussion because they have less of an immediate watershed impact. Some of these sites have advanced successional vegetation or are being redeveloped .

B.4.5 AMD Assessments

The most recent assessment for mine drainage in the Lackawanna is based on comparisons of sampling data collected by partner agencies during the past ten years with historic data from SCAR LIFT, DER and USGS reports.

The assessments indicate a general trend towards more alkaline mine drainage in the upper watershed and related ability for the rivers natural alkalinity to neutralize the effects of the remaining acidity in the outfalls in the upper watershed. The localized apparent impacts of these outfalls masks the fact that they still contribute undesirable quantities of metals to the river's base load.

The larger AMD's at Old Forge and Duryea have a catastrophic effect on water and environmental quality. Due to their size and location, it will require a significant effort to develop the appropriate technological and financial ability to correct the problems they generate. (See *Map 3*)

The following table lists Lackawanna watershed AMD outfalls by name and volume beginning downstream.

Lackawanna River AMD Outfalls

Outfall Name	Discharge Volume
Duryea	30
Old Forge	150
Lackawanna	10
Gravity Slope	30
Gravity Slope Stand Pipe	1
Waddell	1
Dana Tunnel	5
Jermyn	30
Molensky Slope	14
Wilson Creek 1	1
Wilson Creek 2	1
Number 10	1
Beaver	1
Grey Slope	5
Vandling Tunnel	5
Browndale Drift	2

Discharge volumes derived from SCAR LIFT Reports

Further information on Lackawanna River AMD is available on the LRCA website at <http://www.lrca.org/amdoutfalls.htm>.

There are only two AMD mitigation projects in the Lackawanna Basin. A set of revolving limestone water wheels have been installed in two concrete basins to neutralize AMD flows into Aylesworth Creek Lake to help maintain a recreational fishery. The operation of these liming wheels by the local recreation board at the Corps of Engineers-owned dam has been problematic. The costs of limestone, maintenance and vandalism repair have often prevented operation. The costs have been met through a special legislative earmark through the assistance of a local legislator. This system has been operational intermittently since the early 1980's.

The PA Department of Transportation, designed and installed a passive AMD wetland system near Aylesworth along the Robert P. Casey Highway in 1997. This system has proven highly effective in neutralizing acidity and sequestering metals.

B.4.6 Ongoing Programs

The following project/agency summary includes all work presently underway or in development in the context of the Lackawanna Watershed 2000 Program. Some of this work is programmatically linked to the US EPA-funded program being administered by Lackawanna County. Other work is thematically linked by advancing the reclamation and/or reuse of abandoned mine lands in this watershed.

B.4.6(1) Pennsylvania Bureau of Abandoned Mine Reclamation:

Lucky Run: a stream bed sealing and restoration at McDade Park has a goal to seal 800' of stream bed to prevent infiltration of Lucky Run into mine pool at McDade Coal Mine Tour site and to demonstrate the efficacy of naturally analogous stream restoration techniques. Status, nearing completion Spring 2001.

Eynon - Jermyn: Surface reclamation grading and drainage enhancement on 200-plus acres as part of a recreation site development in partnership with PA DCNR and the Borough of Archbald. Status, completing final design.

Mayfield East: A 100-acre surface reclamation and drainage enhancement adjacent to the PA 107 extension. Status, in design and property owner negotiation.

Eddy Creek, Phase I: A 300-plus watershed and stream corridor restoration along 2.5 miles of Eddy Creek in Olyphant and Throop. This project will completely reconstruct 2.5 miles of degraded or nonexistent stream channel and riparian corridor. Status, property owner easements being secured, final design, construction bids by December 2001.

Grassy Island, Phase I: a 400-plus/minus acre surface reclamation culm bank removal, drainage and riparian corridor enhancement along one mile of Grassy Island Creek in Jessup from confluence to Robert P. Casey Highway. Status, in design.

Greenwood Creek: A potential 75-plus/minus acre project to reconstruct three-quarters of a mile of Greenwood Creek corridor from confluence with river to shopping center in Moosic. Status, reconnaissance, preliminary design and discussion with property owner.

Tinklepaugh Creek: Completion of stream flow restoration utilizing precast culverts and rip rap channel. A previous phase of work completed by the Department of General Services constructed three miles of concrete "U" channel on Tinklepaugh and Wild Cat creeks. Benefit, restoration of flow and diversion of 15 to 20 mgd of flow from Gravity Slope AMD. Status, designs complete, difficult property owner negotiations.

Sterry Creek, Phase 2: Previously, the BAMR and Bureau of Stream Improvements had installed concrete "U" channels and rebuilt portions of Sterry Creek using

grouted rip rap, gabions, artificial channel liner (EPDM sheets) in a hybrid structural / natural analogous channel restoration. Phase 2 will proceed upstream of Phase I from the Robert P. Casey Highway to seal, grout and restore another 1000' of loosing reach, regrade and re-vegetate silt and culm banks to reduce erosion of these materials into the stream. Status: after nine years, landowner approval has been received, project in design and permitting.

B.4.6(2) Lackawanna County, Lackawanna River Watershed 2000 Program

Through the cooperative agreement/grant contract between Lackawanna County and the US EPA, the current work plan for Watershed 2000 is authorized as Amendment Number 4.

The work plan includes a four phase, multi year program targeted towards overall improvements in river water quality in the mid and upper watershed. Phase I, a watershed assessment has been truncated at the request of EPA to the work completed under scope amendments prior to 1999.

Phase 2, project characterization and watershed planning is presently underway. The monitoring programs, quality assurance, quality control plan has been approved. A comprehensive one-year monitoring program is collecting water quality data in dry weather and wet weather in the river and tributary streams. The greater and lesser AMD's are being sampled and flows are being measured. A biomonitoring program is establishing base line information on macro invertebrate populations at five stations along the river.

A subset of projects related to CSO is being developed with the Lackawanna River Basin Sewer Authority. In the AMD program, several initial AMD demonstration projects have been developed base on field reconnaissance, research of SCAR LIFT and previous assessments and as recommendations from partnership group meetings and input from other local, state and federal agencies.

Preliminary AMD demonstration projects through Watershed 2000 are:

Leggetts Creek Restoration: The restoration of 3000-linear-feet of stream corridor will remove culm, silt, ash and mine rock, regrade fifty-four acres for recreation, conservation and future residential use. This project is planned as a follow on to an LRCA project (see *Growing Greener* section).

Aylesworth Creek Restoration: This project will regrade culm and mine waste, and vegetate to reduce erosion of these materials. The project will also install successive alkalinity producing systems (SAPS) to reduce AMD from multiple points.

Powderly Creek Restoration: This will restore 7000' of stream corridor and regrade 50-plus acres of coal waste and silt. Watershed 2000 will conduct a portion of this work, other agencies will also be working on related projects on Powderly Creek. (See Corps of Engineers and private development)

Dana Tunnel Treatment: This project will involve a public-private partnership with PG Energy, a gas utility and electric generator. The high aluminum Dana Tunnel discharges adjacent to the PG Energy Archbald electric generator and flows one-

half mile to the Lackawanna. A feasibility study will determine whether a treatment plant or and industrial use of the discharge is possible or if a passive wetland is appropriate. At the conclusion of the feasibility study, the recommended treatment system will be designed and installed.

Lackawanna Outfall Treatment: A feasibility project is proposed to determine the appropriate technologies and costs to treat this AMD outfall in Blakely.

Outfall Remediation Plans: Watershed 2000 proposes to develop remediation plans for several other AMD's depending on an assessment of data, cost feasibility of appropriate technology and overall water quality benefit. This assessment should be complete by 2003.

Tributary Watershed Analysis and Prioritization: Watershed 2000 will utilize the "Model Plan for Watershed Restoration" as developed by a joint state/federal task force and used for the Swatara Creek Rehabilitation Plan for application to rank and prioritize work in the subwatersheds identified by LRCA and BAMR and additional watersheds surveyed in this report which are in need of restoration work.

This process will take the watershed-wide process being applied by LRCA in this reclamation plan and related river conservation plan and focus a greater level of detail at the mine affected subwatersheds.

This process will become a basis for prioritizing future actions and projects subsequent to the initial Watershed 2000 expenditures and the related BAMR projects. With the Lackawanna Partnership and coordinating group continuing to act as a steering committee, this methodology may be effective in meeting many of the remaining reclamation priorities.

B.4.6(3) U. S. Army Corps of Engineers

The Corps of Engineers had established an interest in mine reclamation and environmental restoration in the Lackawanna Basin with the *Lackawanna River Greenway Reconnaissance Study* in 1993. The Corps has become involved in mine reclamation work throughout the Appalachian region. Presently, the Planning Division of the Baltimore District is involved in Section 206, Restoration Planning work for two projects in the Lackawanna Basin. These projects are integrated with the BAMR / Watershed 2000 program of work. Construction is estimated for 2003 - 04.

The Corps projects are:

Fall Brook and Murin Run Project: Fall Brook and its tributary Murin Run loose base flow to the underground mine pool in the City of Carbondale. The creeks were relocated to facilitate the fifteen-year long Carbondale mine fire project in the 1960's to mid-70's. The creeks are in artificial channels of rock rip rap. Both creeks loose their entire base flow. The Corps project will excavate both water courses, install channel liner material and replace the stream substrate and structure with a naturally analogous system.

Powderly Creek: A 3-mile reach of Powderly Creek in Carbondale is severely affected by culm, coal waste and silts. The Corps project will be integrated with BAMR and Watershed 2000 project work to remove coal waste, culm and silt from the water course, flood plain and riparian corridor. These materials will be removed from the site if marketable or banked in upland parts of the project site covered with soils, bermed, swaled and vegetated. The water course will be assessed for flow loss reaches, grouted and naturally analogous channel and riparian features will be installed.

Old Forge Bore Hole: There is a separate reconnaissance interest by the Corps at the Old Forge Bore Hole and related discharges at Duryea Outfall on the Lackawanna and Butler Mine Tunnel in Pittston on the North Branch Susquehanna one and one-half mile below the Lackawanna confluence. Watershed 2000 will be sampling Old Forge and Duryea as well as establishing a discharge record. It is anticipated this new information may provide a basis for a larger federal-state-local initiative to develop a treatment and mitigation system for these large AMD flows. A variety of opportunities are present at these sites for a wetlands, SAP passive system and/or a conventional treatment plant system or some combined system. Whatever system meets feasibility requirements, it will be a significant program since this is one of the largest AMD sources in the Appalachian region. The confluence of the Lackawanna and Susquehanna rivers has been called the largest visible point source of pollution in the Chesapeake Bay Watershed.

B.4.6(4) *Growing Greener*

The Commonwealth of Pennsylvania is funding a number of mine reclamation-watershed restoration grant projects in the Lackawanna Basin. The projects being implemented by local grant recipients are:

Pennsylvania Number Nine Colliery, Old Forge: A 20-acre site with mine structure, culm and coal waste along the Lackawanna River in Old Forge is being reclaimed by the Old Forge Youth Soccer League and Old Forge Borough. The site will be regraded and vegetated for use as a soccer field and riparian access site.

Valley View Business Park, Jessup: The Scranton-Lackawanna Industrial Building Company, an industrial site development affiliate of the Greater Scranton Chamber of Commerce and the Borough of Jessup are cooperating on implementation of a \$1-million *Growing Greener* grant to regrade abandoned strip mine pits, remove municipal waste dumped in several pits, regrade rock waste piles, culm and silt banks and install surface drainage improvement on portions of the 400-plus-acre site. This work in the upland areas of Grassy Island Creek watershed will help prepare the site for adaptive reuse as a business park.

Additional work will be needed on other portions of the site to address the Sunnyside culm dump and other culm and waste deposits from the Sunnyside and Dolph collieries, which once operated along the Grassy Island watershed.

The LRCA encourages projects such as the Valley View Business Park and suggests closer coordination with SLIBCO on this and future projects in the subwatersheds affected by the development of Valley View Business Park: Grassy Island Creek, Winton Run, Laurel Run and White Oak Creek.

The Vandling Washout: The Rail Trail Council of Northeast Pennsylvania owns the Delaware and Hudson Railroad from Carbondale to Lanesboro, Pennsylvania. Sixteen miles of this 40-mile rail corridor follow the upper Lackawanna River. The Council has developed a construction and management program for the trail, which includes drainage improvements and environmental restoration. Significant sections of the rail corridors grade and embankment material are coal waste. At one site in Vandling there is a serious washout. The RTC has worked with Lackawanna County Conservation District and NRCS to design a bank stabilization project. The project will be installed with a *Growing Greener* grant.

Leggetts Creek Greenway: Three-thousand feet of Leggetts Creek is affected by coal waste, ash, culm and structural debris related to the Hudson Coal, Marvine Number Six Colliery. LRCA and its land trust affiliate, Lackawanna Valley Conservancy are funded through *Growing Greener* to regrade and re-vegetate culm and rock wastes on the site. The upland portions of the site will subsequently be prepared for a seventy-lot residential development to infill with adjacent historic neighborhoods.

The riparian corridor along Leggetts Creek will be regraded to remove culm and debris. A grade will be established for a pedestrian - bicycle pathway and the adjacent areas will be hydro-seeded. Additional grants are pending for riparian tree and shrub plantings.

Watershed 2000 is proposing work along the adjoining south bank of Leggetts Creek as well as at several in-stream and stream bank sites where mine waste and mine structures need to be removed.

Marvine Colliery: Lackawanna County is managing a master site reclamation and reuse plan for the Marvine Colliery area, a 400-plus acre area between the Lackawanna River, Interstate 81, Marywood University and the Greenridge residential neighborhood. Carter Creek, a small highly degraded subwatershed and the I-81 drainage system, a newly engineered significant artificial subwatershed are included in this planning area. This plan will function as a reconnaissance study with some preliminary feasibility analysis. The project involves several private property owners as well as county and state owned properties.

Yucca Flats: The Trail Conservation Corporation, an affiliate of the Rail Trail Council is developing a master site reclamation and reuse plan for the 200-plus/minus Yucca Flats (Hillside Colliery) site in Forest City. This project will serve as a preliminary feasibility study and preliminary design plan.

B.4.6(5) Private Development

Private enterprise has often been the agency of the reuse of AML's in the Lackawanna Basin. The benefits are that some reclamation goals are met without the use of public funds. In the past, the less desirable outcomes have ranged from poorly engineered and graded sites to encroachment of mine rock and other wastes into flood plains and water courses of already adversely impacted tributary streams.

The requirements to comply with local ordinances, erosion and sediment control, and storm water management have brought some opportunities to influence the

engineering outcomes on private sites. Smaller private developers still cause negative water and habitat quality impacts. Larger private developers will more often have competently engineered plans and work in an environmentally acceptable manner.

There are several private AML sites with some form of reclamation activity underway or planned.

Powderly Culm Bank Removal: Northampton Fuels, an electric cogeneration plant operator is mobilizing to remove and regrade several culm banks at the Powderly Colliery in Carbondale Township adjacent to the Meredith Street Exit of the Casey Highway. There will subsequently be a reuse opportunity for the landowner F&L Realty. This project will compliment publicly funded work in the watershed.

Marvine Bank Removal: F&L Realty and related interests is a significant owner of coal properties including several-thousand acres of Carrier Coal and eleven-thousand acres of Raymond Colliery. Subcontractors working for F&L are presently removing one of the Marvine banks along the river in Scranton. F&L is a partner with Lackawanna County on the *Growing Greener* reclamation - reuse plan for the Marvine Colliery.

Olyphant Colliery Development: F&L Realty has begun a commercial development of a portion of its Olyphant Colliery site in Dickson City. A supermarket complex is in proposal stage with the municipal planning agencies. Significant other portions of this several-hundred acre site have access problems, which may preclude their immediate reuse.

Greater Forest City Industries: GFCI is developing a small 100-plus/minus acre business park on a portion of Yucca Flats, the Hillside Coal and Iron Colliery site in Forest City.

Breaker Creek: A private residential development is regrading upland portions of the Johnson Number Two culm bank site in Dickson City. Despite its name, there is no creek near the site.

Red Hills of Archbald: A residential subdivision has been redeveloping the Ontario Colliery culm bank in Archbald.

PG Energy Co-gen Park: An electric co-generating plant now owned by PG Energy, a gas utility, has helped reclaim the site of the Gravity Slope Colliery in Archbald. PG Energy may become a partner with Watershed 2000 to treat the Dana Tunnel AMD which originates on this property.

Scranton Craftsman Subdivision: A residential development on 150-acres in Throop is facilitating the work of BAMR on the Eddy Creek restoration project. The private developer is removing, regrading and vegetating upland areas for use as residential lots. The developer has worked pro-actively with BAMR to grant easements for stream restoration and has helped convince upstream and downstream property owners to cooperate with the program as well.

B.4.6(6) Municipal Reclamation Projects

Municipalities have not directly conducted reclamation work. They have often helped to facilitate the work of BAMR. Presently, the Borough of Archbald, PA DCNR - Bureau of State Parks, and PA DEP - BAMR are cooperating on a 200-plus acre recreation site reuse of an AML adjacent to Archbald Glacial Pothole State Park. The Borough of Dickson City proposes an 8.9-million-dollar recreation complex on a 170 acres previously reclaimed site maintained by BAMR as vacant open space.

The Borough of Throop proposes a new municipal garage and DPW yard be co-located with a recreation complex and a senior citizens housing complex on the 200-acre Eddy Creek Colliery culm bank site.

B.4.6(7) Public Infrastructure Improvements

Road and bridge projects, sewer and water pipeline projects, Bureau of Stream Improvement projects and economic development projects often have an ability to address AML and AMD issues in the design and installation of infrastructures. Regrading and capping coal wastes, re-vegetation of installation areas, use of appropriate engineering techniques can have positive impacts on AMD/AML. The design and construction of the Robert P. Casey Highway (US Route 6) between Dunmore and Carbondale by the Pennsylvania Department of Transportation has provided a series of positive impacts. The highway's storm water drainage system address a myriad of AML site drainage problems. A passive wetland and AMD system was installed. Culm banks in or adjacent to the highway construction were often vegetated with hydro-seeding or in some cases regraded completely.

Road drainage installations present a few challenges for mine reclamation at several sites in the valley. The Casey Highway and some of its access roads have presented some drainage restrictions to the Bureau of Abandoned Mine Reclamation. Closer facilitation among agencies is needed to resolve these issues.

The PA DEP-Bureau of Stream Improvements which had previously installed highly engineered and expensive concrete culverts and "U" channels is now proposing projects on Springbrook and Racebrook Creek, a tributary of St. Johns Creek using naturally analogous systems.

Section B.5 Remaining Priorities and Summary Recommendations

B.5.1 Next Steps

The wide range of activities described in Section 4 can be expected to achieve the most significant advance in the reclamation of AML and the restoration of watershed values and functions since the close of the anthracite industry in 1960. When many of the small, mid and larger scale projects are completed during the next ten years, there will still be a large amount of work remaining, especially in the lower watershed.

The Lackawanna River Partnership and the Watershed 2000 program should continue as a process to guide reclamation work in the watershed. The reclamation process can increasingly function with greenway, open space infrastructure and economic development programs to foster a more rational land and water resource stewardship ethic in the Lackawanna Valley.

The next two years will be critical in measuring the efficacy of the partnership concept, the collection and analysis of data and the formation of projects through Watershed 2000. This project assessment ranking and feasibility work in the mid and upper watershed will address the AMD issues above Carbondale and in the Mid Valley. Watershed 2000, BAMR and Corps projects will address seven or eight mid and up valley creeks, one in Scranton and one down valley.

The following table lists creeks with significant reclamation work expected to be completed during the next five years:

Stream Corridor Reclamation Projects

Completion Expected by 2006

Stream	Distance Reclaimed	Agency	Additional Work Needed Y or N
Eddy	3.5	BAMR	Y
Sterry	3	BAMR	N
Grassy Island	2	BAMR	Y
Powderly	3	Corps / BAMR LRW2K / Private	Y
Fallbrook	2	Corps	N
Aylesworth	2	LRW2K	N
Tinklepaugh	1	BAMR	Y
Leggetts	0.5	LRCA / LRW2K	N
Greenwood Run	1	BAMR	N

B.5.2 Ongoing Need Assessments

Over a longer period LRCA recommends that culm bank projects may be a focused way to address highly impacted reaches of stream where the balance of impacts may not contribute to larger watershed degradation. This is particularly the case with the river itself. LRCA suggests that several culm banks and depositional sites on tributaries and the river be prioritized for removal. We expect these sites will remain a top priority of the LRCA until they are removed or addressed to prevent immediate contact with water courses.

The Watershed 2000 program proposes the use of watershed degradation criteria as previously discussed to include water quality, water flow, biological and habitat, and socioeconomic criteria. These assessments will benefit by receiving several sources of data: The river reach and tributary stream surveys developed in this plan, the statewide assessment data being collected in 2001 by PA DEP-BWQ, watershed-wide data from other watershed projects. That data will be supplemented with current field data on water quality, flow and habitat.

B.5.3 Continuing Public Involvement

While these assessments will help rank projects, the ability to actually bring a project to the implementation phase will be dependent on other variables such as scope, development and operational feasibility, property owner involvement and support, community and political support.

Establishing property owner, community and political support has been crucial to the success of recent BAMR projects and recent Lackawanna River Heritage Trail projects. This implies that a significant public involvement, public outreach program needs to be conducted in conjunction within Watershed 2000.

There is a need to develop and maintain informed support among local citizens and to exercise that support with legislative representatives at the state and federal level. While we may expect to see sixty to eighty-million-dollars worth of combined federal, state, local and private reclamation projects in the Lackawanna in the next ten years, the unmet needs will require five to ten times that amount to adequately address.

B.5.4 Unmet Long Term Financial Needs

The Committee on Resources of the U.S. House of Representatives conducted an oversight hearing on abandoned mine land reclamation needs of the Pennsylvania anthracite fields in Scranton on January 24, 2000. Three members of Congress from the anthracite region joined the Chairman, Alaskan Congressman Don Young and Committee staff to take an afternoon of testimony from local citizens, federal and state agency staff and elected officials. Issues related to the abandoned mine land trust fund and other innovative funding mechanisms were discussed along with data and information similar to that presented in this planning document. The message delivered to Congress by the local citizens was that the unmet financial needs for reclamation should be met by Congress. The end result of the hearing was that a small increase in funding for AML/AMD projects in the anthracite region was included in the next federal fiscal budget. A comprehensive program such as

Growing Greener at the federal level would be a welcome compliment to the state and local efforts.

B.5.5 Longer Term Expectations

The Watershed 2000 program and related matching work will not meet all needs in the Lackawanna. Most of the highly degraded watersheds in the upper and mid-watersheds will be addressed. The down valley priorities may indeed need further legislatively designated appropriations. Certainly *Growing Greener* and related Pennsylvania programs will remain a basis for continued work in the Lackawanna.

The remaining creeks, watersheds and culm dumps on the LRCA's present list of priorities may require at least 80-million-dollars. The outlook for the near term eight to fifteen years out suggests that the initiative of Watershed 2000 has the potential to involve the community and secure the resources needed to continue the reclamation of the Lackawanna Valley.

A comparison of expected outcomes from Watershed 2000 projects with LRCA and BAMR watershed priority lists, LRCA culm bank list and the Lackawanna AMD list demonstrates that by 2008, there will still be sixteen to eighteen AML sites with larger culm banks near the water course. There will still be seven important second order tributaries with greater than 50% of their water courses completely degraded. There will be another twenty-four creeks with significant degradation such as total flow loss and nonexistent aquatic habitat. There may still be the Old Forge Bore Hole to deal with.

The Watershed 2000 process, building on this plan, will provide a structure, a methodology to assess the remaining problems and move towards pragmatic, cost effective, technologically appropriate, and environmentally sustainable solutions.

As this process continues into the Twenty-first Century, the landscape and hydrology of the Lackawanna watershed will gradually become reclaimed and help sustain a more vital human and natural community.

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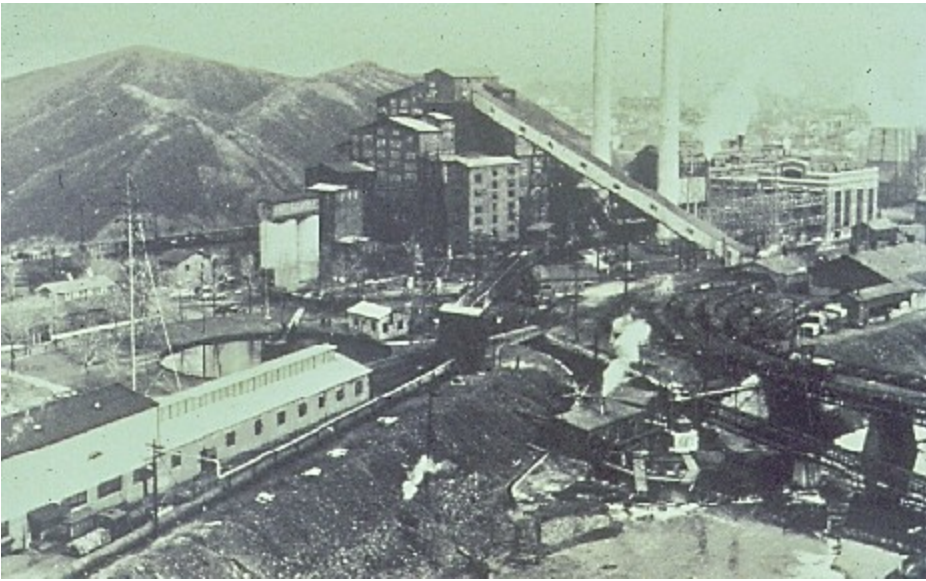
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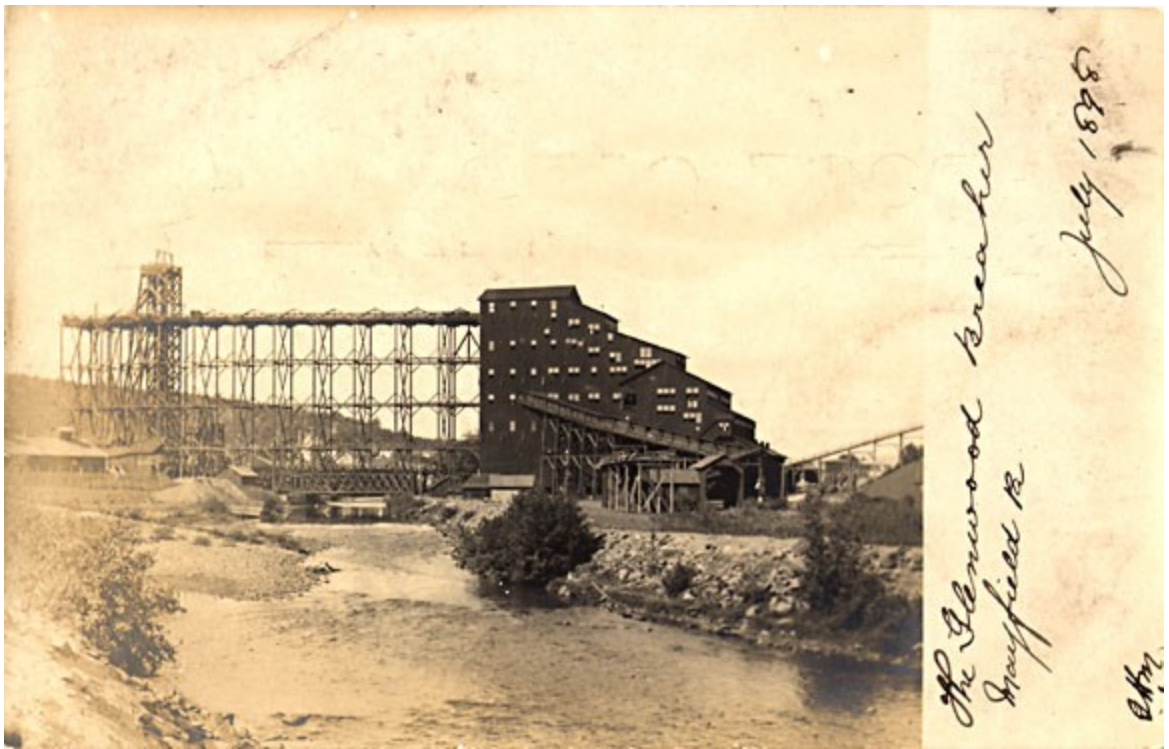
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Pictures:



Aerial View of Olyphant Colliery (ca. 1920)

Note Lackawanna River in Foreground



Glenwood Breaker constructed along the Lackawanna River at Jermy, PA



**Upper Silt
Basin on
Powderly Creek
in Carbondale
Twp.**

**Staff from
LRCA, US Army
Corps of
Engineers, PA
Bureau of
Abandoned Mine
Reclamation and
Lackawanna
County
Watershed 2000
Program, on
reconnaissance
at Powderly
Creek,
Carbondale
Twp., May, 2001**





Outlet of the Old Forge Borehole adjacent to the Union St. Bridge, in Old Forge, PA. This borehole was constructed in 1962 by the Commonwealth of Pennsylvania. It discharges approximately 100 million gallons per day.

Standpipe discharge along the Lackawanna River near Vandling, PA. Its flow is less than 1 million gallons a day. This pipe was formerly a source of water for steam locomotives along the Delaware & Hudson Railroad.





Keyser Creek bank cut at Moffat Colliery culm dump site, causing heavy erosion of sediment and red ash (burned culm residue) into Keyser Creek and the Lackawanna River

Mine reclamation completed by PA Bureau of Abandoned Mine Reclamation, on a bond forfeiture site in Taylor, PA



C.1 River Reach and Tributary Stream Survey Reports Synopsis

The Lackawanna River Corridor Association conducted an extensive series of stream walk surveys along the entire length of the Lackawanna River (Hydrologic Unit Code: 02050107) from the confluence with the Susquehanna River at Coxtan, mile 0.0 to the PA 171 Bridge at Simpson, mile 30.7. The LRCA staff and volunteers also participated in stream walk surveys for the Upper Lackawanna watershed plan developed by the Trails Conservation Corporation (TCC). Please see the TCC's *Upper Lackawanna River Conservation Plan* for a discussion of those surveys.

In addition to river reach surveys, LRCA staff and volunteers also conducted tributary stream survey walks on forty tributary streams and drainages between Coxtan and Simpson. One-hundred-thirty-six miles of tributary streams were surveyed in addition to the 30.7 miles of river. Physical attributes, adjacent land use, water quality, habitat quality and related parameters were assessed in the surveys. Data was recorded for each quarter-mile. Six-hundred-sixty-seven data reports were generated on the river and forty principal tributaries.

An ascension chart has been developed to locate each tributary stream in order, proceeding upriver from the confluence. The chart provides some basic spatial data on each tributary and includes a listing of tributary sub-watersheds in their ascension order. Square mileage of tributaries and sub-watersheds has been developed from the PASDA database and from the Scar Lift program reports for the Lackawanna River (Peters Associates, Scranton; PA DER, 1971 & 1978).

Surveys were also conducted on eleven tributaries of tributaries in the lower and mid valley portions of the watershed with a particular focus on assessment of impacts from coal mining. The database created from the survey provides a comprehensive assessment tool for physical conditions in the Lackawanna watershed at the start of the Twenty-first Century. It is the intention of the LRCA to utilize this database as a benchmark to measure future environmental changes along the river and tributary streams and their adjacent watershed lands.

The survey data is presented for each river and tributary reach in a table, which indicates the number of quarter-mile reaches or total stream-miles exhibiting five physical habitat indicators. These indicators are:

1. Mining impacts:

- culm dumps, coal waste, over burden piles in and along the water course or in adjacent flood plain or upland areas
- coal mine structures
- acid mine drainage outfalls
- encroachment of mine waste into the water course

2. Urban impacts:

- Roads, buildings and impervious surfaces
- urban debris, coal waste deposited along water course or on the flood plain

- culvertization of the water course
- urban point and non-point pollutant source

3. Natural habitat:

- predominance of natural habitat
- woodlands
- wetlands
- geological feature, ledges, waterfalls

4. Natural flow:

- presence or absence of natural hydrologic stream flow
- flow loss due to mining impacts
- flow loss from water supply intakes
- flow influence from storm discharges

5. Channelization:

- manmade channel impacts
- concrete flood walls, levees, dikes
- rip-rap channels
- culvertization and concrete AU@ channels
- stone retaining walls
- railroad or mine related channel modifications

Water quality is not used as an indicator as part of this survey for several reasons:

- water quality in the Lackawanna is examined in multiple reports developed by LRCA and others during the past ten years
- PA DEP staff are presently (2001) conducting an unassessed waters study as part of the EFP2 process for the Lackawanna Watershed
- these water quality reports are incorporated by reference as part of the information base available on the Lackawanna watershed
- LRCA and others are involved in ongoing targeted water quality assessment work
- the focus on the presence or absence of water flow in the tributary streams is the primary water quality indicator in these desiccated sub-watersheds and suggests that reestablishment of base flow from the headwaters of these streams to their confluence with the river needs to be attained before the quality of the water or aquatic habitat can possibly be measured.

Water quality is, however, the most crucial measure of the overall health of a watershed. By reference to previous reports such as Scar Lift, (PA DER, 1971 & 1978), Lackawanna River Water Quality Investigations (PA DER, 1981, 1992), Lackawanna River Fisheries Habitat Study (PA F&BC, 1992-1997), Lackawanna River Watch Report (LRCA, 1999), LRCA believes that sufficient data is available to support the water quality recommendations in this conservation plan. In addition the PA DEP Bureau of Water Supply and Wastewater Management, Division of Water Quality Assessments and Standards (DWQAS) in compliance with Section 303(d) of the Federal Clean Water Act is conducting a survey to identify and assess all impaired waters in the Commonwealth. The Northeast Regional Office is surveying and assessing the Lackawanna Watershed during 2001 to identify and assess impaired reaches of the river and its tributaries. LRCA and DEP staff have and continue to share information on water quality and impairments.

The 303(d) work will be useful in conducting reviews for future permitting and understanding the effects of Total Maximum Daily Load (TMDL's). A significant shortcoming for the Lackawanna and other Anthracite watersheds is that 303(d) and other Clean Water Act parameters and requirements cannot accommodate the many impaired and degraded streams which loose flow to underground mine voids.

In addition to the physical conditions database, several stream walk surveys are further detailed through sub-watershed maps with corresponding numerical indicators of various physical conditions keyed to map locations. A narrative report summarizes all of the physical conditions, highlights the natural and cultural resources of each reach or stream and itemizes a list of recommendations cross referenced to municipality and agency.

The recommendations contained in these reports will serve as the catalogue of projects for implementation of the Lackawanna River Conservation Plan. The categories of recommendations are as follows:

1. Environmental restoration and mine reclamation

- removal of culm banks
- regrading of strip pits and overburden piles
- restoration of channel morphology and reestablishment of flow
- reestablishment of wetlands
- reestablishment of riparian and upland vegetation and habitat
- use of storm water system development or retrofit to restore natural stream flow and habitat function
- acid mine drainage treatment

2. Greenway corridors

- acquisition of stream/rail corridor property
- development of trails, trailheads, stream access points including fishing access, canoe and kayak sites

- integration of trails and greenways with environmental restoration, flood and storm management, utility corridors
- integration of greenways with municipal recreation facilities
- interface greenways and access with commercial sites
- integrate greenways with subdivisions and land developments
- development of river conservation interpretive, educational, and management facilities

3. Special place and natural resource areas

- acquisition and protection of special places, natural and cultural
- integration of special places into a regional open space natural resource management program
- development of public access, interpretive and educational facilities and programs for special places and natural areas
- develop programs and easements to work with private property owners to protect special places

4. Water quality, water resource protection

- develop source water protection programs with property owners, municipalities and utilities
- audit and enhance municipal ordinances to improve water resource protection
- create water resource protection coalitions to work in headwater areas
- promote water quality attainment within the stormwater management system
- promote upgrades to municipal sewer facilities and treatment plants in particular interceptor lines and CSO's
- promote water pollution prevention programs with authorities, municipalities, businesses and property owners

5. Small implementation projects

- small site bank stabilization
- river and greenway access
- small site ecological restoration
- interpretive and directional signage for small sites

Ascension	Tributary Name	River Mile of Confluence	Stream Order	Watershed Area (mi ²)	Length (mi)	Miles Surveyed	Tributaries Name(s)	Watershed Area (mi ²)	Length (mi)
1 (W)	Campbells Ledge Run	1.0	1		0.9	0.9	-		-
2 (W)	Red Springs Run	2.0	2	1.25	1.5	1.0	Unnamed trib 1		1.2
3 (W)	St. Johns Creek	2.8	2	7.19	6.0	3.0	Race Brook		1.8
							Unnamed trib 1		0.8
							Unnamed trib 2		1.7
4 (E)	Mill Creek	3.6	2	10.48	5.8	4.5	Lidy Creek	1.51	1.9
							Collins Creek	1.39	2.7
							Unnamed trib 1		1.0
5 (E)	Spring Brook	3.8	3	54.24	16.0	8.0	Covey Swamp Creek		3.8
							Monument Creek	2.59	2.7
							Trout Creek	4.54	3.0
							Green Run	4.32	4.6
							Un trib 1 (to Nesbitt Res)		0.9

								Rattlesnake Creek	6.24	4.2
								Plank Bridge Creek	1.25	2.5
								Painter Creek	4.52	4.2
								Panther Creek	2.65	1.8
								Unnamed trib 2		0.5
								Unnamed trib 3		2.1
								Unnamed trib 4		1.7
								Unnamed trib 5		0.3
								Unnamed trib 6		1.0
								Unnamed trib 7		1.6
								Unnamed trib 8		0.5
								Yostville Creek		1.3
								Unnamed trib 9		0.2
6 (E)	Greenwood Creek	6.5	1		2.0	1.0	-			-
7 (W)	Keyser Creek	7.3	2	8.58	6.0	5.0	Lucky Run		1.66	2.9

8 (E)	Stafford Meadow Brook	9.2	2	14.11	12.0	11.0	Lindy Creek	1.52	2.5
							Unnamed trib 1		1.0
							Unnamed trib 1		0.7
							Unnamed trib 2		1.5
							Unnamed trib 3		1.4
							Unnamed trib 4		1.4
							Unnamed trib 5		0.6
							Unnamed trib 6		0.7
							Unnamed trib 7		1.1
							Unnamed trib 8		1.0
9 (E)	Roaring Brook	9.7	3	53.68	18.0	16.0	Little Roaring Brook	3.06	3.4
							Lynnwood Run		0.5
							Unnamed trib 1		1.9
							Unnamed trib 2		0.9
							Unnamed trib 3		1.5

10 (E)	Pine Brook	11.2	1	2.0	0.0	-	Rock Bottom Creek	3.05	3.2
							Mud Pond Run		1.6
							Blue Shutters Run		1.2
							White Oak Run	3.22	2.7
							Kellum Creek	2.55	2.7
							Lake Hideaway Run		1.2
							Van Brundt Creek	3.24	3.4
							Langan Creek	2.20	2.6
							Bear Brook	2.25	2.3
							Bill's Market Creek		2.5
							Bloomington Creek		2.2
							Emerson Run (trib to Lake Run)	1.61	1.3
							Lake Run	1.83	1.4
							East Branch	5.86	2.5
10 (E)	Pine Brook	11.2	1	2.0	0.0	-			-

11 (E)	Meadow Brook	12.0	1	2.45	3.0	2.0	-	-	
12 (E)	Carter Creek	14.1	1		1.0	0.0	-	-	
13 (W)	Leggett's Creek	14.5	3	18.46	8.0	7.0	Leach Creek	2.55	2.3
							Summit Lake Creek	3.07	1.8
							Bell Mt. Run		1.9
							Layton Run		2.7
							Landsdowne Creek		2.0
							Venard Creek		0.6
							Edella Creek		2.0
							Edella Trib 1		0.6
							Edella Trib 2		0.5
							Griffin's Run		0.9
							Justus Run 1		1.4
							Justus Run 2		0.9
14 (W)	Greenbush Run	14.6	1		1.0	0.0	-	-	

[illegible]

								Unnamed trib 3	0.5
27 (E)	Winton Run	21.3			2.0	0.5	-	-	
28 (E)	Laurel Run	22.0	2	2.75	4.0	1.5	Unnamed trib 1	1.5	
29 (E)	White Oak Run	22.5	2	5.11	4.0	2.0	Spruce Swamp Creek	2.2	
								Indian Cave Creek	1.58
								Unnamed trib 1	0.8
30 (E)	Powder Mill Run	24.2	1	0.50	0.5	0.5	-	-	
31 (E)	Aylesworth Creek	24.3	2	6.71	4.3	4.3	Unnamed trib 1	0.7	
								Unnamed trib 2	1.5
								Unnamed trib 3	2.0
32 (W)	Woodland Run	24.4	1	0.50	0.5	0.5	-	-	
33 (W)	Calendar Gap Creek	24.8	1	0.76	4.0	2.0	-	-	
34 (W)	Rush Brook	25.1	2	6.00	4.0	4.0	Unnamed trip 1	1.2	
								Unnamed trib 2	1.8
								Unnamed trib 3	1.9

35 (E)	Hosey Creek	26.3	1	1.03	1.5	1.5	-	-
36 (E)	Powderly Creek	26.4	1	1.77	4.0	3.0	-	-
37 (W)	Lees Creek	26.7	1	0.73	3.0	1.0	-	-
38 (W)	Brookside Run	27.0	1		2.0	1.0	-	-
39 (W)	Fall Brook	27.9	3	12.46	5.0	2.0	Moutain Mud Pond Run	1.7
							Sandy Banks Run	2.8
							Unnamed trib 1	1.1
							Unnamed trib 2	0.3
							Finch Hill Run	2.2
							Crystal Lake Creek	0.6
							Unnamed trib 3	0.6
40 (E)	Racket Brook	29.2	2	5.28	6.0	3.0	trib. to Brownwell Res.	1.6
							trib from Carbondale Res. No. 4	0.9
41 (W)	Coal Brook	29.2	1	1.92	2.4	2.2	-	-
42 (W)	Wilson Creek	30.6	1	3.81	5.0	4.0	-	-

43 (E)	Panther Bluff Creek	31.7	1		5.0	5.0	-	-
44 (E)	UNT (Salko's Run)	33.3	1		1.0	0.0	-	-
45 (E)	Roger's Creek		2		1.8	0.0	Unnamed trib 1	0.5
46 (E)	Clark's Creek	34.8	2		2.2	0.0	Unnamed trib 1	1.5
							Unnamed trib 2	0.9
47 (W)	Meredith Brook	35.1	1			0.0	-	-
48 (E)	Brace Brook	36.4	2	2.99	3.0	0.0	Unnamed trib 1	1.4
							Unnamed trib 2	0.9
49 (W)	Unnamed trib	36.5	1		0.6	0.0	-	-
50 (E)	Unnamed trib	36.6	1		0.7	0.0	-	-
51 (E)	Unnamed trib	36.7	1		0.8	0.0	-	-
52 (E)	Stillwater Run	38.6	1		0.5	0.0	-	-
-	Stillwater Dam	39.5	-	-	-	-	-	-
53 (E)	East Branch	39.9	2	18.93	12.0	12.0	Orson/Lorain Tributary	2.8
							Dunns Tributary	0.8

54 (W)	West Branch	40.0	2	16.71	8.0	8.0	Bone Tributary	6.43	2.3
							Independent Tributary		1.1
							Headwaters		0.9
							Unnamed trib 1		1.3
							Fiddle Lake Creek		5.9
							Unnamed trib 1		1.6
							Unnamed trib 2		1.3
							Ball Lake Run		1.9

C.3 Lackawanna Watershed River Mileage Key

The following table lists physical locations along the main stem of the Lackawanna River (HUC 02050107). This table was originally compiled for the Citizens Master Plan for the Lackawanna River in 1988.

The confluence of the Lackawanna and Susquehanna Rivers at Coxton in Duryea, Luzerne County, is River Mile (RM) 0.0 (41°20'29N, 75°47'36W). The main stem of the Lackawanna River begins at Stillwater Dam near Uniondale, Susquehanna County, at RM 39.5 (41°40'47N, 75°28'20W).

Feature	Mile	Municipality & County
Confluence Lackawanna & Susquehanna Rivers	0.00	Duryea/Pittston Luzerne
Pittston Duryea Border	0.50	Pittston/Duryea Luzerne
Twin Rail Bridges	0.50	Duryea Luzerne
Coxton Road Bridge	0.75	Duryea Luzerne
Stephenson Street Bridge	1.85	Duryea Luzerne
Confluence Red Spring Run	2.00	Duryea Luzerne
Luzerne/Lackawanna County Border	2.60	Duryea/Old Forge Luzerne/Lackawanna
Road Bridge (Old Forge Bore Hole)	2.90	Old Forge Lackawanna
S.R. 3013 Bridge	3.30	Old Forge Lackawanna
Conrail Bridge	3.30	Old Forge Lackawanna
S.R. 3017 Bridge	3.45	Moosic Lackawanna
Confluence Mill Creek	3.65	Moosic Lackawanna
Confluence Spring Brook	3.85	Moosic Lackawanna
4th Street Abuts	4.60	Moosic Lackawanna
Old Forge/Taylor Border	5.85	Old Forge/Taylor Lackawanna
PA Turnpike Extension Bridge	6.10	Taylor/Moosic Lackawanna
Scranton/Moosic Border	7.00	Scranton/Moosic Lackawanna
Confluence Keyser Creek	7.30	Taylor/Scranton Lackawanna
McCarthy Street Dead Ends	7.90	Scranton Lackawanna
S. Washington Avenue Dead Ends	8.80	Scranton Lackawanna
Scranton/Taylor Border	9.05	Scranton Lackawanna
Confluence Stafford Meadow	9.25	Scranton Lackawanna
Elm Street Bridge	9.45	Scranton Lackawanna
Confluence Roaring Brook	9.70	Scranton Lackawanna
Broadway Street Bridge	10.00	Scranton Lackawanna
Scranton Street Bridge	10.60	Scranton Lackawanna
Railroad Bridge	10.65	Scranton Lackawanna
Steamtown Vicinity	10.70	Scranton Lackawanna
Lackawanna Avenue Bridge	10.70	Scranton Lackawanna
West Linden Street Bridge	10.90	Scranton Lackawanna
Olive Street Bridge	11.30	Scranton Lackawanna
Poplar Street Bridge	11.90	Scranton Lackawanna
Green Ridge Street Bridge	12.65	Scranton Lackawanna
Market Street Bridge	13.00	Scranton Lackawanna
Parker Street Bridge	14.25	Scranton Lackawanna
Interstate 81 Bridge	15.05	Scranton Lackawanna
Dickson City/Scranton Border	15.10	Scranton Lackawanna
Throop/Scranton Border	15.10	Scranton Lackawanna
Boulevard Avenue Bridge	15.60	Throop/Dickson City Lackawanna

Bridge Street Abuts	15.90	Dickson City Lackawanna
Olyphant/Throop Border	16.75	Olyphant/Throop Lackawanna
Lack. Co. Rail Authority Bridge	17.35	Olyphant/Throop Lackawanna
Lackawanna Avenue Bridge	17.75	Blakely/Dickson City Lackawanna
Jessup/Olyphant Border	19.10	Jessup/Olyphant Lackawanna
Bridge St/Depot St. Bridge	19.60	Jessup/Peckville Lackawanna
Hill St/Bridge St. Deckers Bridge	19.95	Jessup/Peckville Lackawanna
Archbald/Blakely Border	20.50	Archbald/Blakely Lackawanna
Winton (Hill Street) Bridge	21.10	Archbald Lackawanna
Archbald/Jessup Border	21.50	Archbald/Jessup Lackawanna
Monroe Street Bridge	22.35	Archbald Lackawanna
Gilmartin Street Bridge	22.65	Archbald Lackawanna
Archbald/Jermyn Border	24.00	Archbald/Jermyn Lackawanna
Delaware St/Bridge St. Bridge	24.70	Jermyn Lackawanna
Confluence Rush Brook	25.15	Jermyn Lackawanna
Jermyn/Mayfield Border	25.50	Jermyn/Mayfield Lackawanna
Poplar Street Bridge	25.70	Mayfield Lackawanna
S.R. 1008 Bridge	26.05	Mayfield Lackawanna
Confluence Powderly Creek	26.40	Mayfield Lackawanna
Carbondale Township/Mayfield Border	26.70	Mayfield Lackawanna
Meredith Street Bridge	26.90	Carbondale Township Lackawanna
Confluence Lees Creek	26.75	Carbondale Township Lackawanna
City of Carbondale/Carbondale Township Border	27.35	Carbondale Lackawanna
Confluence Greenfield Creek	27.70	Carbondale Lackawanna
Pike Street Bridge	27.75	Carbondale Lackawanna
Confluence Dougherty Creek	27.90	Carbondale Lackawanna
Lack. Co. Rail Authority Bridge	28.40	Carbondale Lackawanna
8th Avenue Bridge	28.70	Carbondale Lackawanna
7th Avenue Bridge	28.80	Carbondale Lackawanna
6th Avenue Bridge	28.90	Carbondale Lackawanna
Salem Avenue Bridge	29.05	Carbondale Lackawanna
Confluence Rackett Brook	29.20	Carbondale Lackawanna
John Street Bridge	29.50	Carbondale Lackawanna
Fell Township/City of Carbondale	30.10	Carbondale Lackawanna
Reservoir Street Bridge	30.70	Simpson Lackawanna
Abandoned Railroad Bridge	31.75	Fell Township Lackawanna
Abandoned Railroad Bridge	32.45	Fell Township Lackawanna
Abandoned Railroad Bridge	32.80	Fell Township Lackawanna
Vandling Borough/Fell Township Border	33.20	Vandling Lackawanna
Abandoned Railroad Bridge	33.50	Vandling Lackawanna
Lackawanna/Wayne County Border	33.55	Clinton Township Wayne
Wayne/Lackawanna County Border	33.95	Vandling Lackawanna
Lackawanna/Wayne County Border	34.40	Clinton Township Wayne
PA 247 Bridge	35.80	Clinton Township Wayne
Forest City/Wayne County Border	36.40	Clinton Township Wayne
River is County Border	36.40	Forest City Wayne/Lackawanna
Confluence Brace Brook	36.80	Forest City Lackawanna
Forest City/Clifford Township Borough	36.85	Clifford Township Susquehanna
Railroad Bridge Crossing	37.80	Clifford Township Susquehanna
Railroad Bridge Crossing	38.05	Clifford Township Susquehanna

Stillwater Dam	39.50	Clifford Township Susquehanna
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C.4 River Reach Survey Reports and Recommendations

The Lackawanna River Corridor Association's staff and volunteers conducted River Reach Surveys to assess physical condition, natural habitat and environmental impacts along the Lackawanna River between 1999 and 2001. For purposes of this survey, the river reaches were selected in three to five mile lengths from strategic points and bridge crossings. Each reach contains several common physical condition typologies, which provide a general characterization of the reach, such as abandoned mine land and acid mine drainage impacts, abandoned mine land-suburban borough land use, urban corridor, and abandoned mine land-successional riparian corridor.

The river reach segments in this report are as follows:

- R1 Confluence with the Susquehanna River in Duryea, Luzerne County, to Main Street bridge in Old Forge, Lackawanna County**
- R2 Main Street bridge in Old Forge to Davis Street/Union Street bridge in Taylor/Minooka (Scranton)**
- R3 Davis Street bridge in Taylor to Lackawanna Avenue bridge in Scranton**
- R4 Lackawanna Avenue bridge in Scranton to the Interstate 81 bridge in Scranton/Dickson City/Throop**
- R5 Interstate 81 bridge in Scranton to Mellow Park in Peckville**
- R6 Mellow Park in Peckville to Gilmartin Street in Archbald**
- R7 Gilmartin Street in Archbald to Meredith Street in Childs (Carbondale Township)**
- R8 Meredith Street in Childs to PA Rte. 171 bridge in Simpson (Fell Township)**
- R9 Rte. 171 bridge in Simpson to PA Rte. 247 bridge in Forest City/Browndale (Clinton Township), Susquehanna/Wayne Counties**
- R10 Rte. 247 bridge in Forest City to Stillwater Dam**
- R11 East Branch of Lackawanna River: Stillwater Dam to Mud and Dunns Pond**
- R12 West Branch of Lackawanna River: Stillwater Dam to Lake Romobe**

Summary reports and recommendations follow for Reaches R1 through R8. This plan contains a brief assessment report and summary recommendations for Reaches R9 through R12. More detailed and specific recommendations for these reaches are contained in the Upper Lackawanna River Conservation Plan, prepared by the Trails Conservation Corporation (TCC).

R1 Confluence to Main Street, Old Forge (RM 0.0 to 3.0)

At its confluence with the North Branch of the Susquehanna River at Coxtan, in Duryea Borough and the City of Pittston, Luzerne County, the Lackawanna is a fourth order stream. In recent years annual mean discharging has averaged 470 ft³/s. The Lackawanna descends for 60 miles through a 352 mi² watershed from an

elevation of 2000 feet, at Dunns Pond, to 520 feet at the confluence at Coxton. The river drops an average of 24 feet per mile.

Land use at the confluence was originally agricultural, then topsoil, gravel and coal mining. Abandoned, flooded and partially flooded topsoil pits predominate the topography of the confluence's flood plain today. The former Lehigh Valley, now Reading and Northern rail yard, is located one-quarter of a mile upstream from the confluence. The Coxton Rail yard bridges the Lackawanna at this point. The north branch Susquehanna Canal also crossed the Lackawanna on an aqueduct near the rail bridge. The lower Lackawanna was also dammed at the Luzerne-Lackawanna county line. A feeder canal from the dam provided water for the Wyoming Valley division of the Susquehanna Canal.

Campbells Ledge forms a large escarpment to the west of the confluence where the Susquehanna cuts a water gap in the west mountain and enters the Lackawanna Wyoming Valley syncline. Campbells Ledge, the confluence point and a nearby neolithic archeological site are included in the LRCA's List of Special Places and Natural Areas inventory of the Lackawanna watershed.

Coxton Road bridge crosses the Lackawanna from Main Street near the Pittston City Duryea Borough line at a point three-quarters of a mile upstream of the confluence. The east bank of the river is a steep fill slope holding an active railroad grade. The west bank is extensive flood plain with flooded topsoil pits and successional riparian forest.

The Lower Lackawanna Valley Sanitary Authority's sewage treatment plant and its discharge are located in the vicinity of Coxton Road on the west bank. The Duryea acid mine drainage (AMD) outfall flows into the river on the east bank at Coxton Road bridge. This 30-mgd AMD outfall flows for 800 feet through a channel from a roof fall now flooded in a beaver dam.

From Coxton Road north to Stephenson Street the west bank features the remnant of a graded levee covered with invasive knotweed and successional riparian forest. The interior floodplain contains the flooded topsoil and gravel pits known as the Duryea Swamps. The upland areas on the west mountain (see Campbell's Ledge and Red Spring Run reports) contain abandoned anthracite strippings and an active sand and gravel quarry

From Coxton Road to the central developed area of Duryea Borough on the east bank, the river channel is bifurcated with several islands and riffle structures. The east bank holds remnants of the canal prism. The developed area of Duryea, its Main Street commercial district and residential zones, is protected with a large earth berm flood control levee. The Borough clears out the vegetation along the levee mechanically and does follow up with applications of herbicide to prevent riparian tree establishment. The levee protection extends upstream of the Stephenson Street bridge to a point near the Luzerne-Lackawanna county boundary on the east bank. On the west bank the major land use is the Popple Brothers Colliery, a several hundred-acre coal processing area once known as the Babylon Colliery.

Three-tenths of a mile upstream of the Luzerne/Lackawanna county line, the Union Street bridge in Old Forge links Main Street with the Connells Patch neighborhood. The river channel makes a transition from having been dredged and channelized

around the Duryea flood walls, to the Class III and IV white water drops across the rock ledges of the Moosic Anticline, a subterranean geological feature which crests in the riverbed at Old Forge. The anticline rock formation forms a natural dam which separates portions of the flooded abandoned underground mine void network, forming the Northern Anthracite Mine Pool. There is another acid mine drainage discharge point at this location (41°21' 33N, 75°45'05W). The Old Forge Borehole discharges over 100 million gallons of acid mine drainage into the river a day, through a concrete covered trough, which flows out into the river beneath the western abutment of the Union Street bridge. The Old Forge Borehole is one of the largest acid mine drains in the anthracite coal region.

The rock ledges of the Moosic Anticline are evident upstream through the Main Street bridge and into the reach along Lonesome Road. Between Union Street and Main Street, the adjacent land uses are primarily residential, with one 30-acre abandoned mine site on the west bank adjacent to the Main Street bridge.

R1 Recommendations:

1. This plan recommends development of a confluence resource management area to involve: the Pennsylvania Fish and Boat Commission in wildlife habitat management, the Bureau of Abandoned Mine Reclamation and US Army Corps of Engineers in a large mine drainage treatment program, and the Lackawanna Heritage Valley Authority, local municipalities and Luzerne County agencies in a greenway and recreational trail program throughout the confluence area. Therefore, this plan recommends that a major resource management, reclamation and recreation development plan is needed. Private residential, commercial, institutional and industrial development is also recommended for the perimeter of the confluence area.
2. As a first step towards a confluence area plan, this plan recommends a consensus building project to be funded through the River Conservation Program.
3. Major transportation improvements will also be needed in this area. Access to Keyser Avenue in the north and I-81 and Rte. 11 in the east and south would need significant improvements.
4. The abandoned rail corridor from Coxtown through Connells Patch and the active Reading & Northern line to Taylor along the river, are important greenway links described in the trails section of this plan. These corridors are recommended for trail project implementation through this plan.
5. This plan recommends consideration of a large comprehensive acid mine drainage treatment and mitigation project, to treat the Old Forge Borehole, Duryea Outfall and Butler Mine Tunnel discharges. The US Army Corps of Engineers, Bureau of Abandoned Mine Reclamation and the Lackawanna Watershed 2000 program are the potential partners on this project. The Popple Brothers Colliery, the Duryea Swamps and the Lower Lackawanna Sewage Treatment plant are potential project resources.
6. The City of Pittston, the Borough of Duryea and the Luzerne County Rails With Trails program are potential cooperative partners with the Lackawanna Heritage Valley Authority and the LRCA for the development

of trail and greenway facilities along this reach of river corridor. Implementation projects to develop this partnership and acquire and develop greenway and trail sites are recommended.

R2 Main Street, Old Forge to Davis Street, Taylor/Minooka (RM 3.25 to 6.75)

This three and a half-mile reach begins at the Main Street bridge in Old Forge. The riverbed features rock ledges associated with the Moosic Anticline (see R1 narrative). The riverbanks are steeply pitching drops of 20-30 feet from the road grade to the water line. The river is bridged in quick succession by the Main Street steel truss, the former DL&W (now Reading & Northern) steel railroad truss bridge and the Bridge Street steel girders. The USGS, Old Forge River Gage Station is located on the west bank of the river just upstream of the rail truss.

Lonesome Road parallels the river's east bank for one-half mile from Main Street in Old Forge to Main Street in Moosic, near the confluence of Mill Creek. Land use along this reach includes a derelict four-story apartment building, several abandoned gas stations, a burned-out diner, a large auto junkyard and several used car lots. The west bank contains the Lehigh Electric Superfund site, a former electric transformer recycling facility, now cleaned up, but sealed and monitored under an EPA-managed closure program.

The river course turns northeast at the Mill Creek confluence. This site also features the recently decommissioned Moosic Sewage Treatment Plant, of the Lackawanna River Basin Sewer Authority. Just upstream, on the east bank, Spring Brook flows in the Lackawanna. The east bank through the residential area of Moosic features a flood control levee, from the Spring Brook confluence upstream to the Moosic Road bridge. Along the west bank, land use upstream of the Lehigh Electric site includes: the Reading & Northern rail corridor, Mariotti Lumber, Panel Prints, near the Moosic Road bridge, and a number of used car lots.

Along Moosic Road bridge, the river turns northwest around the Panel Prints plant. The Reading & Northern rail corridor is the main feature on the west bank through the balance of Old Forge. The Canadian Pacific rail line is located along the east bank in Moosic, through this sub-reach.

The river features natural riffle structures and long pools throughout the R2 reach. Steep embankments of 20-25 feet drop from the rail grades down to the watercourse. The embankments are covered with riparian forest of river birch and red maple, with invasive knotweed dominating the understory. The Old Forge upland area features Llewlyn sandstone ledges and escarpments, with dry site, oak-mesic forest communities. A multitude of abandoned mine entries are located along these escarpments. The LRCA lists these escarpments and this sub-reach of the Lackawanna on its List of Special Places and Natural Areas in the Lackawanna watershed. This area extends through Old Forge and Moosic from the vicinity of Panel Prints upstream to the Davis Street bridge.

The Northeast Extension of the Pennsylvania Turnpike crosses the river in this sub-reach, just upstream of the Old Forge-Taylor boundary. Adjacent land uses on the east bank in Moosic are the Turnpike gradient, abandoned mine land in upland areas and the Canadian Pacific rail corridor along the riparian edge. On

the west bank, the Borough of Taylor owns a river corridor access parcel adjacent to the Turnpike, between Main Street and the Reading & Northern rail grade.

From the Turnpike bridge upstream to Davis Street, the Llewlyn sandstone ledges continue to form escarpments from the developed residential corridor along Main Street, with 30-40 foot drops down to the rail grade on the west bank. The riffle and pool structure in the river remains consistent within the balance of the downstream reach.

The Canadian Pacific rail grade crosses the Lackawanna on a steel truss bridge. On the east bank there is a rail interchange, known as Minooka Junction, where the Canadian Pacific rail transects the Lackawanna County Rail Authority's (LCRA) Scranton to Carbondale main line. The LCRA rail corridor continues upstream through the balance of R2 on the east bank. On the west bank, the gravel bar upstream of the Canadian Pacific truss has been known to feature several rare plants listed on the Pennsylvania Natural Diversity Inventory (PNDI). This area, known as the Moosic Bend, is also listed on the Lackawanna County Natural Areas Inventory and the LRCA's List of Special Places and Natural Areas.

R2 Recommendations:

- 1. The Borough of Old Forge is interested in demolishing the vacant multi-story apartment structure at Lonesome Road and promoting redevelopment of this site. LRCA suggests that this site could be associated with a Heritage Landing or Trailhead as referenced in the Heritage Trail Alternatives section of this plan. This could include the former DL&W station site across the river. This project area is recommended as an implementation site for River Conservation program participation.**
- 2. The Lonesome Road area could support a high quality commercial, multi family, mixed-use development. This plan recommends that the Borough of Old Forge and private developers consider a redevelopment of this area.**
- 3. A Lonesome Road redevelopment could provide a link to a Moosic flood levee greenway recreation trail, to extend to Moosic Road as an alternative, or loop trail in conjunction with a Lackawanna River Heritage Trail route along the Reading & Northern corridor on the west bank. This property is recommended for a feasibility study pending the interest of Moosic Borough.**
- 4. This plan suggests that the Lackawanna River Heritage Trail alternative route along the Reading & Northern corridor be developed, with an additional acquisition and management program for the Old Forge escarpments. An acquisition and conservation management plan could be developed for the escarpment area as an individual project action in partnership with the Borough of Old Forge and property owners, or through the initiative of the LRCA and/or Lackawanna Valley Conservancy and individual property owners. A River Conservation project for the Old Forge Escarpments is a recommended action.**
- 5. The development of greenway and trail links across the Lackawanna from the Old Forge Escarpments to upland areas of Moosic, may be possible along abandoned rail corridors adjacent to the PA Turnpike, US Rte. 11, Interstate 81 and PA Rte.**

502. The purpose of these greenways are to link the river corridor to the Glen Maura/Montage area and to a Spring Brook greenway trail through PAWC and Theta Company lands, in the Spring Brook watershed. The development of this trail utilizing the abandoned Wilkes Barre & Eastern rail corridor would also link the Lackawanna corridor to Lackawanna State Forest and State Game lands in the upper Lehigh watershed and other resource areas in the Poconos. The development of a Moosic/Springbrook/Thornhurst/Pocono greenway is recommended for further consideration, as a feasibility study or for open space conservation acquisition.

6. The Borough of Taylor has an interest in developing river corridor and greenway access using its property adjacent to the PA Turnpike and through development of easements, acquisitions and improvements to other parcels in the river corridor in the Borough of Taylor. This plan recommends development of river access and greenway projects in Taylor for further implementation through this conservation plan.

R3 Davis Street, Taylor/Minooka to Lackawanna Avenue, Scranton (RM 7.0 to 10.0)

In this three-mile reach of the Lackawanna, the river transitions from the mixed use reaches of the smaller suburban boroughs of Moosic, Taylor, Old Forge, and Duryea, which have a variety of residential neighborhood, commercial and abandoned mine land uses, to the intensely urban reaches of the City of Scranton. From the Davis Street bridge, at RM 7.0, upstream to the Elm Street bridge in Scranton, at RM 9.45, the west bank of the river is consistent in its land use with the abandoned Central Railroad of New Jersey (CNJ) running along a terrace between 10-20 feet above the watercourse. A variety of abandoned mine land parcels in various states of succession are above the CNJ corridor, to the main line and rail yards of the St. Lawrence & Hudson division of the Canadian Pacific Railway.

The east bank of the river holds the Lackawanna County Rail Authority's (LCRA) Scranton to Carbondale main line, on a grade about 20 feet above the watercourse. Steep wooded slopes containing some abandoned strip mine pits rise to upland residential neighborhoods in South Scranton and Minooka. At RM 8.0 on the east bank, the flood plain and terrace holds the 22 million-gallon per day capacity Scranton/Dunmore Sewer Authority Treatment Plant, which occupies approximately 20 acres. Just upstream of the STP is the 70+ acre industrial site now known as Valley Storage, a warehousing operation. The facility, built in 1942-43, was the first project of the Scranton-Lackawanna Industrial Building Company (SLIBCO), which was built with financing through the War Production Board, and used by aircraft manufactures, which made B24 and B29 wing assemblies. From 1880 to 1901, this site was the location of the South Works of the Scranton Iron and Steel Company. These steel mills were purchased by Bethlehem Steel and were disassembled and moved to Lackawanna, New York, near Buffalo in 1901-03.

The natural course of the Lackawanna River was altered by the steel works construction in the 1880's. The river's course and banks are severely influenced by the steel, coal and rail uses, which occurred historically within this reach. The river bank along the Valley Storage site is occupied by a large retaining wall constructed from 2'X6'X8' blocks of conglomerate sandstone and steel mill slag. The retaining wall is penetrated by several stone and brick arched culverts which convey overflows from CSO chambers, located approximately 200-600 feet inland of the

river bank. These are just a few of the nearly 70 CSO's on the Scranton/Dunmore sewer system.

The land use on the west bank, above the CNJ corridor, is the abandoned Baker Colliery mine site. A large culm bank and underground mine fire at the Baker was extinguished in the 1970's. A cavernous pit over 150 feet in depth, approximately 300-400 feet wide and nearly one-half mile in length is located in the upland part of the Baker site, near the Canadian Pacific rail line.

From RM 9.25, at the confluence of Stafford Meadow Brook to RM 10.0 at the Broadway/Hickory Street bridge, the east bank of the Lackawanna is altered by the South Scranton Flood Control Project. An earthen rip rapped levee runs from the Stafford Meadow Brook confluence, which is itself in a concrete "U" channel, upstream to the Elm Street bridge. A concrete floodwall runs from Elm Street up to the Roaring Brook confluence. Roaring Brook is cased in a concrete "U" channel from Cedar Avenue to its confluence. An earthen and rip rapped levee runs upstream to the Hickory Street bridge.

The flood plain in this neighborhood, hosts commercial uses, neighborhood strip-shopping centers and warehouses. The historic, mixed-use neighborhood was destroyed during the Hurricane Diane floods of August, 1955. The flood control structures and commercial reuses of the flood plain are the result of that flood of record for the Lackawanna watershed.

The west bank flood plain in this sub-reach features the William Schmidt Recreation Complex. The upland areas are residential and commercial neighborhoods of West Scranton. Upstream from Broadway Street and the Schmidt Complex, the CNJ rail corridor, now developed as the CNJ section of the Lackawanna River Heritage Trail, runs on a gradient from 15-30 feet above the watercourse. The CNJ corridor contains some riparian canopy trees with knotweed dominating the understory. The river's gradient drops from Lackawanna Avenue to Hickory Street. The short riffle, followed by long pool structures, common above and below this sub-reach, is interrupted by several strong riffle drops, ledge and boulder drops and intrusions.

LRCA calls the sub-reach between Hickory Street in R3, upstream to Linden Street in R4, the Scranton Canyon. The river makes a deep incisive cut in the upland topographic grades in this area. The road and rail bridges cross the Canyon about 100 feet above the elevation of the watercourse. The grade separations are often reinforced with a variety of stone masonry and concrete retaining walls, the oldest dating back to the 1840's.

The LCRA Scranton to Carbondale line follows the east bank terrace of the river from Roaring Brook upstream through the balance of R3 and into R4. The flood plain on the east bank at Cliff Street and RM 10.7 holds the Cliff Street yards of PG Energy, a gas utility. This site hosted a coal gasification plant from 1854 to 1954. The soil, subsoil, river bank and riverbed are impacted with coal tar residuals throughout this site and downstream in the riverbed. The utility has registered the site under the Pennsylvania Act 2, Industrial Site Contamination Program. Part of the site has been capped with asphalt to divert direct groundwater paths to the river. LRCA has collected river sediment samples adjacent to the site, which yielded heavy concentrations of polycyclic aromatic hydrocarbons and a variety of

benzene compounds with known carcinogenic properties (LRCA/NOAA project, 1996).

The upland areas on the east bank contain the former Delaware, Lackawanna and Western railroad yards and shops, which has been redeveloped to host the Steamtown National Historic Site and the Lackawanna Trolley Museum. Adjacent to this site is the Central Scranton business district. Between the Steamtown rail bridge at RM 10.7 and the Lackawanna Avenue bridge, the CNJ rail grade has been filled by the property owners with potentially compromised soils from rail yard excavations.

R3 Recommendations:

- 1. This plan recommends development of the Scranton to Taylor reach of the CNJ section of the Lackawanna River Heritage Trail, with a trail head near Depot Street. An upgrade of Depot Street, the public grade crossing of the Canadian Pacific trackage and improvements to the Depot Street/Main Street intersection would enhance public safety and aesthetics in this area.**
- 2. This plan recommends that Lackawanna Valley Conservancy (LVC) work with property owners to develop or acquire easements or fee interest in properties along this reach.**
- 3. This plan recommends development of a trail link to South Washington Avenue in Scranton from the CNJ, using the existing rail bridge at the Valley Storage site. This could provide a loop trail using the Elm Street bridge.**
- 4. This plan recommends development of an educational/interpretive program for the South Works site and its slag dump, now owned by LVC, along the CNJ on the Taylor side of the river. Presently, there is a cut stone title block from the steel company office building covered in overgrown shrubbery at the Washington Avenue entrance to the Valley Storage site. The educational/interpretive program could also address the war production and SLIBCO history at the site.**
- 5. This plan recommends developing a river access point along the CNJ across from the Stafford Meadow Brook confluence.**
- 6. A major cleanup of urban debris is needed along South Washington Avenue, off the entrance driveway to Valley Storage.**
- 7. Acquisition of the Danny's Garage site could provide an enhanced trailhead at Elm Street, an interpretive site for a reuse development of the Baker Colliery site and a maintenance station for the trail.**
- 8. A pedestrian loop trail on the flood works along the east bank between Elm Street and Hickory Street could compliment the CNJ trail and the recreational uses at Schmidt Field. A footbridge over the Roaring Brook confluence would an element in this implementation project.**
- 9. Canoe-a-thon and recreational paddle uses of the river would be enhanced with an improved canoe access and landing beach at Schmidt Field. This plan recommends an improved canoe access site at this location.**

10. Installation of a new pedestrian bridge at Cliff Street would offer opportunities for historical interpretation of the original 1794 log bridge between Slocum Hollow and Hyde park, the railroad development of 1850 and the gas works of 1854. This pedestrian bridge would also serve as a greenway link from the CNJ trail to Streamtown.
11. Engineering, acquisition and construction funding for the Bridge 60 to Lackawanna Ave. reach of the CNJ trail is recommended for implementation with River Conservation Program funding and other sources of funding. Trailhead links to Lackawanna Avenue and the river would help in integrating this segment of CNJ trail and river corridor into the Downtown Scranton River Greenway.

R4 Lackawanna Avenue, Scranton to Interstate 81, Scranton/Dickson City/Throop (RM 10.25 to 15.0)

This five-mile reach of the river corridor and uplands is the most consistently urbanized reach in the entire watershed. Yet surprisingly, the river is almost entirely buffered by a riparian canopy. River birch, red maple, willow and tree-of-heaven, form the canopy, and knotweed dominates the understory. The riparian corridor is mostly confined to the immediate riverbanks but expands wherever the flood plain remains unbuilt.

Starting on the west bank at Lackawanna Avenue, the Central Rail Road of New Jersey Freight Station dominates the built environment, with its Victorian-Gothic brick and slate roofline and stair tower. The adjacent Lackawanna Avenue bridge, constructed in 1921 of formed, reinforced concrete, gracefully arches across the Lackawanna and its flanking rail grades, with a classic pinaché, absent from its modern and post-modern upstream neighbors. Linden Street saunters over the river with the mundane vernacular of a 1960's era interstate bridge, while the new Mulberry Street/Expressway span throws itself across with the sharp angularity of a late cubist sculpture.

The riverbank through the upper end of R3 and into R4 almost to Linden Street, is girded on both sides with stone and concrete retaining walls. These structures make access with the watercourse extremely difficult. At Linden Street the flood plain and terrace opens up on both sides of the river. Steep banks dropping from the terrace 15 feet to the watercourse are common.

On the east bank the Lackawanna County Rail Authority's (LCRA) Carbondale line occupies the initial terrace. Upstream of Lackawanna Avenue, the Diamond/Greenridge branches of the DL&W lie immediately below the Mifflin Avenue grade to intersect with the Carbondale line near Gordon Place.

On the west bank, newly developed commercial and educational sites interface with the river from Linden Street through the Expressway along 7th Avenue to Olive Street. The Redners Supermarket site abuts the river on a terrace with a new concrete block retaining wall, 25 feet high. The flood plain features an access roadway along an abandoned rail corridor, linking Love Road to the CNJ rail grade at Lackawanna Avenue bridge and CNJ station. This roadway also serves as an access road to Scranton Sewer Authority CSO structures.

Upstream of Linden Street, the access roadway passes under the Expressway bridge and becomes Love Road to Olive Street. The interior flood plain now features the

new Scranton High School athletic fields between the river, Olive Street and 7th Avenue. The new high school itself rises proudly on the upland slopes between Memorial Stadium and the Scranton Expressway.

North of Olive Street a variety of industrial uses dominate the west bank flood plain. This area was historically known to feature the Native American settlement known as Capouse Meadows. The Farmers Market is located off Middle Street and Albright Avenue.

On the east bank, from the confluence of Pine Brook below Olive Street, through the Sandy Banks neighborhood, the LCRA rail corridor and vacant land are common flood plain and terrace uses. The Diamond branch, 1885 iron rail truss bridge crosses the river at the Farmers Market. At this writing, the City of Scranton and the US Army Corps of Engineers (USACOE) are beginning acquisition of property in preparation for construction of a flood control system on the west bank from the Expressway bridge at RM 11.0 to Wood Street at RM 12.5. Another levee is scheduled in the next few years on the east bank, from Meadow Brook confluence near Albright Avenue, to the Lackawanna County Rail Authority bridge near Amelia Avenue.

The west bank adjacent land uses between Albright Avenue and Wood Street are primarily residential, as are the east bank along Nay Aug Avenue. The upland area along North Main Avenue, off the west bank, is a predominant mix of commercial with residential, while the interior flood plain on the east bank from Albright Avenue to Green Ridge Street and East Market Street is a mix of commercial, light manufacturing and residential.

From Greenridge Street to East Market Street, the river's west bank, its railgrade terrace and upslopes to the Main Avenue corridor are heavily impacted by the dumping of building demolition waste, urban and municipal waste, white goods and auto parts. Rudy's Auto Parts junkyard occupies approximately four acres adjacent to the East Market Street bridge, along the remnants of the NYO&W rail corridor.

Upstream of East Market Street into the Plot neighborhood, the Lackawanna Valley Conservancy (LVC) owns a four-acre reach of NYO&W rail property. This site has been cleaned of urban waste and restored as a community trail and river corridor greenway. The east bank holds the Scranton Wiping Cloth warehouse and vacant industrial land along the proposed upstream tie-in of Greenridge Street (east bank) levee.

The USACOE proposes a third levee around the Plot neighborhood on the west bank, from the LVC's rail grade parcel at Depot Street, to an upstream tie-in along Leggetts Creek near Welles Street. Presently, this sub-reach of river contains a predominantly residential land use along the west bank. The Plot neighborhood occupies the flood plain, surrounded on three sides by the Lackawanna River.

The east bank through this sub-reach, from the LCRA rail truss at Amelia Avenue through Sanderson Avenue and along the rear of Boulevard Avenue to Parker Street is a very steep 1 to 1 slope rising from the river's edge to the back yards of residential and commercial buildings. There are some sections of this slope with extensive debris dumps and fill slopes. A noteworthy feature on the east bank below the intersection of Boulevard Avenue and Olyphant Avenue, is the portal entry of

the Underwood Tunnel, constructed by the Pennsylvania Coal Company in 1909. This three-mile long rock tunnel runs on a east-northeast alignment to Dunmore, near the I-81/PA Rte. 347 interchange, where it turns to the northeast, terminating in the Underwood Colliery workings in Throop. This tunnel was built to drain the mines along its route. Subsequent to abandonment, the mine drainage continues through the mine pool and discharges at the Old Forge Borehole. The Underwood Tunnel does not carry any regular flows to the Lackawanna.

From Parker Street north to the I-81 bridges, the LCRA's Carbondale line runs along the west bank of the river and over the Leggetts Creek confluence at RM 14.5. The east bank hosts the remnants of the Marvine Colliery of the Hudson Coal Company, a 400 plus acre abandoned mine site with extensive culm banks along the river bank and flood plain, which rise for one-half mile upland towards Marywood University. The I-81 drainage channel, a 2.5 mile culvert and rip rap drainage basin system, flows into the Lackawanna on the east bank, between the Lackawanna County Recycling Center and I-81.

R4 Recommendations:

- 1. This plan recommends a major debris removal and community cleanup along the banks of the Lackawanna in Scranton. The USACOE project will address several sub-reaches, the Lackawanna River Heritage Trail (LRHT) will address another several reaches, however other reaches will need program attention; particularly the Boulevard Avenue sub-reach, from Sanderson Avenue to Parker Street. The LRHT program will need assistance within the Greenridge Street to East Market Street sub-reach, with building debris, auto parts and junkyard soil removal. Therefore this plan recommends a variety of cleanup projects in Scranton be developed with River Conservation program implementation grant support.**
- 2. As recommended in the Trails Alternative Report, a Scranton greenway area is proposed from Cliff Street through Lackawanna Avenue, the Mulberry Street/Expressway area to Olive Street, on both sides of the river. This would include the Gas Works, the Verrastro site, the CNJ station site, the LCRA' Carbondale line, Diamond and Strawberry Hill lines, the Redners site, the new Scranton High School campus and adjacent recreation facilities to Olive Street. An appropriate historic, cultural, retail and public access/commercial reuse for the Sprague and Henwood site on Olive Street is suggested.**
- 3. River access improvements for water access and water contact are recommended throughout this sub-reach. A canoe/paddle sport put-in and take out beach (constructed point bar) is a requirement, with interface to the school district site and the CNJ site. Foot bridges to access east bank activity locations and uplinks to the street grade at Mifflin and Spruce Streets are suggested.**
- 4. This plan recommends the installation of a low-flow weir, with fish and canoe passage structures, be installed near Linden Street, to create a navigation pool of sufficient depth for rowing and paddling use and excursion boat use from Linden Street to Albright Avenue. A low-head structure of four feet at Linden Street could provide a pool for navigation one-mile upstream the Farmers Market. The USACOE had identified low-flow navigation weirs as a possibility in this area during the Lackawanna River Greenway Study in 1993. This plan recommends a reexamination of this topic to advance the recreational and commercial redevelopment potential for this important river reach.**

5. This plan recommends that an upgrade of the USACOE levee project is needed to integrate managed recreational trail and public access use along the entire levee alignment in Scranton. This will require a reexamination of the fee and easement acquisition pattern along the levee to fund the acquisition of remaining residual fee interest of adjacent property owners. An integrated physical, structural and public use management plan is necessary as well as physical facilities, trail heads, parking access, signage, landscaping, public informational materials, and a promotional, public involvement and volunteer utilization program. These needs may be met through the intermunicipal agreements for the Lackawanna River Heritage Trail Commission. This plan recommends a River Conservation implementation program to develop a levee trail system and integrate it into the LRHT program.
6. This plan recommends acquisition of a portion of the former New York, Ontario and Western railway from the upstream termination of the Weston Field levee at Diamond Avenue, through to the TEA 21 funded LRHT acquisition of NYO&W parcels north of Greenridge Street. The property is a strategic trail link and will insure safe access and passage for trail users under Greenridge Street and East Market Street, to avoid pedestrian crossings of these busy streets.
7. This plan recommends canoe/paddle sport and fishing access, put-in and take-out points along the R4 reach at Mulberry-Linden Street, Olive Street, Albright Avenue, Diamond Avenue, Nay Aug Avenue, East Market Street, Amelia Avenue, Sanderson Avenue and Parker Street. The development of these points should include acquisition of fee or easement integration with levee projects, parking, signage and provisions for public safety, river access and physical management.

R5 Interstate 81, Scranton to Mellow Park, Blakely (RM 15.25 to 19.25)

This four-mile reach of river in the lower mid-valley has recovered from the adverse impacts of the anthracite industry urban development to a point where it now supports a native wild trout population. The river features a constant series of riffles and pools interrupted at two locations by channel dredging conducted in the 1950's following Hurricane Dianne in August 1955.

From the I-81 bridge to Boulevard Avenue bridge in Throop the adjacent land use is the Throop Plant of the Lackawanna River Basin Sewer Authority, an eleven million-gallon per day capacity plant. A residential neighborhood abuts the plant along Boulevard Avenue.

On the west bank, the Lackawanna County Rail Authority's (LCRA) Carbondale line follows the first terrace above the flood plain upstream of I-81 for one-quarter mile, to a point where the Dickson City local flood protection levee begins near the Elm Street Park off Boulevard Avenue. This levee continues for one mile upstream to Polonia Park, providing protection to the extensive residential neighborhood on the lower Dickson City flood plain along Boulevard Avenue.

On the east bank in Throop, the Lackawanna Valley Conservancy owns a 2-acre parcel of flood plain and upslope to the Oleckna Street residential neighborhood. The river makes a bend above the Boulevard Avenue bridge with the cut bank on the Throop side along the conservancy parcel. Upstream in Throop there is a small local flood protection levee along the Belmont Street/Sanderson Avenue neighborhood adjacent to the Sulfur Creek Confluence. Above this point lies the 200 +/- acres of the lead contaminated Marjol Battery site. Upstream of Marjol, the

east bank topography rises in elevation several hundred feet into the Eddy Creek Colliery property. A narrow flood plain of a few dozen feet gives way to a one-in-one gradient. The flood plain and uplands have remnants of original habitat in a few patches; rhododendron and oak, with some mountain laurel are growing along ledges of Llewlyn Sandstone outcrops. This area transitions into a large debris slope of strip mine overburden out cast from the ridgeline. This debris slope covers a 20-acre area approximately one-half mile in length. It is composed of 2 to 4 foot slabs of Llewlyn sandstone and shale of varying thickness up to 2 feet. This material is rich in carboniferous age fossils.

The east bank elevations descend in a shallower gradient to the north of this point into Valley Junction at RM 16.7. This point is adjacent to the Lackawanna County Services building at the intersection of Eagle Lane and Enterprise Street in Dickson City. It is marked on the east bank by the Throop-Olyphant border, near an abandoned rail grade and bridge abutment. On the west bank the wooden remnants of a railroad trestle are known locally as the Trestle Hole Fishing Area. Historically, Valley Junction was the western terminus of the inclined plane operations of the Delaware and Hudson Gravity railroad. From Valley Junction south, the D&H used steam locomotives to haul coal and freight to and from its mines in the Providence section of North Scranton. From Valley Junction north to Carbondale and over the Moosic Mountain to Honesdale and the D&H Canal, the Gravity Railroad used a system of stationary hoisting engines and inclined planes. This system operated through Valley Junction from 1856 until 1899.

North of Valley Junction, the river is bordered by the abandoned mine land parcels of the Olyphant and Eddy Creek Collieries. These parcels cover four hundred acres of flood plain and uplands on both sides of the river. Economic redevelopment projects are underway at the Olyphant Colliery site, off Main Street in Dickson City. Several sections of the west bank have recently been re-graded for the reconstruction of several thousand feet of LRBSA Sewer interceptor pipeline. The river makes several 90-degree turns around Olyphant.

The downtown commercial district of Olyphant Borough lies on the flood plain, exposed to the river's course on the south and northwest. This district and adjacent residential neighborhoods have been subject to repeated flooding since the 1850's; the most recent being the ice-flood of January 1996. Demolition of river bank homes and structures is now underway in preparation for a flood control levee project.

The three Mid Valley Boroughs of Dickson City, Olyphant and Blakely have a common boundary point at the Lackawanna Avenue bridge. Blakely corners, off the west bank, features an anchor from the aircraft carrier USS Wasp in commemoration of Captain Johnston Blakely, commander of the first USS Wasp, a sloop which saw action in the War of 1812.

Upstream of the Lackawanna Avenue bridge through RM 18.0, the PA Department of Transportation installed numerous channel deflectors and boulders to restore natural sinuosity to the river's course and to enhance aquatic habitat. This project was installed in 1996 as mitigation for the loss of habitat resulting from stream culvertization under the Governor Robert Casey Highway. It has been very effective in restoring fish habitat through a sub-reach that had previously been dredged and channelized.

The west bank, through RM 18.0, features remnants of the NYO&W rail grade on a terrace along the floodplain. Passing into the Peckville section of Blakely, the Lackawanna Outfall AMD channel confluences with the river at RM 18.0. The Olyphant Flats neighborhood lies along the east bank floodplain into Condella Park. In Peckville, the Mott Haven neighborhood lies along the floodplain through the confluence of Wild Cat and Tinklepaugh Creeks and along Riverside Drive into Mellow Park, which extends upstream to PA Rte. 247 at Keystone Avenue.

The east bank across from Mellow Park features rock and coal outcrops in several ledges with remnant rhododendron and mountain laurel groves. The Lackawanna Heritage Crossing, a 150 foot pedestrian bridge, crosses the Lackawanna at the upper end of Condella Park and the lower end of Mellow Park. This bridge is the first link in the 40-mile Lackawanna River Heritage Trail, built in 1992 through a partnership of the LRCA, Lackawanna Heritage Authority, the boroughs of Olyphant and Blakely and several hundred local families and businesses, who contributed funds to purchase planks on the bridge. This site once featured trestles carrying the D&H Gravity Railroad.

Upstream of the bridge and the rock outcrops, Sterry Creek enters the river near the Jessup/Olyphant border. The river drops through several rock ledges, sluices and riffles in the Mellow Park sub-reach and flows through a riffle and pool structure downstream. This sub-reach of stream is classified as a Class A wild trout fishery by the Pennsylvania Fish and Boat Commission. Water quality for aquatic habitat is good to excellent, having improved significantly since the 1973 start-up of the LRBSA system. Bacterial and floatable contamination from discharging CSO's are an occasional water quality concern. The smaller AMD's in this and upstream sub-reaches have only a minimal effect on aquatic habitat quality.

R5 Recommendations

- 1. This plan recommends that the Olyphant flood levee project and any future flood control projects in Dickson City, Throop or Blakely, be designed and constructed to accommodate trail use, protect river access, habitat and water quality. The maintenance and restoration of a forested riparian buffer through this reach is a vital necessity.**
- 2. This plan recommends development of easements, acquisition or conveyances of rights-of-way for trails and riparian greenway corridors along the river and Eddy Creek in the Olyphant/Eddy Creek Colliery area. This proposal can be integrated with economic redevelopment, abandoned mine land reclamation and public infrastructure work, at this and related sites.**
- 3. Several trail and greenway alternatives are recommended in the Lackawanna River Heritage Trail Alternatives section (Appendix A) of this plan for this site. Please refer to that section for additional recommendations.**
- 4. The preservation and reuse for pedestrian trail linkages of the surplus 1906 truss bridge on the Lackawanna County rail line, near the South Valley Avenue crossing and Queen City Station, is recommended.**
- 5. The LRCA, LHVA and Dickson City are encouraged to cooperate on a signage program to integrate the Boulevard Levee into the LRHT system as soon as possible.**

6. The development of a historical interpretive program with signage and a Kiosk Exhibit is recommended at the Valley Junction/Trestle Hole site.
7. The preservation and re-use of the Olyphant Colliery/Eddy Creek Colliery rail trestle is recommended.
8. The development of a west bank trail along the NYO&W and Erie Railroad grades, from Blakely corners to Peckville and Mellow Park, is recommended.
9. The development of a mitigation and habitat enhancement for the Lackawanna AMD Outfall and its channels is recommended.
10. The development of a bicycle route along the river through Mellow Park to provide LHRT continuity is recommended. The costs for fencing, signage and other improvements to help develop a separate bike route through Mellow Park are recommended to be funded as an early implementation project through the River Conservation program.
11. The development of LHRT routing along the Olyphant Levee is recommended as a priority action pending completion of levee construction. Development of a bypass alternate or screening alternate is recommended where the interface between the levee and residential homes is a concern.
12. Development and installation of historical and interpretive signage at the Heritage Crossing site in Mellow Park is recommended to focus on the gravity railroad, mine reclamation, trout and aquatic habitat and river conservation.
13. An upgraded river access point at Wild Cat Creek confluence is recommended for Canoe-A-Thon and for regular public access for canoeing and paddle sport take out and put-ins. This would require parking, creation of graveled pathways, informational signage, installation of vegetation and screening to address neighbor privacy issues. The Borough of Blakely would need to approve and partner with LRCA and others to accomplish this recommendation. The St. Nichols Church parcel adjacent to the Lackawanna Outfall near the Haband Company facility is an alternate site, which offers another physically appropriate paddle sport access point.

R6 Mellow Park, Blakely to Gilmartin Street, Archbald (RM 19.5 to 22.7)

This three-mile reach contains some outstanding wild trout habitat, challenging Class III whitewater ledges and drops, and the Blakely to Archbald reach of the Lackawanna River Heritage Trail, along parts of the former New York, Ontario and Western (NYO&W) Railway.

The reach begins at Mellow Park. There is a residential subdivision and a plumbing warehouse along the west banks in Peckville between Mellow Park and the PA Rte. 247 bridge. The Jessup side is similarly occupied with residential uses along the floodplain. Residential use continues to the area upstream of Deckers Bridge at River Mile 20.

The west bank carries the LHRT on the O&W rail grade which runs along a 5-10 foot high retaining wall for one-quarter mile above and below Deckers Bridge.

The Gravity Slope acid mine drainage outfall is located on the west bank floodplain near the Archbald/Jessup/ Blakely border point near RM 20.5. The Rose pile, a

100-foot high culm dump covers 30 acres of the river flood plain at the confluence of Grassy Island Creek. This confluence was restored using a geomorphologic design in 2001 by the Lackawanna County Conservation District to address a channel failure and erosion of coal waste into the Lackawanna from the Rose pile as a result of the January 1996 floods.

From the Rose pile to the Winton Street bridge, the predominant adjacent east bank land use is the Lackawanna County Rail Authority's Carbondale rail line and the river terrace with the 400-plus acres of the Pompey Colliery abandoned mine land site in the uplands.

The LHRT along the O&W rail grade forms a greenway corridor along the west bank to Winton Street. North of Winton Street, the Brojack culm bank is located at the site of the former Waddell breaker. This 100-acre abandoned mine land culm pile sits directly on the flood plain of the Lackawanna River and is in immediate contact with the watercourse during high flow events. The O&W rail grade continues through this area on a terrace about 30-40 feet above the floodplain. There is an extensive grove of rhododendron along this sub-reach of river and rail corridor. Industrial and residential uses continue on the upland area of this sub-reach to Monroe Street.

From Monroe Street to Gilmarten Street, the neighborhood commercial district of Archbald is located along Main Street immediately adjacent to the river.

Along the east bank from Winton Street for three blocks to the dead-end of River Street, the Winton neighborhood of Jessup provides a small residential use along the floodplain. From this point upstream into Archbald, the east bank is a steep upland slope rising 20-30 feet to a terrace, which carries the LHRT alignment along the LCRA Carbondale line. Once into Archbald, the LHRT alignment descends onto the floodplain to the trailhead at the Laurel Street cul-de-sac.

The electric generation plant and industrial site operated by PG Energy, a gas utility is located upland of this sub-reach. This 50 plus, mega watt plant and related industrial sites occupies a 400-plus acre abandoned mine land which once hosted the Gravity Slope and White Oak Collieries of the Hudson Coal Company. Several buildings, including the Shifting Shanty of the Gravity Slope are located near the river and the Laurel Street cul-de-sac. The Borough has recently acquired these structures with an interest in a historical district restoration.

Along Laurel Street on the east bank, the predominant land use is wooded riparian corridor along the river with three homes at one location adjacent to the stream. The boroughs of Archbald, LRCA and LHVA have developed numerous improvements to the river corridor through the David Maslair Park. This includes a section of the LHRT as far as Monroe Street.

From Monroe Street to Gilmartin Street, the O&W rail corridor follows the riverbank with a 12-20 foot retaining wall as grade separation. Residential use predominates the adjacent area. The Archbald Borough Building is located at the confluence of White Oak Run and the river along Church Street near the St. Thomas Aquinas Catholic Church. The Gilmartin Street bridge nearby is presently closed pending demolition and replacement.

R6 Recommendations

- 1. This plan recommends mine reclamation work at the Pompey site and the Brojack site. LRCA also recommends the removal of the Rose pile and the Waddel pile and the restoration of floodplain habitat on those sites.**
- 2. A multi-objective combined sewer overflow and acid mine drainage remediation project is recommended at the Gravity Slope outfall.**
- 3. An environmental restoration of the Winton Rocks habitat along the LRHT is recommended.**
- 4. A stabilization and interpretive project is suggested for the abandoned Erie Rail grade and its bridge abutments at Winton.**
- 5. Enhancements to the riparian landscape and access pathways are suggested for Winton and the Sarah Braty Park area.**
- 6. A mitigation or treatment project for the Dana Tunnel outfall is recommended to reduce aluminum sulfide pollution.**
- 7. Improved pedestrian access to Dougher Island is recommended.**
- 8. Support for interpretive and historic district development at Gravity Slope is recommended.**
- 9. Continued acquisition of former NYO&W rail grades for the development of LHRT is a priority recommendation.**

R7 Gilmartin Street, Archbald to Meredith Street, Carbondale Township (RM 22.7 to 27.0)

This approximate four and one-half mile reach holds a transition from natural stream channel to levees and floodwalls at Mayfield. There is a larger amount of undeveloped open space and abandoned mine lands in the Archbald/Jermyn sub-reach and a small but intense series of urban use at Jermyn/Mayfield.

The river maintains good aquatic habitat conditions and a vibrant reproducing Wild Trout Fishery. A mix of riffle and pool structures is interrupted by concrete flood control works at Mayfield and the rock ledges of the Moosic anticline and the remains of the Powder Mill Dam at Jermyn.

From the Gilmartin Street bridge upstream for one half mile, Main Street follows the river west bank to a point near the USGS Archbald River Gauging Station. Residential properties lie to the western side of Main Street. Several have old stone retaining walls in their backyards rising up the hillside. These circa 1845 era walls are remnants of D&H Gravity railroad inclined planes.

The east bank holds the former NYO&W rail corridor along the terrace for three miles to just past Delaware Street in Jermyn. Two reaches of east bank floodplain hold the LRBSA Archbald Treatment Plant at RM 23.0 and the remnants of the Powder Mill Dam and Moosic anticline outcrop at RM 23.4. The Powder Mill Dam site on the east bank is owned by the Lackawanna Valley Conservancy, which manages the twelve acres for habitat conservation and public access for passive

recreation. This site features the confluence of Aylesworth Creek. West bank floodplain contains several small residential subdivisions including the Woodlands, which was built on the former Powder Mill site itself. The main residential and commercial district of Jermyn lies along the west bank of the river along Washington Avenue (Main Street). This residential/commercial use continues into the Borough of Mayfield.

On the east bank in Jermyn the river corridor holds the LCRA Carbondale line on its terrace, the upland land use at the former Raymond Colliery site is the Rapid Pallet Company. On the west bank, the Rush Brook Creek confluence with the river is adjacent to the Rushbrook Street PA Rte. 107 extension road which crosses the river at RM 24.25.

The east bank from RM 24.3 upstream through Mayfield to RM 25.9 has been altered with flood protection levees. One sub-reach for one-quarter mile above and below Poplar Street bridge in Mayfield features a concrete “U” channel open box culvert with a concrete drop structure or weir. Both sides of the river are altered in this sub-reach.

Above this point, the river floodplain is in a wooded undeveloped use through to the Lackawanna Heritage Center campus at the Mayfield/Carbondale township border, RM 26.7, with the exception of a reach of NYO&W property at the Cemetery Street bridge. At this location, the property owner is conducting an unsightly but apparently legal dumping and filling operation adjacent to the FEMA designated floodplain.

R7 Recommendations

1. This plan recommends acquisition of the balance of NYO&W undeveloped parcels in Archbald, Jermyn, Mayfield and Carbondale Township for development of the LRHT.
2. This plan recommends construction of a pedestrian river crossing bridge at River Street in Jermyn on the NYO&W and at Rush Brook; original abutments are in place at these sites.
3. This plan recommends additional acquisition of river corridor lands where and when they are identified or become available.
4. This plan recommends a partnership with Jermyn Borough and others to develop a park, river access, historical and cultural interpretive program and habitat restoration at the confluence of Calendar Gap Creek in Jermyn.
5. This plan recommends a LHRT linkage to the pathways along the Mayfield flood control levees and a linkage to the Lakeland elementary center.
6. This plan recommends no action other than interpretive signage and monitoring for the Jermyn Tunnel AMD discharge.
7. This plan recommends public involvement with property owners; individuals and community groups to clean up debris and litter and protect river related resources in this and other river reaches.

8. This plan recommends environmental audits to update river conservation and protection capacities of local municipal ordinances.

R8 Meredith Street, Carbondale Twp. to PA Rte. 171, Fell Twp. (RM 26.9 to 30.7)

This four mile reach of the Lackawanna transitions from more sparsely developed uses downstream, through the intensely developed urban corridor of the City of Carbondale, and then abruptly to undeveloped abandoned mine lands and forest lands north of PA Rte. 171. The river gradient drops gradually but steadily through riffles and pools through the entire reach. Several sub-reaches bear evidence of historical river channelization work associated with railroad and coal mining. Water and habitat quality support a Class A wild trout fishery. Numerous CSO points and obsolete municipal sewers cause endemic point sources of pollution and should caution water contact.

From Meredith Street to Pike Street in Carbondale, the land use is vacant or commercial. The Bauman scrap yard, covered in successional woods with knotweed, lies along the NYO&W rail grade, as does the former Mermelsteins store, now a strip mall along Bus. Rte. 6. Tuzzies Trucking yard at Pike Street is a cause for concern with contaminated soils in evidence from automobile and truck fluids and lubricants.

Mixed residential and commercial use predominates as Bus. Rte. 6 parallels the river, becoming Brooklyn Street along the flood plain in south Carbondale. The Carbondale High School, elementary center, recreation fields and commercial shopping uses occupy the flood plain where Fall Brook joins the river. This was the location of the Carbondale mine fire, a multi-year, multi million dollar project to extinguish an underground fire which necessitated removal of nearly 400 homes and businesses and the excavation of a 600 foot by one-half mile by 300 foot deep trench, needed to extinguish burning coal measures.

The east bank of the river from Meredith Street to Pike Street is predominately an abandoned mine land site, with advanced successional growth. The PPL electric utility occupies a facility on a 40-acre parcel at Meredith Street. The river flows along this reach at the base of a 10 foot by 50 foot high slope of mine wastes, covered by vegetation in advanced succession. The mine waste pile drops abruptly near the Off Track Betting property at Pike Street. Residential and small commercial uses are evident along the east bank of the river from the Pike Street bridge to the Lackawanna County Rail Authority's (LCRA) rail grade crossing. The LCRA grade is the predominant use upstream on the east bank to its crossing of the river near Brooklyn Street.

From this point for the next mile upstream to RM 29.2, at the confluence of Racket Brook, the Lackawanna River flows through the heart of the downtown Carbondale commercial district. The river's course is bracketed by stone and concrete walls, some over 100 years old. Four city streets cross over the river on concrete bridges; two of these bridges are new (7th and 8th Avenues), and the old concrete arch bridge at Salem Avenue is scheduled for replacement in 2001-02; the other at 6th Avenue has weight restrictions.

The historic Carbondale City Hall and Pioneer Square are located off the east bank of the river at 6th Avenue and North Main Street. Carbondale City Hall is the oldest

continuously used government building in Lackawanna County. The original part of the structure at the rear, dates back to the 1850's, when this area was still part of Luzerne County.

The Racket Brook confluence on the east bank marks the location where the first D&H gravity railroad inclined plane was initiated into operation in 1829. Coal was first mined by founders of the D&H, the Wurtz brothers, in 1822. Remnants of the D&H steam era roundhouse occupy the west bank of the Lackawanna across from Racket Brook. The Carbondale Rail Yards Industrial Park occupies the west bank and flood plain of the river for the next mile up to the PA Rte. 171 bridge. A walking path follows the wooded river bank, providing a buffer between the Industrial Park access road and businesses, and the river. The NYO&W rail corridor crossed down town Carbondale and the Lackawanna River on a large, mile long elevated trestle, similar to elevated subway line in New York City or Chicago. The O&W station was located astride this bridge, between Dundaff Street and the river, near where the post office is now located.

The structure terminated on a terrace above the east bank along the Maplewood Cemetery. The O&W rail grade and a parallel D&H rail grade run for a quarter-mile upstream. The D&H grade crosses the river on a 1909 steel truss into a private parcel (Thorton's scrap yard) in the former rail yard industrial area. The O&W continues along the east bank to intersect with the Rte. 171, near the Holt Lumber Yard and the Gentex works in Simpson.

Main Street in Simpson (Rte. 171) parallels the east bank of the Lackawanna for three-quarters of a mile from the Gentex works to the Rte. 171 bridge. There are several residential and commercial properties which border the river and a 1000-foot sub-reach where Rte. 171 lies directly along the river bank.

The Delaware and Hudson Company had channelized the Lackawanna from Simpson through Carbondale to facilitate their coal and railroad operations during the 1820's to the 1950's. The area of the Morse Street bridge at RM 30.5, between Main Street, Simpson and the Doyle & Roth industrial site, downstream of the Rte. 171 bridge and the Wilson Creek confluence, had been altered by D&H with reinforced concrete flood walls constructed in 1910. These walls helped to reinforce previous work done by the D&H to eliminate the naturally braided channel and broad flood plain of the Lackawanna to create the Carbondale Rail Yards and locomotive shop complex, at the beginning of the 20th century. This river area had once given Carbondale it original name, "Ragged Island."

R8 Recommendations:

- 1. This plan recommends completion of the Lackawanna River Heritage Trail as described in the Trails Alternative Report, including several links to the D&H and O&W trails.**
- 2. This plan supports restoration of the stone floodwalls and installation of river access points through the City of Carbondale.**
- 3. This plan recommends development of a Heritage Landing at the Racket Brook confluence and the D&H round house site. This site could become a Carbondale River Commons.**

4. This plan recommends development of a greenway and recreational easement with PPL and other property owners between Meredith and Pike Streets along the east bank.
5. This plan recommends the development of conservation easements for greenway and recreational purposes along all sub-reaches of the Lackawanna, including the Thorton property at the former Carbondale rail yards.
6. A river access and educational site at the Schoolside branch of PennStar Bank could improve river access and presentation of in-stream river and watershed education. This plan recommends improvements and easements at this site.

R9 through R12: The Upper Lackawanna River

The upper Lackawanna River is included in the Upper Lackawanna River Conservation Plan prepared by the Trails Conservation Corporation (TCC), with the participation of the LRCA. Detailed information and recommendations for the upper Lackawanna are included in that planning document, which is incorporated into this document by reference. Tributaries to the river between PA Rte. 171 in Simpson and Stillwater Dam, and the East and West Branches and their tributaries, are included in the ascension chart in this document. A synopsis of physical conditions, narratives and plan recommendations for R9 through R12 follows below. See the Upper Lackawanna document for further detail.

R9 PA Rte. 171, Simpson to PA Rte. 247, Forest City (RM 30.7 to 35.8)

Once above Rte. 171, the prevalent land use on the east bank is forestry and on the west bank a mix of abandoned mine lands, forest and residential. The river falls in a steep gradient from Forest City to Simpson, with numerous riffles, ledge drops and a unique twin waterfall at No. 10 Hole, near River Street in Simpson.

The abandoned D&H and O&W rail grades parallel the river through this reach. The 1500-acre Panther Bluff tract between the river and the Moosic Mountain ridgeline is being preserved through conservation easements. The D&H is owned (with a 6500 foot exception) by the Rail Trail Council of Northeast Pennsylvania (RTC NEPA). The RTC holds easements on the O&W through this reach and R10 as well.

The Northwest Coal abandoned mine land and culm dump at RM 33.0 is problematic with AMD surface flows and erosion of culm during high flow periods. Illegal dumping of household and automotive wastes have been problems, along with vandalism, in this reach. The exquisite Panther Bluff gorge, a rhododendron and hemlock-lined ravine cutting through Pocono and Llewlyn strata, is located at RM 31.75, on the Panther Bluff Preserve tract.

R9 Recommendations:

1. Panther Bluff ravine and the preserved tract as well as the No. 10 Hole twin waterfalls are included on the LRCA's List of Special Places and Natural Areas. These sites are recommended for stewardship management activities and educational programs.

2. The Northwest Dump culm pile is recommended for removal and site reclamation. This plan recommends a conservation subdivision development as an appropriate reuse of the site.
3. This plan recommends acquisition of the balance of the 6500-foot gap in the D&H right-of-way.
4. This plan recommends development of interpretive programs for the abandoned mine land sites and the Grey Slope Colliery area.

R10 PA Rte. 247, Forest City to Stillwater Dam, Uniondale (RM 35.8 to 39.5)

Forest City and Browndale are notable urban and suburban mixed land uses in the upland areas of this reach. The Yucca Flats (Hillside Colliery) site is a large abandoned mine land site between the D&H and river, at the edge of Forest City.

The Forest City Pennsylvania American Water Company (PAWC) Filtration Plant and a small intake dam are located at RM 36.0, just downstream of the Brace Brook confluence. The balance of adjacent land use to Stillwater Dam is vacant, abandoned mine land sites and forestry. The O&W and D&H rail corridors continue to the Rte. 171 bridge at RM 38.0. The D&H follows along the west bank and shoreline of old Stillwater and Stillwater Dam.

Old Stillwater Dam is a water supply reservoir owned and operated by PAWC. The original dam was reduced in 1960 as part of the construction of Stillwater Dam (RM 39.5) by the US Army Corps of Engineers, to provide flood control protection to the Lackawanna Valley.

Stillwater Cliffs is a large scenic escarpment at RM 38.0 forming a water gap at a point where the Lackawanna syncline ridge doubles back on itself, forming the Moosic and West Mountain ranges. Stillwater Cliffs is an escarpment of Pocono conglomerates and sandstones. A large block of sandstone on the cliffs had been sculpted by an amateur sculptor from Forest City in the 1920's. Known as Old Stone Face, the carved stone resembles George Washington.

R10 Recommendations:

1. This plan joins TCC and RTC in recommending a reclamation and redevelopment plan for the Yucca Flats area.
2. This plan recommends acquisition or protection by conservation easement of appropriate river corridor or upland properties, including the Stillwater Cliffs area. Stillwater Cliffs and Stone Face are included on the LRCA's List of Special Places and Natural Areas.
3. This plan recommends an implementation program to match River Conservation funds with federal funds to perform a reallocation and reauthorization study of Stillwater Dam and its management authorizations. The study would have multiple goals including:
 - reallocation of water regime to allow maintenance of a deeper, larger base pool:
 - o to reduce water temperature of the base release flow

- o to allow a reserve for flow augmentation releases for recreational paddle sport use of the Lackawanna on a prescribed schedule between April and October, integrated with fisheries management needs.
 - authorization for greater public access and use of Stillwater Dam and Lake, including recreational trail linkage across the face of the dam between the D&H and O&W railroads.
 - authorization to allow creation of a state or regional park management and facility development
4. The LRCA considers upgrades to sewer facilities in the Lackawanna basin a priority action. While not appropriate for River Conservation funding, this plan recommends eliminating all CSO's on the Vandling/Forest City/Browndale system a priority action.
 5. This plan recommends that the municipalities in R10 consider conducting environmental audits of their comprehensive plans, zoning, land use and subdivision ordinances to insure they are employing up-to-date practices to aid in the protection and conservation of watershed resources. These audits are recommended for implementation funding through the River Conservation program.

R11 East Branch Lackawanna River, 53(E)

The twelve mile long East Branch rises in a series of glacial bogs and lakes, including: Lake Lorain, Orson Pond, Bone Pond, Independence Pond, Dunn Pond and Mountain Mud Pond, in Arrarat Township, Susquehanna County and Preston Township, Wayne County. The East Branch flows through an 18 mi² watershed to confluence with the main stem at Stillwater Dam.

The East Branch is a high quality, cold water fishery, with a Class B fishery rating. Water quality is good to excellent. Land use is marginal agriculture with some dairy, successional abandoned farms and forestry. Arrarat Mountain and Sugar Loaf Mountain at 2400 feet are the northern terminus of the Moosic Mountain range. Dunn and Mountain Mud Ponds, 400+ acre Theta Company properties, are habitats for several rare or endangered plant and animal species. These important conservation properties are on the LRCA's List of Special Places and Natural Areas of the Lackawanna Watershed.

R11 Recommendations:

1. This plan recommends the acquisition of Dunn Pond and Mountain Mud Pond and any other appropriate lands as may be available for perpetual conservation purposes.
2. This plan recommends environmental audits to update municipal capacity to manage and protect watershed resources.
3. This plan recommends acquisition of the O&W rail grade and its development as a recreational conservation corridor.

R12 West Branch Lackawanna River, 54(W)

The eight mile long West Branch rises in Sink Hole Swamp, Lake Romobe, Hathaway Pond, Fiddle Lake, Ball Lake, Lowe Lake and Lewis Lake in Arrarat, Herrick and Clifford Townships, Susquehanna County. It joins the East Branch in the reservoir at Stillwater Dam near Uniondale. The second order West Branch has several first order tributaries in its 17-mi² watershed.

Water quality is good to excellent with dairy farming land use causing some concern in Herrick Center and summer cottage use generating fecal contaminants at some of the source ponds. The D&H rail trail is a consistent land use from Stillwater Dam to Sink Hole Swamp, at the head of Lake Romobe.

R12 Recommendations:

- 1. This plan recommends acquisition of Theta Company lands such as, Ball Lake and the West Branch parcels and other lands, to conserve watershed resources and preserve open space at the headwaters of the Lackawanna.**
- 2. This plan recommends continued improvements to the D&H rail trail along the West Branch.**
- 3. This plan recommends support for artistic and cultural activities and programs in the upper Lackawanna watershed.**
- 4. This plan recommends sanctions or incentives to remove dairy cattle from the water course and related water bodies in the upper Lackawanna.**
- 5. This plan recommends environmental audits of municipal capabilities to conserve and protect watershed and open space resources.**
- 6. This plan recommends support for the establishment and operation of Environmental Advisory Committees by municipalities throughout the Lackawanna watershed.**

C.5 Tributary Stream Reports and Recommendations

1(W) Campbells Ledge Run

Campbells Ledge Run is a first order stream approximately one-mile long, rising in springs on the West Mountain ridge at Campbells Ledge adjacent to the confluence of the Lackawanna and Susquehanna rivers. The headwaters of Campbells Ledge Run are encompassed in private property owned by Theta Corporation including the Campbells Ledge and Falling Spring Reservoirs. The original confluence of Campbells Ledge Run with the river has been obliterated by extensive soil and gravel excavations along the flood plain. These pits are flooded, with the Run providing the base hydrology maintaining the pool elevation. The flooded pits are known as the Duryea Swamps. Between the swamps and the ridge top reservoirs, the Run drops precipitously along the reservoir access road off Coxton Road. The run loses flow to infiltration just prior to entering the swamps.

The ruins of some waterworks buildings are located about midway between the reservoirs and the flood plain. The upland areas are characterized by successional vegetated stripping pits and overburden piles. The upland forest cover is degraded second growth with signs of high-grade timber harvest.

The reservoir access road also accesses the summit of Campbells Ledge, a significant natural feature and a landmark in the Lackawanna and Wyoming Valley. The ledge is a 300 to 400-foot high escarpment, which forms part of the water gap where the Susquehanna River enters the Lackawanna-Wyoming syncline. Luzerne County EMA maintains a radio transmitter at the Ledge.

Recommendations:

1. The Duryea Swamps may provide the site for a large scale acid mine drainage (AMD) treatment program to treat flows from the Old Forge Bore Hole and the Duryea Outfall. Some mine reclamation work to address flow loss and strip pits could enhance the stream corridor and upland habitat.
2. The swamps are also possible sites for a water fowl management program and a viable warm water fishery.
3. The upland terraces between the swamps and the reservoirs offer potential residential development sites.
4. The reservoir areas offer ridge-top reservoir conservation opportunities with a recreational use as appropriate. There are public safety issues associated with the escarpment and the present remoteness of the ridge top sites. Several of the larger private parcels at the reservoirs are owned by Theta Corporation, a real estate holding business formerly associated with the PG Energy/PG&W gas and water utility.
5. This plan recommends that the future land uses in the upland/reservoir area be focused on recreation/conservation uses above the reservoirs with a transition into residential use between the upland sites and the flood plain at Coxton Road. The Swamps need to be reserved for recreation/conservation uses and potential AMD mitigation.

2(W) Red Springs Run

Red Spring Run is a small second order stream, with a one-mile long tributary, draining a 1.25 mi² watershed just north of Campbells Ledge Run. Rising in springs on West Mountain, the stream and its tributary drop in a steep decline to the flood plain along the Lackawanna/Luzerne County line at Duryea and Old Forge. The streams originate along the Llewellyn-Pocono boundary at the 1200 foot elevation and is quickly affected by abandoned mine impacts.

An active quarry permit #40900304, to Airport Sand and Gravel (3-007-1) is a major activity in this watershed. Stream flow loss begins above the Airport Sand and Gravel operation. Red Springs Run flows through a small remote residential cluster, part of the Connells Patch neighborhood, adjacent to the Popple Brothers Colliery. This site was formerly the Babylon Breaker. The Popple Colliery buildings and the nearby residential cluster, form a unique remnant of the colliery/patch community once common in the valley.

The lower portion of Red Springs Run's stream channel is impacted by mining operations. It flows into the river through a concrete culvert at RM 2.0. An abandoned Lehigh Valley rail corridor crosses the creek just above its confluence with the river.

Recommendations:

1. Effective regrading, revegetating and erosion control are needed at the Airport Sand and Gravel site.
2. Upland mine reclamation could promote residential reuses linked to similar uses at Campbells Ledge.
3. Portions of the Popple Colliery site may be appropriate for an AMD mitigation project for the Old Forge Bore Hole.
4. The colliery buildings and adjacent residential cluster offer historic preservation and interpretative opportunities.
5. The rail corridor can be developed for greenway-rail trail links from Connells Patch Park (softball complex) in Old Forge to Stevenson Street and Coxton Road sites in Duryea.
6. The Popple Colliery culm banks should be reclaimed and the site restored for flood plain habitat.

3(W) St. Johns Creek

St. Johns Creek and its tributaries, Race Brook, Sawmill Creek and an unnamed tributary, form a 7.19 mi² watershed in Ranson Township, Taylor and Old Forge Boroughs, Lackawanna County. Rising on West Mountain, the stream flows down steeply pitching terrain before encountering a broader, nearly level flood plain along Keyser Avenue near the Pennsylvania Turnpike. From there it flows southerly and joins the river near Union Street in Old Forge, 500-feet upstream of the Luzerne/Lackawanna county line and 500-feet downstream of the Old Forge Bore Hole, one of the largest acid mine drainage points in the anthracite coal region.

The headwaters of the creek and its tributaries are springs along the upper reaches of the West Mountain ridge in Ranson Township. The upper watersheds are forested with diverse second and third growth native trees. There are ruins of water works along Race Brook above the Austin Heights neighborhood. Sawmill Creek has been relocated into an artificial channel, with splash pools, and some naturalistic structure, by the Alliance Landfill. The main stem of St. Johns is partially channelized around the north side of the landfill, along and through the PA Turnpike/Keyser Avenue Exit complex.

Due to infiltration into the underground mine pool, St. Johns and its tributaries lose their base flow to the mines; the main stem loses flow along the north side of the landfill, Sawmill Creek loses flow between the landfill and Keyser Avenue and Race Brook loses flow where its channel was altered by the developer of homes in Austin Heights.

From the turnpike to the river, the creek has lost its channel integrity due to sediment transport, shallow gradients and channel braiding. Significant amounts of sediments are generated from the reach of Sawmill Creek between the landfill and St. Johns, at the rear of JoJo's Travelers Garage. Other sediments are generated from mine waste deposited along the water course by historic mining operations. Some of this material has been graded into the flood plain and water course by developers and adjacent property owners. The St. Johns corridor between Sibley Avenue and Connells Patch also features an abandoned railroad right-of-way, the Lehigh Valley Railroad's Sibley branch and the St. Johns Creek branch of the Lower Lackawanna Sanitary Sewer Authority interceptor line. There are several borough, school district and fire company owned properties along the St. Johns corridor:

1. Sibley Avenue recreation site under development (Borough)
2. Eagle McLure Fire Company grounds
3. Old Forge High School Campus
4. Connells Patch Softball Complex (Borough)
5. Milwaukee Avenue soccer field, under development (Borough)

Recommendations:

1. Perform a Growing Greener audit of zoning, land use and subdivision regulations to improve watershed and open space protection.
2. Promote the installation of natural stream channel restoration designs, to eliminate sediment transport and restore natural stream functions and habitat.
3. Facilitate upgrades to storm water systems to enhance water quality in watershed.
4. Facilitate improvements to sanitary interceptor system.
5. Acquire and develop a greenway for recreation and open space protection, utilize abandoned rail corridor and linkages to borough, school district and fire company properties. Link greenway to Lackawanna River Heritage Trail.

6. Acquire protective easements along restored stream reaches.
7. Develop easements or acquisitions to conserve Race Brook water works and upper headwaters areas of Race Brook, Sawmill and St. Johns creeks.
8. Involve school district and watershed residents in educational and stewardship activities.
9. Link greenway to Luzerne County trails.
10. Facilitate development of Heritage Trailheads at rail station or historic site in Old Forge.
11. Develop interpretive site and trail link at, Old Forge Bore Hole and Moosic anticline ledges in riverbed.

4(E) Mill Creek

Mill Creek drains a 10.48 mi² watershed in the Southeast portion of the Lackawanna Watershed. The 5.8 mile long stream and its tributaries rise along the flanks of Suscon Mountain in the Moosic Mountain range in Pittston Township, Luzerne County.

Mill Creek crosses into the Llewellyn coal formation at 1200' in elevation. It cuts down a steep ravine adjacent to Suscon Road. A portion of the ravine is accessible along an abandoned Erie Rail Road grade. There are several scenic cliff faces, waterfalls, splash pools within a canopy of hemlock and an understory of rhododendron. Most of the ravine is in private property parcels.

Below this reach Mill Creek flows for approximately one mile through a 1200 acre plus tract of mixed oak forest, occupied by the Akzo Nobel Dupont Explosives Company. LRCA secured special permission to survey Mill Creek through this property.

The stream channel, riparian and upland habitat of the Akzo Nobel tract are in fairly natural condition of successional forest cover. There are two small impoundments related to the previous manufacturing uses of the site. The small dams are breached and the impoundments have transitioned into wetlands. There is no evidence of strip mining on this site. Stream flow loss becomes evident about 500' from the downstream end of the Azko Nobel property near O'Hara Road. The Mill Creek channel was dry from 500' above O'Hara Road to its confluence with the Lackawanna during the survey period.

From O'Hara Road to Interstate 81 the dry streambed exhibits evidence of past surface mining and contemporary urban storm water flows. There is a concrete channel liner between Interstate 81 and the PA 315-Suscon Road intersection in Dupont. This liner was ruptured in several places during the flood of 1996. These ruptures provide direct access for stream flow infiltration into underground mine voids. A maintenance road along this reach has greenway trail potential.

Mill Creek flows through central Dupont along PA 315. The creek has been channelized throughout this reach. The channel work is an eclectic mix of WPA era stone walls and concrete culverts and retaining walls, characteristic of 1960 and 1970's state road and flood protection projects. The Mill Creek channel work dissipates near the US Rte.11

overpass at the Avoca-Dupont Borough boundary. The US Rte. 11 overpass location is a strategic point in the Mill Creek watershed. As the creek cuts a deep channel through a ridge of Llewlyn sandstone. The two main tributaries, Collins Creek and Lidy Creek enter Mill Creek above this point in Dupont which lies along a broad flood basin of Mill Creek.

Collins and Lidy Creek rise on the ridge line above the Wilkes Barre-Scranton International Airport and flow through the International Trade Zone Industrial Park, where both tributary streams begin to lose flows to the mine pool. This survey indicates that Collins Creek is incorrectly located on USGS quadrangle maps.

The Rte. 11 overpass site features a concentration of road, rail and utility infrastructure. The Canadian Pacific, St. Lawrence and Hudson Division main line passes through the creek's gap in the sandstone ridge, as does the Reading and Northern line from Allentown to Pittston. The track structure of the Reading and Northern crosses Mill Creek on a diagonal trestle set within the 100- year flood way of the creek at this strategic choke point. This site was once featured in "Ripley's Believe It or Not," as a location where three railroad and one highway bridge criss-crossed over one another.

The Heidleburg Colliery is the predominant land use in the next reach of Mill Creek as it passes into Avoca. There is a complete degradation of stream channel and habitat due to mining, railroad and urban impacts.

There was a state funded channelization project under construction on the mile and a half reach of Mill Creek through Avoca during the survey period. This project offered a sharp contrast between two types of habitat degradation as a concrete "U" channel is installed to replace the remnant natural stream channel filled with coal wastes, sediment and urban debris. The channel project could have provided greenway or parkland opportunities; however its single purpose mission prevented the borough from taking advantage of a once in a lifetime opportunity to restore the stream corridor for multiple objectives.

The Avoca reach also hosts a 40-acre adjacent site, featuring a closed-down railroad tie preservative treatment facility, operated by the Kerr-McGee Corporation. The Borough of Avoca with the assistance of PA DEP has recently engaged Kerr-McGee in a dialogue on an assessment and management program for this site. LRCA staff has noted numerous anecdotal evidence of potential off-site migration of preservative materials during the Mill Creek survey.

The flood channel work terminates on the upstream side of a 100 plus year old Erie Railroad stone arch culvert. This culvert crosses the creek near the Luzerne-Lackawanna county border. The creek flows through a successional riparian corridor with numerous evidence of coal waste piles and sedimentation of coal waste in the streambed.

Mill Creek passes under Main Street in Moosic adjacent to its intersection with Lonesome Road in Old Forge. Mill Creek flows into the Lackawanna River 1000 feet downstream of this intersection along Lonesome Road. The Moosic Sewage Treatment Plant of the Lackawanna River Basin Sewer Authority formerly discharged into Mill Creek near its river confluence. This plant was closed and its flow diverted to the Lower Lackawanna Valley system in 2000.

Recommendations:

Due to the extent and scope of environmental destruction caused by mining, urban and transportation related impacts, lower Mill Creek is not a viable candidate for an ecological restoration in its entirety. With the restoration of natural base flows, some of the remaining unchannelized reaches have some restoration and greenway potential. The newly constructed flood culvertization and concrete channel system in Avoca has some recreational greenway potential, however, the extensive concrete system can never support a naturally analogous riparian corridor.

The Kerr-McGee Corporation's railroad tie treatment plant in Avoca may be a continuing source of both environmental quality and human health concerns. The Schott Optical facility in Duryea may be a source of ground water contaminants from lagoons containing metallic glass wastes. Soil assessments conducted for the Avoca flood control project also indicated the presence of coal tar residues in the streambed sediments. LRCA suggests that soil, sediment and groundwater studies should be considered in the lower watershed to assess or discover the scope and sources of contamination.

The following recommendations are included in this plan as projects eligible for River Conservation program implementation or as action by LRCA, private or municipal interests:

1. A clean up of coal waste sediments (possibly contaminated from industrial sources) is recommended in the confluence reach from Moosic, Old Forge through Duryea to the Erie railroad culvert and the Avoca flood works. This reach is further recommended for installation of a naturally analogous restoration. A riparian flood plain buffer presently exists and is in need of zoning protection and/or acquisition on the Old Forge/Duryea side of this reach. An abandoned rail corridor lies along the Moosic side and is also recommended for acquisition and greenway development.

2. With the abandonment of the Moosic sewer plant discharge by LRBSA, municipal officials are encouraged to work with property owners along Lonesome Road to clean up and enhance their properties. Lonesome Road could be targeted for a community development initiative.

3. The Borough of Avoca may wish to consider creation of a continuous pedestrian-bicycle recreation greenway along the Mill Creek flood control works. Construction and maintenance easements can form the basis for an acquisition and recreational greenway development project. A pedestrian bridge or grade crossing will be required over the secondary, rail freight branch line.

4. The Heidleburg reach contains challenges which need to be addressed by various agencies:

- a culm bank removal-abandoned mine land reclamation and an economic redevelopment of the Heidleburg colliery site and adjacent lands is recommended.

- a regrading, realignment, reconstruction of portions of the Reading & Northern railroad is recommended at the US Rte. 11 overpass to remove the R & N railroad girder bridge from the Mill Creek flood way. A culvertization or channelization of Mill Creek for several hundred feet through this portion of the Heidleburg reach may be useful in restoration of flow and improved flood passage.

· a flow loss assessment on the Dupont and Heidleburg reaches of Mill Creek is suggested. The concrete flume reach between PA Rte. 315 and I-81 needs to be repaired and maintained. The Heidleburg reach may then be a candidate for a riparian restoration, with some aspects of naturally analogous installations possible.

5. The Borough of Dupont may consider creating a pedestrian walk way along portions of the Mill Creek alignment. This reach could benefit from a more active management plan, which could include public access and ornamental landscape improvements.

6. The PA-DEP Bureau of Abandoned Mine Reclamation should consider extending flow loss assessment upstream, into the Akzo Nobel site, to begin flow restoration to the Dupont and Heidleburg reaches.

7. The Akzo Nobel reach represents an important and predominately natural high quality habitat for Mill Creek and the entire lower Lackawanna watershed area. This plan recommends that the Akzo Nobel site be considered for preservation through conservation easements or acquisition. This action is recommended whether the site remains as a reserved proprietary business site or is developed for other business or residential purposes. The entire site would provide a good regional park property or an addition to nearby State Game Lands.

8. The Suscon Road reach of Mill Creek contains a ravine with numerous water falls and splash pools at the Llewlyn-Pocono formation boundary. The reach is included on the LRCA's List of Special Places and Natural Areas. Most of this site is on private property. The LRCA recommends that the Lackawanna Valley Conservancy develop contacts with property owners to inform them about voluntary conservation actions. A rail grade at this site has rail to trail potential.

9. The Suscon Road reach of Mill Creek and the headwater reaches of Lidy and Collins Creeks all drain high quality mountainous watershed habitats. These reaches of streams and their watersheds should be protected from sprawl development. Conservation easements and management plans on private properties and acquisition by state conservation agencies are both recommended actions supported in this plan.

10. The Boroughs of Old Forge, Moosic, Duryea, Dupont, Avoca and Pittston Township should include the protection of Mill Creek, and technical requirements for that protection, in their zoning, land use, subdivision ordinances and comprehensive plans.

5 (E) Spring Brook

Spring Brook, the second largest tributary to the Lackawanna River after Roaring Brook, flows west from the Pocono Plateau for 16.0 miles to confluence with the Lackawanna in the Borough of Moosic, at RM 3.8. Spring Brook, a third order tributary, drains a large and diverse 54.24 mi² watershed. It enters the Lackawanna Valley through Spring Brook Gap in the Moosic Mountains, near Nesbitt Reservoir.

Spring Brook's tributary streams rise in Pocono Plateau wetland complexes and from springs along the western flank of the Moosic Mountain range. A majority of Spring Brook tributaries are heavily forested. A significant portion, upwards of 60%, is owned by Theta Company, which had formerly been associated with the Pennsylvania Gas and

Water Company (PG&W). The Theta lands are no longer protected watershed lands and are presently subject to an extensive timber harvest program. The Pennsylvania American Water Company (PAWC) acquired PG&W reservoirs and several hundred acres of buffer lands adjacent to the reservoirs. There are some road-side residential and small suburban residential subdivision land uses along Spring Brook at Yostville, Maple Lake, and Spring Brook Village.

Watres, Nesbitt and Maple Lake Reservoirs and the Spring Brook Intake Reservoir and water treatment plant are significant PAWC installations in the watershed. The Spring Brook Township sewer treatment plant discharges into Green Spring Run near PA Rte. 307. The balance of water and habitat quality in the upper watershed is excellent.

As Spring Brook exits the west end of Spring Brook Gap, it enters the Lackawanna Valley and the Llewlyn geologic formation. The upland flanks of the ridge on either side of the stream show some evidence of coal mining, however, residential encroachment on the narrow flood plain along PA Rte. 502 at Belin Village and Spike Island provide the more significant environmental impacts. Response to numerous flood events in this reach has resulted in a variety of rip rap bank stabilization projects.

In its final reach through Moosic Borough, Spring Brook has been channelized in a large trapezoidal and “U” shaped open concrete channel. The stream confluences with the river through this concrete channel, flanked by rip rapped berms. Covey Swamp Creek, which drains Covey Swamp and Rocky Glen, is the only major tributary to Spring Brook from the main valley. There are remnant culm dumps along the concrete channel between Rtes. 502 and 11. These dumps and some stream flow loss in the Belin Village and Spike Island reaches are the only significant anthracite mine impacts to Spring Brook.

Recommendations:

1. Due to the value of Spring Brook and its tributaries as a water supply resource, the LRCA recommends that municipalities in the Spring Brook watershed, particularly Spring Brook Township, review their zoning, land use and subdivision ordinances and comprehensive plans, to insure that state of the art ordinances and planning goals are included to provide the highest level of protection to the stream and reservoir areas.
2. This plan recommends that acquisition of a majority of Theta Company properties, or the development of a conservation easement program to insure the maintenance of these lands as watershed, open space, natural resource, and timber lands, continue into the future. These lands should be included in the review and policy outcomes of the Lackawanna County Open Space Study.
3. Municipalities should consider updating subdivision and land use ordinances to insure that state of the art Best Management Practices and design standards are required of any development in forested watershed areas.
4. Recreational trail developments offer a potential to provide passive recreational access in the Spring Brook watershed to link the Lackawanna Valley to the Lackawanna State Forest, State Game Lands and other resources in the upper Lehigh River watershed. This plan recommends a trail program be developed along the former Wilkes-Barre and Eastern railroad alignment which parallels Spring Brook. Other trail links on township roads and fire management roads should be included.

5. The lower reaches of Spring Brook in Moosic, Spike Island and Belin Village offer \opportunities for educational interpretation of the various types of structural and non structural responses to issues related to bank stabilization, flood control and mine water infiltration.

6. The Borough of Moosic may consider the development of a local pedestrian trail on the flood levees at the Spring Brook-Lackawanna River confluence.

6(E) Greenwood Creek

Greenwood Creek is a 2.0 mile long first order tributary, draining an approximate 2.0 mi² watershed in the Borough of Moosic. It originated in springs and wetlands near the Davis Street / Montage Mountain Exit of Interstate 81. It flows through the Booth & Sons scrap yard, the Railroad Avenue residential neighborhood, the Birney Avenue Shopping Center and an abandoned coal mine property before reaching its confluence with the Lackawanna River at RM 6.5, just upstream of the Canadian Pacific Rail Bridge between Taylor and Moosic.

Greenwood Creek is one of the most severely degraded sub-watersheds in the Lackawanna Basin. It is primarily a storm sewer shed with natural hydrological capacity having been destroyed by coal mining and urban development activities.

The water course has been severely altered in its entire length. The headwaters are a storm sewer shed receiving runoff from Interstate 81, the scrap yard and the Railroad Avenue residential area. The obliterated watercourse is supplanted by gutters, catch basins, and storm culverts.

From Pittston and Birney Avenues the water course is culvertized under the parking lot of the Birney Plaza. It discharges from a disintegrating 4' diameter galvanized metal culvert 200 feet southwest of the rear corner of the K Mart Store.

After a 20 foot plunge from the culvert, the water course meanders through a 1,000-foot reach of strip mine overburden before plunging another 1,000-feet reach down a steeply pitching sinuous cataract with high wall cuts through conglomerated layers of overburden soils and rock, coal and shale waste and culm.

Portions of the high wall cuts reveal a stratigraphy of burnt culm and shale with large clinkers and slabs of oxidized shale and sandstone. Large quantities of these materials are mobilized by storm events and outwash into the Lackawanna at the confluence forming a large delta fan.

Immediately prior to the confluence the Creek passes under several culvert pipes in the embankment of the Lackawanna County Rail Authority=s rail line, one-quarter mile north of its Minooka junction with the Canadian Pacific. These culverts have experienced several washouts. There is a combined sewer outfall on the LRBSA Moosic collector system at this point as well.

Persistent flooding problems in the Railroad Avenue neighborhood have been the subject of discussion by residents, developers, Moosic Borough and state officials during 2000. Lackawanna Watershed 2000 has proposed a CSO upgrade at the confluence and has also

recommended, with the LRCA and Bureau of Abandoned Mine Reclamation, that a restoration program be developed for the watershed.

Recommendations

1. Coordinate infrastructure upgrades with restoration of lower reaches of open channel to maximize comprehensive nature of work to approach some restoration thresholds.
2. Utilize new storm water management systems to sustain a more natural flow regime.
3. Divert Interstate flows out of watershed with redesign of Davis Street interchange.
4. Retrofit retention basin at culvert discharge site at rear of K Mart to maintain longer discharge hydrographs to enhance natural flows through cataract area.
5. Reclaim and restore as much as possible the water course through cataract area. Regrade coal waste and overburden as part of large site mine reclamation.
6. Use municipal ordinance and/or easements to maintain natural habitat corridor along reclaimed stream reach from Shopping Center to river.

7(W) Keyser Creek

Keyser Creek is an important second order tributary which drains a 8.58 mi² watershed along the base of West or Bald Mountain in the Borough of Taylor and the City of Scranton. The Creek and two of its three tributaries, Lucky Run and Lindy Creek, rise in springs and wetlands along Bald Mountain in Ransom and Newton Townships.

Keyser Creek is nearly a mirror image of its immediate neighbor to the south, St. Johns Creek. Its headwater streams flow quickly eastward from the mountain ridge down steeply graded courses, form small cataracts at the Llewellyn/Pocono boundary and then turn to the southeast across a shallow gradient flood plain for a 2.5 mile run to the river.

Some salient features of Keyser Creek are:

1. a delta fan of eroded red ash sediments at its confluence with the Lackawanna
2. three steel girder bridges which carry the Central New Jersey Railroad (now Lackawanna River Heritage Trail for 20' across the mouth of Keyser Creek)
3. a 250' stone arch culvert under the Canadian Pacific rail yard at Taylor, sanitary sewer overflow evident along culvert
4. stone and concrete culverts under Main Avenue
5. no regular flow in lower watershed
6. erosional morphology along previous bond forfeiture reclamation at Moffat Colliery, source of red ash in delta at confluence

7. ruins of Moffat Colliery buildings, red ash and culm dumps
8. remnants of semicircular barrel staved wooden flume are evident from Oak Street upstream through the former Hampton Rail Yards/Hampton Colliery area now Stauffer Industrial Park. Ruins of flume work extend over two miles into the Keyser Avenue car shops area.
9. pyroclastic materials in foundry slag and coal mine waste evident through colliery sites particularly at former site of Hampton Roundhouse
10. various culverts remnant of rail yard operations are evident along water course
11. stream channel is choked with sediments; braided flows evident and loss of defined channel encountered in numerous reaches.
12. flood control channelization in progress at Lindy Creek confluence and up Lindy Creek
13. old ice pond dams and other historic stone and concrete structures located on Lindy Creek adjacent to Frink Street
14. sanitary sewage discharges evident at culverts adjacent to Luzerne Street pumping station
15. remnants of water works evident on main stem of Keyser Creek 2000' west of Keyser Avenue below Fawnwood development
16. Keyser Creek loses flow between water works and Keyser Avenue

Recommendations:

1. Major stream channel restoration project on main stem from confluence to Fawnwood.
2. Complete restoration of Lucky Run channel from McDade Park through Keyser Terrace to confluence with Keyser Creek adjacent to Kane Truck yard in Stauffer Park.
3. Excavate and conserve a portion of flume structure for historical interpretation.
4. Develop a trailhead on the LRHT at the confluence.
5. Develop a trailhead or Heritage Landing at the Moffat Breaker site.
6. Develop a trail and greenway link along the Keyser-Lucky Run corridor to join the LRHT with McDade Park.
7. Conserve and reconstruct Lindy Creek and the ice pond dam site on it, along Frink Street, and the water works at Fawnwood Estates for public access, if appropriate.

8. Develop conservation easements, acquisition or other protection for headwaters of Keyser Creek.
9. Monitor operations at Scranton Materials Quarry to define impacts and protect Keyser Creek from impacts.
10. Locate, assess and manage farm dumps and similar sites in the sub-watershed.

8(E) Stafford Meadow Brook

Stafford Meadow Brook (SMB) is a larger, second order tributary which rises on the Pocono Plateau in Roaring Brook Township and flows west-southwest through a 14.11 mi² watershed for 12.0 miles to confluence with the Lackawanna River at RM 9.2 in South Scranton.

The SMB watershed is closely associated with the development of the Lackawanna Coal and Iron Company in the 1840's. Several iron ore quarries were operated along the stream through the 1880's. SMB later became, and remains today, a significant water supply resource.

Stafford Meadow Brook rises in Bear Swamp, a Pocono wetland bog adjacent to I-380 in Roaring Brook Township. It hosts significant wetland complexes as it flows through Simersons Gap, in the Moosic Mountain range, between Coon Hill and Scrub Oak Mountain along PA Rte. 307. A tributary stream from Long Swamp, a wetland in a saddle of Scrub Oak Mountain, flows into SMB at the Williams Bridge Dam.

The Williams Bridge Reservoir, Lake Scranton, and the Lake Scranton Water Filtration Plant are major water supply facilities for the Scranton metropolitan area, located along SMB on the western flanks of the Moosic Mountain range. Below Lake Scranton, the No. 5 Reservoir supplies water for snow making at the Montage Mountain Ski Resort. The reach between Lake Scranton and the No. 5 reservoir holds the remains of the iron ore quarries. Below the No. 5 Reservoir, SMB flows northward for a mile before turning west through the older residential neighborhoods of South Scranton.

The reach between the No. 5 Reservoir and South Scranton lies in a glacially deformed drainage. At a saddle in this drainage, high flows from SMB could at one time flow through Rocky Glen and into Spring Brook. There are extensive wetlands and beaver ponds along the SMB watercourse in this reach, providing excellent habitat for a diverse community of plants and animals. The former Erie and Wyoming Valley rail corridor and remnants of the Pennsylvania Coal Company Gravity Railroad, the Lackawanna Coal & Iron Company gravity railroad and the Lackawanna and Wyoming Valley Railroad (Laurel Line) all pass through this reach of the SMB watershed, as does I-81. The Laurel Line is presently (2001) being restored for freight and tourist excursion service. The water and habitat quality of SMB is very high quality from its headwaters down through the reservoir reaches and the Laurel Line reach. As SMB passes under I-81, it transitions from undeveloped, forested, mountainous, wetland dominated land uses, to urban, residential, commercial and industrial land uses.

The reach through South Scranton is extensively culvertized with a mixture of stone retaining walls and culverts over 100 years old, to areas of gabion baskets and concrete bridge piers and wing walls. SMB flows through a 25-30 foot deep ravine where remnants of open channel still exist through back yards and alleys of the residential

neighborhood east of Pittston Avenue, along Elm Street. Yard waste and other urban debris is common along the steep banks leading down to the channel. From Pittston Avenue to its confluence, SMB flows through an open, concrete box culvert system built as part of the Scranton flood control projects in 1960. Commercial, industrial and residential development lies adjacent to the culvert system, restricting the development of any overhanging vegetative cover.

Recommendations:

Most of the land in the upper three-fourths of the Stafford Meadow Brook watershed was, until recently, owned and managed by the Pennsylvania Gas & Water Company as protected watershed and reservoir recharge lands. Sale of the reservoir filtration plant's buffer zones and the water supply business by PG&W to the Pennsylvania American Water Company in 1996 resulted in the gas utility merging with another gas utility, Southern Union, based in Austin, Texas, in 2000. Southern Union then sold the stock in the PG&W/PG Energy subsidiary Theta Land Company, to an unnamed purchaser. The Theta lands in the Stafford Meadow Brook watershed and other Theta lands in the Lackawanna River watershed provide important open space, water supply, timber, recreational and aesthetic resources to the Northeast Pennsylvania region. Therefore, LRCA recommends through this plan that:

1. Significant large tracts of these properties should be conveyed to public and private conservation agencies, to protect water resources and to insure long term natural resource protection.
2. These lands and similar holdings need to be included for assessment and management recommendations in the pending Lackawanna County Open Space Study.
3. Funding from state, federal and private resources for the acquisition and protection of these lands is recommended as an action of the highest priority.
4. If any development does occur on former PG&W watershed lands, the recommendations in the PG Energy Land Use Plan for limited, conservation type subdivisions, state of the art storm water management systems, limited impervious surfaces and substantial buffer zones along water courses should be considered as requirements by township and county agencies.
5. This plan recommends that the Bear Swamp wetlands along Simerson Road and the SMB corridor be protected with 1000 foot buffers, to be acquired and managed as part of the open space and natural areas included in the pending Lackawanna County Open Space Plan.
6. The SMB corridor between Lake Scranton, No. 5 Reservoir, Little Virginia and the McNichols School in South Scranton has potential for a recreational, cultural and educational interpretive trail. The LRCA recommends development of a trail program along SMB, to ingrate with Scranton urban neighborhoods, the Lackawanna River Heritage Trail, Montage and Glen Maura, the Lackawanna Trolley Tour and the Lackawanna County Open Space Plan.
7. The culvert system through South Scranton may soon require significant reconstruction. City and state agencies should consider designs for culvert replacement

which utilize naturally analogous designs. A capital funding program will also need to be developed.

8. The LRCA and PG&W had once considered development of a nature center in the caretaker's house at Williams Bridge Dam, near Lake Scranton. LRCA recommends that the Pennsylvania American Water Company develop a watershed resource educational and research station at this site.

9(E) Roaring Brook

Roaring Brook, third order stream, is the largest tributary to the Lackawanna River. It flows for 18.0 miles off the Pocono Plateau to the east of the Moosic Mountain range, in a 53.68 mi² watershed. Roaring Brook flows west cutting through the Moosic range at Cobbs Gap. After flowing through the Nay Aug Gorge, it flows into the river in South Scranton. Roaring Brook has 19 tributaries, all originating outside the coal measures.

The headwater reaches of Roaring Brook, in the North Pocono townships of eastern Lackawanna County, are all high quality, cold water fisheries. The headwaters also feature once protected watershed lands owned by the Theta Corporation, formerly associated with the Pennsylvania Gas and Water Company. The Hollister, Elmhurst, and Curtis Reservoirs are now operated by the Pennsylvania American Water Company. Seventy percent of the land cover in the upper Roaring Brook watershed is forested, twenty percent is agricultural or successional field and ten percent is developed with villages, shopping plazas and residential uses.

Extensive use of the Roaring Brook corridor for water supply and water supply protection has provided a vital open space, habitat and recreational resource. The Lackawanna Rail Corridor follows Roaring Brook between Scranton, the Pocono Plateau and points east.

Roaring Brook maintains high water quality and habitat values through Cobbs Gap and into the Llewellyn formation boundary at the Dunmore No. 7 Reservoir. Urban storm impacts and abandoned mine land impacts begin to affect Roaring Brook between Dunmore No. 7 and the Bunker Hill Bridge. The DeNaples Auto Parts property contains several AML sites, notably the remnants of the Coons Pile, a silt basin deposit associated with a coal washery operation. This silt washed into Roaring Brook due to a failure of erosion control at a permitted remining operation in 1991.

Between Bunker Hill Bridge and Nay Aug Park, urban and industrial impacts consist of storm water flows at the DeNaples junk yard and CSO's along the Roaring Brook interceptor line of the Scranton sewer system.

Nay Aug Gorge and Nay Aug Falls in the park are listed on the National Register of Geologic Landmarks. Roaring Brook cuts a deep gorge through Pocono conglomerate and underlying Llewellyn sandstones. The Gorge continues downstream from Myrtle St. Bridge to the Harrison Ave. Bridge. The Step Falls, an abandoned water power dam associated with the Lackawanna Iron Works, is located in the gorge immediately upstream of the Harrison Ave. Bridge. At this point the stream corridor is flanked by the Lackawanna Railroad and the Central Scranton Expressway exit off Interstate 81.

Below Harrison Ave. the gorge widens. There are extensive remnants of foundations of rolling mills and other structures associated with the Lackawanna Iron Works between Harrison Ave., the Spruce St. expressway bridge and Cedar Avenue. The impact of

channelization for industrial, and later flood control purposes is more evident in this reach of stream.

At Cedar Ave., Roaring Brook passes the Scranton Iron Furnaces, a State Historic Site. For its last reach from Cedar Ave. to its confluence with the river, Roaring Brook has been channelized into a large concrete “U” channel.

The Roaring Brook corridor contains significant natural and cultural resources. The Roaring Brook watershed continues to provide strategic environmental and economic inputs to the Lackawanna watershed. Roaring Brook provides major transportation corridors, local and interstate highways and railroad’s follow its course. It serves as the eastern gateway to the Lackawanna Valley, the major regional link between the Lackawanna/Wyoming Valley metropolitan region, the Pocono region, and the New York-New Jersey metropolitan areas.

The historic, cultural and recreational resources of Roaring Brook present important opportunities for both cultural tourism and local recreation. Presently the Iron Furnaces, the Steamtown excursion line and the Lackawanna Trolley line are the only important tourism uses in the corridor. The Nay Aug Gorge access and management issues are an impediment to the safe public use of this resource. Limitations and public access to Theta properties are another obstacle, which needs to be addressed.

Recommendations:

1. The Nay Aug Gorge and Falls of Roaring Brook is an extremely important natural resource feature recognized as a National Geological Landmark. The approaches to the site through Nay Aug Park and along the Lackawanna Railroad offer many opportunities for public access, natural and cultural interpretation, education, and ecotourism development. The Nay Aug Gorge contains significant old-growth forest with a mixture of oaks, pine and hemlock. Remnant access pathways dating from the development of Nay Aug Park can be restored to provide access to The Gorge area. This plan recommends development of public access, public safety improvements, interpretive and educational programs and facilities in Nay Aug Park to focus on the Gorge Area and the examples of Natural History and native ecosystems still present at the site. More immediate action is recommended to control an infestation of Hemlock wooly adelgid (HWD). The loss of these 100+ year-old hemlocks can be prevented with concerted action by the City. LRCA recommends treatment of the entire grove by an arborist skilled in the control of HWD AS SOON AS POSSIBLE. Other actions are required to control invasive exotic vegetation such as Japanese Knotweed and green briar. The hillslopes along Lynnwood Park from Hannon Grove to Myrtle Street are remnants of the City dump from circa 1930. The toe of this dump slope is mobilized by high storm flows in Roaring Brook. The dump slope is completely covered by invasive vegetation. Many of these recommendations could be implemented through a Master Plan for restoration of Nay Aug Park.

2. The Lackawanna Heritage Valley Authority, LRCA and appropriate partners should develop the Roaring Brook Greenway Trail as a link from the Lackawanna River Heritage Trail, Steamtown and the Iron Furnaces through Nay Aug Gorge and continue up corridor to access the 12-mile, county owned Erie and Wyoming Valley rail corridor.

3. County, state and federal agencies should consider the scenic, recreational and cultural importance of the Cobbs Gap reach of Roaring Brook. This area between

Dunmore and Elmhurst includes the Pennsylvania Gravity Railroad Inclines, Moosic Mountain natural areas, the Moosic Lake Trolley corridor, early historic settlement Roads, and Scrub Oak Mountain. The pending Lackawanna County Open Space Plan presents an opportunity to focus on these resources. This area should be prioritized for acquisition of property, public use easements, public access sites for fishing and trail use and a public use and natural resource management plan .

4. The Roaring Brook Greenway can continue with trail development on the 12 mile reach of the Erie and Wyoming Valley Rail Corridor. A link to Jefferson Twp. and the Mt. Cobb-Moosic Lake area from the rail corridor at Wimmers, can connect to the Trolley corridor and PA Gravity Railroad corridor for a loop trail system over Moosic Mountain. An additional link trail to Moscow and Covington can be developed by rebuilding the Elmhurst Reservoir Bridge and using a forestry road and pipe line corridor to Kellum Creek and Roaring Brook to Moscow. Therefore, this plan recommends development of a North Pocono Rail-Trail and Community Trail feasibility study to further this potential.

5. Roaring Brook contains vital drinking water resources for the Lackawanna Valley. The protection and conservation of Roaring Brook's forested watersheds and source water areas is a strategic public interest. This plan recommends state, county, and local governments prioritize the acquisition, protection and appropriate management of real estate associated with the source waters of the drinking water supply reservoirs. A management program for these properties should be a key element in the Lackawanna County Open Space Study. This plan recommends that acquisition of these and related watershed resource lands is an outcome eligible for implementation funds under this River Conservation Plan.

6. The development of a watershed coalition among citizens, business interests and municipalities in the North Pocono area is presently under discussion by LRCA and local watershed stake holders. LRCA recommends that support for this initiative is an outcome for implementation under this plan.

7. The Lackawanna Valley Conservancy (LVC), a land trust affiliate of the LRCA, works with public and private interests throughout the Lackawanna Watershed. The LVC has prioritized the acquisition and protection of cultural and natural resources. A long term LRCA/LVC goal is the creation of a Lackawanna Watershed Nature Center. The Roaring Brook watershed offers several opportunities for a nature center. The LRCA recommends development of a nature center as an outcome of this plan eligible for implementation funds.

8. Community links along the Roaring Brook Greenway include links to educational facilities, residential, commercial and cultural sites and existing or proposed municipal parks and trails. LRCA recommends that the following community links are eligible for funding, in addition to the previously mentioned North Pocono Rail-Trail and Roaring Brook Greenway.

In Dunmore:

- a link from Roaring Brook to Mill and Chestnut Streets.
- a link from the E & WV Rail Corridor to Drinker St., the PA Gravity Trail at Dunmore No. 1 Reservoir.

- an urban trail link through Dunmore to the school campuses, the Dunmore cemeteries, Marywood University campus and the I-81 drainage access road to link with the Heritage Trail at Boulevard Avenue.

- a link to the St. Anthony's Park recreation site.

- a link to Scrub Oak Mountain, Long Swamp Road, Mt. Margaret, Lake Scranton and East Mountain.

- Little Roaring Brook between Dunmore Reservoir, Drinker St., and the confluence below Dunmore No. 7 Reservoir is recommended as a greenway/natural area restoration and park development project with Borough and property owner cooperation.

In Roaring Brook Township:

- links and access areas are recommended in the Cobbs Gap area for trails and fishing access

- links in the Elmhurst and Curtis Reservoirs area are recommended for fishing and trail access.

In Elmhurst:

- a trail head link along PA Rte. 590 near Elmhurst Reservoir
- a bridge over PA Rte. 435
- a link along Main Street to the Community Park
- a bridge reconstruction at the Elmhurst Reservoir

In Jefferson:

- a trail head link at Wimmers Road
- other links to be identified in a feasibility study

In Madison:

- a link at Curtis Reservoir
- a community trail system to be developed with a feasibility study
- a link on the Elmhurst Reservoir Trail along Kellum Creek to Aberdeen

Corners

In Moscow:

- development of the Greenway Trail along the Roaring Brook and the Hollister/Elmhurst water pipeline right-of-way, with a trail head link Near the Moscow Sewage Treatment Plant.

- development of links to North Pocono school campus, from the Moscow commercial and residential districts

- development of Greenway and Community Trail links along local roadwaysto Covington Township

In Covington:

- continuation of Greenway Trail along Roaring Brook and/or Lackawanna Rail Corridor where feasible

- links to Covington regional park

- links to Covington Twp. park and Daleville commercial center

- links to Hollister-Fryetown natural areas

- links to Lehigh watershed and Pocono area at Gouldsboro

Summary Recommendations

- A Roaring Brook Greenway Feasibility Study can facilitate linking these resources and developing management programs, acquisition and access sites.

- The Lackawanna County Open Space program should include acquisition, and management recommendations for cultural and natural resource lands in the Roaring Brook corridor, including the Cobbs Gap and Hollister areas.

- An Urban Roaring Brook Greenway should be developed to link the Nay Aug Gorge.

- Development of a North Pocono Watershed Coalition is supported as an outcome and implementation project of this plan.

- Partnerships with local municipalities and community groups to develop greenway and trail resources and community links are a recommended outcome of this plan.

10(E) Pine Brook

Pine Brook was a second-order tributary stream approximately two miles in length. Its sources were wetlands and springs which once existed in the Borough of Dunmore, in the residential and commercial neighborhoods immediately north and east of the Borough Building. It survives today primarily as a sewer shed. All remnants of the natural creek have been replaced with storm and sanitary sewer culvert system. This system is identifiable on the maps of the Scranton Sewer Authority. The sewer shed follows the approximate course of Pine Brook through the Dun Del neighborhood of Dunmore and the Pine Brook and Sandy Banks neighborhoods of the City of Scranton. Pine Brook flows into the Lackawanna in Sandy Banks about 500 feet downstream of the Olive Street Bridge. The stone arch culvert conveying the brook under the Lackawanna Rail

Authority tracks provides mute evidence of Pine Brook's previous existence as a natural stream.

Pine Brook is offered here as an example of the fate of many other first and some second order streams in the urbanized areas of the watershed which have lost all natural functions and become sewer sheds. LRCA has not collected stream assessment data on many of these sheds. We do suggest that they serve as examples of what not to do in the future and how not to manage our water resources.

Several other sub-watersheds which are primarily sewer sheds but contain identifiable remnants of their hydrological or morphological features are discussed in this survey. They are Greenwood Run in Moosic, Meadow Brook, Carter Creek and Greenbush Run in Scranton, Grier, Storrs and Miles creeks in Dickson City. There are other remnant streams in the Mid Valley, Carbondale and Forest City where sewer shed conditions affect the majority of the water courses' characteristics.

Other streams which no longer exist but can be inferred by historical evidence, sewer drainage sheds and typography are Pear Street, South Scranton; Watson Street, West Scranton - Taylor; Luzerne Street, Washburn Street, Schalger/West Linden all in West Scranton; Tripps Park, Ravine Street, Blair Avenue, Bullhead - Philo Street, Oak Street - Love Place in North Scranton.

Recommendations:

There are no easy river conservation recommendations for Pine Brook and the other "lost streams" of the Lackawanna watershed. They serve as sad examples of the total destruction of our natural habitat related to the historical practices of coal mining and urbanization which occurred between the 1820's and the present day. Some of these practices continue in the actions of private and public interests: developers, municipal and state agencies often move to culvertize or channelize portions of natural streams in the interests of "flood control" or maximizing use of private property.

Municipalities can include protection of stream corridors and water resources in their comprehensive plans, zoning, subdivision, land use and storm water ordinances. Municipalities may consider restoration of portions of lost stream corridors when projects such as the East Mountain Road and drainage program are developed to address neighborhood drainage and nuisance flooding problems.

Restoration of stream corridors, day lighting of lost streams, retrofitting storm water basins to restore natural hydrological functions in small sub-watersheds can be accomplished. Public agencies and developers can take the initiative to include these restoration techniques, especially in upland areas with abandoned mine lands being redeveloped. Many landlocked areas require new outlets for storm water drainage. There are several projects involving the Bureau of Abandoned Mine Reclamation and developers which can serve as examples of this restoration process, most notably, the recent project along Eddy Creek in Throop and Olyphant.

11(E) Meadow Brook

Meadow Brook, Pine Brook's immediate neighbor upstream has a similar history. There are more significant portions of the Meadow Brook channel in evidence but its hydrology now consists entirely intermittent storm events. Meadow Brook's historic watershed was

about 4.0 mi². Today's truncated shed occupies about 2.2 mi² with a 2.0 mile long water course in the Borough of Dunmore and City of Scranton.

The natural source of Meadow Brook was a range of natural springs and seeps flowing from a ridge of Moosic Mountain between the Little Roaring Brook and Eddy Creek watersheds along the border of Dunmore and Throop. These springs fed a large glacial bog and wetland system. This area became the site of the Gypsy Grove Colliery of the Pennsylvania Coal Company. Today this site is occupied by the Keystone Sanitary Landfill.

From its headwaters, Meadow Brook flowed in a southwesterly direction through the O'Neal Highway, Dunmore Cemetery, Marywood College, Forest Hill Cemetery and Pennsylvania Oral School. The creek was culvertized in the 1880's from the Oral School to Sanderson Avenue as part of the development of the Green Ridge residential neighborhood. From Sanderson Avenue the creek flows in an open channel under the Lackawanna County Rail Authorities trackage. Meadow Brook flows into the Lackawanna River between the Scranton Building Block and Laminations, Inc. properties off Glen Street and Mylert Avenue.

The confluence area and the Green Ridge residential reach are proposed sites for a state-sponsored six-million-dollar culvertization and flood control project, and an interface with the proposed Corps of Engineers levee project for the Green Ridge Flats.

The Forest Hill Cemetery reach contains remnants of the natural stream channel and corridor. This reach features important remnants of old growth forest. There are over twenty remaining white pine, hemlock and red oak specimen trees over 150-years old. An unfortunate loss occurred when the Cemetery Association allowed the harvest of over a dozen older trees in 1996. Counts of growth rings by LRCA staff suggests these trees were between 175 and 250-years of age at the time of their loss. The stream corridor also hosts old growth groves of rhododendron in the understory. The cemetery also has two stone arch bridges which cross the stream.

Meadow Brook lost its natural functions by 1900. Its baseline flow was lost to mining activities and was diverted by the Pennsylvanian Coal Company in the Underwood Mine Drainage Tunnel (1909). Additional storm water flows were diverted by PADOT through bore holes to the Underwood Tunnel from the Interstate 81-O'Neal Highway intersection in the 1960's.

In order to further divert storm water from Interstate 81 and the Industrial Highway - Interstate junction away from Meadow Brook, the Department of Transportation designed and installed a entirely new artificial watershed with the LVIH project between 1995 and 97. This system is addressed as Tributary 15(E) later in this survey report.

Recommendations:

Meadow Brook can not be practically restored but some measures can be taken to preserve the remnant habitat along the reaches of the cemeteries and Marywood University. A program to retrofit existing and integrate new storm water management systems in this reach has the potential to restore some perennial hydrology to Meadow Brook.

The LRCA suggests that the habitat and hydrologic values of Meadow Brook can be enhanced with a partnership effort to develop a watershed restoration plan for Meadow Brook.

Due to the presence of several cemeteries and institutions in the middle portion of the Meadow Brook watershed, the following partnership is suggested:

Marywood University

State School for the Deaf

Dunmore School District

Dunmore Borough

Dunmore Shade Tree Commission

St. Joseph Center

Holy Family Residence

Forest Hill Cemetery Association

Dunmore Cemetery Association

Temple Israel Cemetery Association

Good Shepard Church

St. Claire's Church

If a sufficient number of partners including Marywood University and Forest Hill Cemetery are interested, LRCA suggests that the partnership consider a management plan with two elements:

1. Urban Forestry Management

- an assessment survey of all trees and shrub beds as well as unmanaged wooded portions of the campus and cemetery properties needs to be developed.
- a comprehensive urban forest management program can be developed to enhance collaborative or unified management of the urban forest by the various partners.

2. Water resources

- existing and new storm water systems in the watershed can be designed to mimic and restore natural hydrological conditions.
- the stream channels of Meadow Brook and the “Ravine” area of Marywood Campus can be restored to advance the ecological and hydrological values of the Meadow Brook watershed and restore the capacity of the middle reach of this watershed

for flood storage capacity and lower storm and flood flows downstream in the neighborhoods.

LRCA suggests that the collaborative partnership can offer an enhanced capacity to address the many issues related to management of the urban forestry and storm water resources. Individually the institutions have differing capacities and interests in the resource management necessary to adequately insure that ecological goals as well as economic goals are achieved.

12(E) Carter Creek

Carter Creek is a small first order drainage which rises along Olyphant Avenue on the northwest side of the Marywood campus. Carter Creek once had its confluence with the river near the intersection of Parker Street and Boulevard Avenue. It presently exists as a storm culvert system and discharges into the river through the Raines Street combined sewer overflow (CSO) regulator.

The watershed has extensive urban and coal mine impacts. The area of its original spring-fed source adjacent to Olyphant Avenue has been affected by underground mining, surface strip mining and an underground mine fire.

The City of Scranton used a property at the end of Washington Avenue as a municipal dump from 1940 to 1960. The Interstate 81 drainage channel and roadway cuts off the remnants of the upper drainage of Carter Creek.

Recommendations:

Lackawanna County is presently (2001) working with Marywood University, D&L Realty and others on a site assessment plan for the 500-acre area between the Marywood campus, the former Marvine Colliery, the Lackawanna River, Route 81 and Parker Street. This includes the Carter Creek watershed.

The purpose of the plan is to recommend a reclamation and redevelopment plan for the area. The plan will include watershed restoration, campus related development recreation fields and mixed used development for commercial, institutional and manufacturing on the colliery site.

13(W) Leggetts Creek

Leggetts Creek is a third order stream which enters the Lackawanna River at RM 14.5, in the City of Scranton. The main stem of Leggetts Creek begins at Griffin Reservoir at 1360 feet in South Abington Township. Tributaries above the reservoir drain wetlands in South Abington and Scott Twps. From these wetland sources, the stream flows for 8.0 miles, draining a 18.46 mi² watershed and entering the river at 730 feet. Leggetts Creek has the third largest watershed of the Lackawanna River's tributary streams. Most of the stream's watershed is developed with only a few reaches of the stream still remaining in natural conditions. In Scranton, the stream is also impacted by past mining operations at the Marvine #6 Colliery. Leggetts Creek has twelve tributary streams which include: Leach Creek, Summit Lake Creek, Landsdowne Creek, and small first order tributaries with local names. Like Leggetts Creek, most of these streams flow through developed areas, with generally only their upper reaches remaining in undisturbed conditions.

Headwater wetland and stream reaches to Leggetts Creek are generally surrounded by residential development. Though the wetlands themselves are relatively unimpacted, streams flowing from them intersect roadways and subdivisions, restricting their riparian corridor. As development in South Abington and Scott Twps. continue, the wetlands are being crowded as well. A recent request to the US Army Corps of Engineers to allow filling of one of these headwater wetlands in South Abington, is an example of the development pressure that headwater wetlands are experiencing.

Conditions at Griffin Reservoir, the source of Leggetts Creek main stem, are relatively undisturbed. The reservoir is the source of drinking water for residents in the stream's watershed, so access and use are restricted. A native cover of trees and understory surround the reservoir and all development is well off its banks.

A pipe discharge at the dam on Griffin Reservoir conveys flow downstream into Leggetts Creek. From the dam downstream 0.75 miles to a water supply intake pond, near I-81, the stream and its corridor remain in natural condition. Adjoining property along this reach was formerly water company property, however it is now part of Theta Corporation lands. The riparian zone consists of old growth forest, which includes an impressive stand of large tulip poplar trees. Rock ledges, large boulders and the remnants of old mill works provide small waterfalls and cascades in the stream. This reach is very scenic and listed by the LRCA on its Special Places and Natural Areas List.

Just upstream of I-81, Leggetts Creek flows into a small pond, from which an intake pipe conveys water downstream to a filtration plant in Chinchilla. The stream then crosses under I-81 and an entrance ramp to the North East Extension of the PA Turnpike, before flowing through South Abington Park. Through the park, the stream's banks have been stabilized and a riparian zone of native trees and understory flank the north bank. A walking trail has been developed through the park along the north bank. It extends about 0.4 miles downstream of the park to Layton Road and receives regular use. The park, an elementary school, and PA Rtes. 6 & 11 lie off the south bank, restricting the riparian corridor.

Two second-order and one first-order tributary stream enter Leggetts Creek in the park area. The first order tributary stream originates in Scott Twp. and flows along developed areas of the township and Chinchilla Borough. Its south bank is flanked primarily by undeveloped forest, however, residential development off its north bank has begun to encroach into its corridor. A second order tributary, Landsdowne Creek, drains areas of Clarks Summit and Clarks Green. It is primarily stabilized or channelized and runs along roadways and residential and commercial properties, receiving significant amounts of storm water runoff. A project to redesign the stream's capacity to carry runoff is currently underway. Summit Lake Creek originates at the South Abington – Newton Twp. border and flows from the west into Leggetts Creek. Its upper stretches are more natural and undisturbed, however, lower portions also flow through developed areas.

From Layton Road downstream for about 1.5 miles, through The Notch, Leggetts Creek closely follows Rtes. 6 & 11. The Notch, or Leggetts Gap, is a water gap cut by Leggetts Creek through the West or Lackawanna Mountain range. In addition to Leggetts Creek: the former Lackawanna Railroad (now the Canadian Pacific), Rtes. 6 & 11, and I-81 use the narrow gap to enter and leave the Lackawanna Valley. The Notch is a significant landscape and geological feature and is on the LRCA List of Special Places and Natural Areas. Commercial properties along Rtes. 6 & 11 have encroached into and restricted the stream's riparian corridor, and the channel is stabilized along the highway. The

Chinchilla sewage treatment plant discharges its effluent into this reach of the stream. During summer, low-flow periods, effluent makes up most of the flow in the stream. From the discharge point downstream to The Notch, the creek is bounded by Rtes. 6 & 11 off the north bank and a well established, native tree and understory cover along the south bank. Remnants of the former Fountain Springs water works and the water supply pipe from the Chinchilla filter plant to Scranton are evident along the south bank. Sections of the stream are also rip rapped through this reach, as it runs within close proximity to the highway. The stream corridor is narrow, as it begins to flow through the Notch and under Rtes. 6 & 11 (the North Scranton Expressway) in a large concrete culvert. Just downstream of the Rtes. 6 & 11 culvert, a first order tributary enters the stream. From its source on Bell Mountain, the tributary descends a steep gradient and flows under Rte. 6 near the Viewmont Shopping Mall. Upper reaches are natural and undisturbed by development, however from the highway to its confluence with Leggetts Creek, the tributary is channelized or stabilized around and under parking lots and roadways.

From the culvert under Rtes. 6 & 11 downstream 2.0 miles to the confluence, Leggetts Creek and its corridor are impacted by urban development and debris, and past mining operations. Conditions are not as impacted within the first 0.5 mile portion of this stretch however. Residential development is away from the stream corridor and stable vegetative cover generally exists along a natural stream channel.

As the stream reaches Trestle Hole Park, conditions begin to change. At the park, fill has been dumped along the stream channel and in upland areas, creating steep slopes off the stream bank, which are overgrown by invasive vegetation. Though rock ledges and plunge pools exist in the stream, fill and garbage take away from the scenic value of this reach. A lot of garbage has been dumped along roadways in upland areas as well.

Downstream of the park, residential development begins to crowd the stream corridor. Some stream reaches have been stabilized, while others are unstable and eroding into the stream channel. Construction debris and garbage is common along the banks and upland areas, and in some instances has resulted in steep slopes of fill on the stream banks. These conditions have restricted the riparian corridor and invasive vegetation has taken over throughout much of the lower reach.

About 0.25 miles above the confluence, the stream runs along the former site of the Marvine #6 Colliery. Waste mine rock from this site has encroached into the stream channel and covers both banks. Successional vegetation has developed along the stream and upland mine spoils have also developed a vegetative cover. A reclamation project on the site will begin in 2001, with plans for a housing development. Initial work to regrade and vegetate mine spoil piles, and create a trail greenway along Leggetts Creek through the site, should go a long way to address some of the impacts to the stream within this lower reach.

Leach Creek

Leach Creek is a second-order tributary stream to Leggetts Creek which enters the stream in North Scranton, just off East Market Street. The source of Leach Creek is a small wetland pond along PA Rte. 307 (Morgan Highway) near the Scranton and South Abington boundary. From its source it flows 2.3 miles to its confluence with Leggetts Creek, draining a 2.55 mi² watershed.

For the first 1.5 miles of Leach Creek, from its source to Keyser Ave., the stream flows just off the west side of the highway down the mountain into Scranton. It passes along a condominium development, cemetery and medical services complex before running under the highway and Keyser Avenue. A stable riparian corridor and stream channel is relatively intact through this stretch, as development is generally off its banks.

The remaining lower reach of Leach Creek through Scranton is heavily impacted by urban development. The stream is culvertized under the intersection of Rte. 307, Keyser Ave, and the North Scranton Expressway and then flows along the Keyser-Oak Shopping Mall. Along the shopping mall the stream flows into a tall, narrow stone culvert under a culm pile. An athletic field has been developed over most of the culm spoil area. Dumped garbage is common along the stream through this reach and the corridor is composed of steep slopes with overgrown successional and invasive vegetation.

Downstream of the culvert, the stream channel has been stabilized with rip rap and flows into a flood control basin behind the shopping mall. Urban debris and sediment have filled the basin, which sits within a residential neighborhood.

From the basin downstream to its confluence the stream channel is heavily impacted by urban development. Most of the stream is stabilized through back yards or channelized under buildings and roadways. Its riparian corridor is essentially non-existent, invasive vegetation has overgrown its banks, and the channel is choked with sediment from storm water runoff. Though the stream was discharging into Leggetts Creek at the time of this stream survey (November 2000), the stream generally does not carry a base flow.

Recommendations:

1. Scott and South Abington Townships, Clarks Green and Clarks Summit Boroughs and the City of Scranton should conduct environmental audits to update their plans and ordinances, to insure the protection and conservation of Leggetts Creek and its watershed resources.
2. A majority of Theta Company lands associated with the PAWC water supply system in the Leggetts Creek watershed should be acquired by public or private conservation agencies for long-term preservation.
3. The Griffin Mills reach of Leggetts Creek, between Griffin Pond dam and I-81, contains exceptional cultural, historic and natural resources: mill foundations and groves of old growth pine, hemlock and tulip poplar. This reach, which is included on the LRCA's List of Special Places and Natural Areas, is a priority for preservation and acquisition.
4. The recently developed South Abington Park and Leggetts Creek trail in Chinchilla, can serve as a greenway and trail system base for links to Clarks Summit and connections with the Northern Electric Trail into the Tunkhannock watershed to the west, and through the Leggetts Notch to the Lackawanna River Heritage Trail, to the east. A trail alignment along Leggetts Creek through Chinchilla, past the water and sewage treatment plants and along the Fountain Springs water works is physically accessible. The Fountain Springs to Scranton Expressway reach has significant engineering challenges. A Leggetts Creek greenway trail feasibility study is recommended by LRCA as an outcome of this watershed plan to advance these greenway links.

5. The Scranton portion of this greenway can utilize existing City of Scranton owned riparian lands, neighborhood streets and existing recreation areas. The Leggetts Creek/North Scranton greenway can be based at the Leggetts Creek subdivision project, between Rockwell Avenue and the Dutch Gap Little League field.

6. The Lackawanna River Watershed 2000 program can address a number of mine drainage problems in the Rockwell Avenue and Charles Street reach of Leggetts Creek. LRCA recommends using River Conservation Implementation Program funds to match Watershed 2000 program funds where appropriate.

14(W) Greenbush Run

Greenbush Run is a small, 1.0 mile, first-order tributary which rises in springs and wetlands near the Lackawanna County Career Technology Center, and flows in remnant channel and culverts to confluence with the river at RM 14.6. The run flows through a stone culvert for several thousand feet. The culvert was built by the Hudson Coal Company in about 1900.

Recommendations:

Greenbush Run has very little potential for restoration. The water course should be defined and protected through municipal (City of Scranton) ordinance. The run may have potential as an outlet for storm water management discharge if any of the vacant land near the Career Center becomes developed.

There are two large bridge structures which cross over the Lackawanna River at the Greenbush Run confluence. The bridges were part of the Hudson Coal Company's Marvin Colliery operations. These bridges may be historic under Section 204 of the National Historic Preservation Act. The LRCA recommends that these structures need to be removed from their present location.

An engineering and cultural resource assessment plan including a demolition and/or relocation program should be an outcome. LRCA recommends that the demolition and/or relocation of these bridge structures serve as a river conservation implementation project.

15(E) I-81 Channel

The I-81 Channel is a 3.5-mile drainage system within a 3-square-mile artificial watershed created by the construction of the Interstate and Industrial highway junction in Dunmore in 1995. The drainage is an engineered capture of parts of the Meadow Brook, Little Roaring Brook and Carter Creek watersheds. The upper reaches are a culvert, swale and storm water detention basin system from the (LVIH) U.S. Route 6 - Interstates 81-380-84 junction, and the I-81/PA Rte. 347 exchange at the O'Neal Highway.

The culvert system discharges into an open trapezoidal channel adjacent to I-81 and the Marywood University Campus. The open channel runs for three-quarters of a mile to discharge into the Lackawanna between the Lackawanna County Recycling Center and the I-81 Bridge over the Lackawanna.

Recommendations:

LRCA recommends that the Department of Transportation consider design modifications to this system to mimic natural conditions by storing water in detention wetlands to be released as perennial flow. The open channel structure may be modified to induce natural morphological behavior.

The corridor area of the channel can be enhanced by a canopy tree and understory restoration scheme. An easement on the maintenance road along the channel can be conveyed to an appropriate agency to manage the roadway as a recreational trail from the Lackawanna River Heritage Trail between the river and Boulevard Avenue and the Marywood University Campus.

16(W) Grier Creek

Grier Creek, Storrs Creek, Scott Creek and Miles Creek all rise on Bell Mountain, on the west side of the Lackawanna Valley in Dickson City. All four creeks have similar typologies. Their sources are springs and seeps at the 1800 foot elevation, along the ridge line. From their sources the creeks flow down steep, rocky ravines and begin to encounter abandoned mine impacts and strip mines along the Llewellyn outcrop, and urban impacts near the PA Rte. 6 commercial corridor.

Bell Mt. Run, another Dickson City Creek also rises on Bell Mountain. It flows southwest and follows Rte. 6 to Leggetts Creek at the North Scranton Expressway. There is some evidence of another first order run entering the river near the City of Scranton/Dickson City border, 100 feet upstream of the I-81 bridge. There is a further remnant of this run adjacent to Commerce Boulevard/Main Avenue intersection. The balance of the stream would likely have drained the Storrs Colliery of the DL&W Coal Company. This area between Main St. and Rte. 6 commercial mall area saw extensive strip mining during the Second World War. Portions have been reclaimed and are proposed for development as a recreation complex by the Borough of Dickson City.

Grier Creek borders the north side of the proposed recreation area. There are several ponds, wetlands and drainage features on the reclaimed site. Grier Creek loses, regains and then loses its flow to underground mines from the reaches above Rte. 6 to the reclamation site above Laurel St. (visual observation during stream walk in July, 2000).

Grier Creek has been culvertized in a closed box culvert from the vicinity of Laurel St. and Grier St., and emerges into an open channel near the Bowman St. grade crossing of the Lackawanna County Rail Authority. The open channel flows for 0.5 miles along the rail corridor and river flood plain to its confluence with the river, 0.25 miles downstream of the Boulevard Ave. bridge.

The open channel hosts a severely degraded ecosystem: knot weed dominates the understory, coal waste piles and a remnant of the NYO&W rail way embankments are the dominant topographical feature, and a mix of silver maple, grey and river birch are the trees in the riparian forest canopy.

The confluence is adjacent to the downstream high ground tie out of the Dickson City flood levee, which forms a fish-hook berm along the river and wraps back upstream along Grier Creek, towards Bowman Street.

Recommendations:

1. Dickson City may wish to consider enacting stream corridor buffer and set back requirements in its ordinances and identify protection of stream and river corridors, flood plains and habitat values and functions as an outcome of future comprehensive plan revisions.

2. The Borough, developers and government agencies should consider stream flow and channel restoration and protection outcomes in all stream related work.

3. Future culvertization of Grier Creek should be discouraged; existing culverts should be day-lighted when possible.

4. The confluence area and levee tie in adjacent to Elm St. Park may serve as a river corridor access area and habitat restoration site. LRCA, LHVA and Dickson City may consider future projects for development at this site.

17(E) Sulphur Creek

Sulphur Creek was a small second order stream which once drained the central portion of Throop near the Marjol site. It now serves as a storm sewer shed, carrying storm discharge from the Marjol site as well as residential and commercial neighborhoods in Throop.

A Borough play ground at Woodlawn Avenue, St. Josphes Cemetary, a Little League complex and part of the Marjol site constitute a modicum of open space in the Sulphur Creek shed. A long abandoned rail grade offers some potential to tie in lower Throop with central Throop and the Mid Valley school campus area.

Recommendations:

- 1.

Due to its small watershed size and limited availability of open space, there are limited opportunities for any restoration of watershed habitat along Sulphur Creek. The establishment of a green space and recreation corridor is suggested.

- 2.

The LRCA supports the Borough of Throop's efforts to secure an acceptable clean up of the Marjol site. We suggest a green space recreation use be developed for Marjol as recommended in re-use feasibility studies considered by Gould Inc. as an end use following completion of clean up activities.

- 3.

We recommend the remnant rail corridor near the Little League field and Woodlawn Ave. should be preserved and developed as a link in a borough wide recreational path system linking the river corridor, recreational sites, new subdivisions and the Mid Valley school campus along the Eddy Creek greenway.

18(W) Storrs Creek

Storrs Creek rises in the Peaceful Valley Gap on Bell Mt., near the border of Dickson City and Scott Township. It falls steeply through a property developed as Bell Mt. Village, a commercial development above the PA Rte. 6 corridor. It is culvertized

through the development under a large cut and fill deposition, which forms the parking lot for a shopping center. A Wal-Mart store once occupied part of this site. Poor development practices, deficient site engineering, the violation of numerous environmental regulations and municipal ordinances and inept self interest by the developer has lead to the closure of the Wal-Mart and legal action in civil court against the developer.

The developer excavated a huge cut, forming an unstable highwall which has discharged large rocks and rock debris, which in turn impacted on the Wal-Mart store, forcing it to close. The site has become infamous as an example of poor development. The aesthetic and environmental damage to the Storrs Creek watershed is incomparable.

Storrs Creek is degraded for another 2000 feet between Rte. 6 and St. Anthonys Cemetery at Price Street. The creek flows through strip pits and overburden piles, cutting a steep, erosive ravine upstream of the cemetery. This cut generates much of the sediment and debris, which adds to the bed loads blocking the culverts downstream. The St. Anthonys Cemetery reach contains a few small remnants of habitat and has good green space and habitat restoration potential.

Storrs Creek is culvertized for the balance of its course through the developed portion of Dickson City along Main Ave. and the Lackawanna River. The culvert runs along Jackson St. to Main Ave. and conflues with the open channel of Scotts Creek at Enterprise Street, near Polonia Park.

Recommendations:

Storrs Creek is too heavily damaged and impacted by urban activities to warrant any comprehensive restoration project. Culvertization should be curtailed and existing culverts day-lighted.

1.

The Borough of Dickson City may wish to consider enacting ordinances to more effectively protect streams and stream corridor resources. The Borough plan should establish the protection of natural values and functions as a goal for the better management of stream and river corridor resources.

2.

The Borough, LRCA and property owners may wish to cooperate on a conservation management program for the St. Anthony's Cemetery reach.

3.

The Borough, LRCA and property owners may wish to cooperate on a conservation management program for the St. Anthony's Cemetery reach.

19(W) Scotts Creek

Scotts Creek rises in springs and seeps in outcrops of Pottsville conglomerate at 1600 feet, near the border of Dickson City and Blakely Boroughs on Bell Mountain. It encounters abandoned mine impacts as it approaches PA Rte. 6, north of the Circle Drive-in Theater.

These impacts, such as strip pits, overburden piles and stream flow losses and reappearances are common for the next mile, as Scotts Creek flows in an undeveloped corridor north of Idle Hours Bowling Lanes. The stream is bordered by cemeteries and residential neighborhoods, as it drops down a steep ravine.

The ravine exhibits morphological instability induced by upstream encroachments and illegal trash dumping. There are some specimen trees of tulip poplar, red and white oak, hemlock and white pine within the ravine. An occasional mountain laurel or rhododendron indicates patch remnants of native vegetation. The steep slopes of the ravine show numerous deposition sites where cemetery waste and residential yard waste and litter are dumped. There are also several 1950's era auto hulks in the ravine.

Scotts Creek enters its culvert system at the cemetery entrance drive way near Scott Road and Walker Street. The culvert follows Dundaff St., Grant Court, and Jermyn St. to discharge in an open channel near Eagle Lane at the rear of Gibbons Ford.

The open channel continues to pick up the Storrs Creek culvert and an LRBSA CSO near the county rail bridge. The channel then passes under Enterprise St. and flows between the Richard Mellow Electric Contractor site and Palonia Park.

Scotts Creek has its confluence with the Lackawanna River upstream of the flood levee berm at Palonia Park. A former LRBSA CSO and pump station was relocated from the confluence point in 1998. The habitat of the open channel is dominated by knotweed. The substrate is coal waste silts and ash.

Recommendations:

1.

The Borough should consider stream protection in updates to its comprehensive plan and ordinances.

2.

Further culvertization and encroachment to Scotts Creek should be prevented.

3.

The upland corridor near Rte. 6 offers a viable green space area to enhance and protect natural values and functions of Scotts Creek. The Borough may wish to consider acquisition of land for a stream corridor buffer protection zone to limit developmental impacts.

4.

As a follow on to any work performed by the PA DEP Bureau of Waterways Engineering, LRCA suggests that the Borough examine property acquisition, natural morphological management and restoration of flood plain habitat as outcomes.

5.

The ravine contains remnant natural habitats. A clean up program could aid in stream and flood event management and a recreational trail could be developed subsequent to cleanup activities. Proactive involvement of property owners and cemetery associations is suggested as a way to enhance stewardship of the Scotts Creek corridor.

20(E) Eddy Creek

Eddy Creek is a mid-sized second-order tributary of 6.0 miles in length and drains a 7.54 mi² watershed in the Boroughs of Throop and Olyphant.

Eddy Creek rises in springs and wetlands in the area of Marshwood on the western flank of Moosic Mountain. Marshwood Reservoir, a PAWC-owned reserve water supply reservoir was constructed in a wetland that straddles the headwaters of Eddy Creek and Little Roaring Brook.

Eddy Creek originates in a wetland on the northern spillway of Marshwood Reservoir. It flows through a wetlands system and then in a restored channel through a reclaimed mine site. The creek then flows through its natural channel and cuts across numerous rock ledges and outcrops of Llewellyn formation sandstone and coals.

The creek drops from an elevation of 1540 feet at Marshwood Reservoir along Marshwood Road. The loss of stream flow becomes more evident between 1200 feet and 1100 feet, where the stream loses flow completely via infiltration to the subterranean mine pool. All flow is lost into a noticeable void at about the 1100 feet elevation approximately 800 to 1200 feet upstream of the U.S. Route 6, Robert Casey Highway exit at Marshwood Road.

The creek flows through a constructed channel and culvert system under the Casey Highway. Below the highway, the creek's channel is still discernable as it meanders through woodlands on a shallower gradient. This reach contains an intact stone arch culvert, which carries the creek under the long abandoned Winton Branch of the Delaware, Lackawanna and Western Railroad. The channel is lost completely at the intersection with an electric transmission corridor and the portal of the Eddy Creek Mine Tunnel (1921).

The channel is completely obfuscated as it crosses through several private parcels over the next quarter-mile reach. Evidence of Eddy Creek is apparent just upstream of a culvert under the former Jessup Branch of the Erie Railroad. This site at the rear of Butler Stone Yard and Blue and White Trucking also features another artificial watershed anomaly, the discharge culvert for the Keystone Sanitary Landfill storm water management system. This system discharge actually provides nearly consistent flow to Eddy Creek. The discharge is heavily laden with sediments from the landfill's roads and under vegetated and exposed rock and soil areas.

The flow passes under the former Erie rail culvert and continues between the rail gradient and a natural cliff face for about 1000-feet. At this point enormous quantities of municipal waste from an old town dump are evident, having been dumped from the top of the 30 to 40 foot high cliff face.

The water course and all flows disappear in strip pits and sinks in this reach. From the base of the natural cliff face to the Birds Eye Mine entry at Underwood Road the water course of Eddy Creek has been completely obliterated by strip mining activities.

The water course is again evident at Underwood Road. The creek then passes between the Mid Valley School Campus and the Washington Street Playground in a residential neighborhood in Throop. Much of the stream corridor in this reach is compromised by strip mine impacts and fill encroachments. The creek passes under another stone arch rail

culvert. This structure, a wide shallow arch about 20' across and 100-feet in length once carried the Pancoast spur of the DL&W's Winton Branch to reach the Price Pancoast Coal Mines in lower Throop. This rail spur was abandoned about 1920.

After passing under the Pancoast rail spur the creek through the Choba Demolition Company property and the Scranton Craftsman property. Scranton Craftsman has graded an engineered channel for Eddy Creek in preparation for a residential subdivision development. This development also includes some Raymond Colliery property part of the Hudson Coal Company's Olyphant and Eddy Creek Colliery operations. This site includes a large coal waste rock dump now being regraded by Scranton Craftsman.

The defined channel of Eddy Creek is again compromised by stripping in the balance of this reach to Line Street on the Throop-Olyphant border. At Line Street, Eddy Creek picks up a tributary flowing from the northeast. This stream originates near Specialty Records and in various storm water detention basins in the Mid Valley Industrial Park and the Olyphant exit of the Casey Highway.

Eddy Creek passes under South Valley Avenue in a stone arch culvert. The creek shared the culvert with a narrow gage, Hudson Coal mine railroad, which operated until 1959. From the South Valley Avenue culvert, Eddy Creek flows dry one-half-mile to the river through the main portion of the Eddy Creek Colliery site. A large culm bank fire burned at this site until 1970. Erosion of coal waste and urban debris litter the stream bed and corridor as Eddy Creek makes its confluence with the Lackawanna, 200 feet downstream of a trestle which once carried the mine railroad across the river to the Olyphant Colliery.

A large delta of eroded coal mine wastes at the confluence is evidence of the large quantities of sediment transported to the river by Eddy Creek during storm events.

Recommendations:

The following projects and actions are recommended for Eddy Creek as part of the Lackawanna River Watershed Conservation Plan.

- 1.

Support for the PA-DEP Bureau of Abandoned Mine Reclamations plans for a stream corridor and channel restoration program including stream bed sealing and lining, total channel restoration using natural morphological designs, maintenance of stream corridor easements through private properties to insure continued future integrity of the corridor.

- 2.

Integration of an Eddy Creek greenway into the BAMR restoration project to include recreation trail and riparian conservation program involving ongoing stewardship and maintenance of the restored creek and stream corridor.

- 3.

Involvement of property owners and municipalities in a greenway management program for Eddy Creek.

- 4.

Involvement of Mid Valley School District with the greenway and trail. This trail can link the school campus with the Lackawanna River Heritage Trail at the confluence of Eddy Creek.

5.

Rehabilitation of the historic mine railroad trestle between Eddy Creek confluence and Olyphant Colliery is recommended to link the Eddy Creek greenway with the Lackawanna River Heritage Trail alignment at the Olyphant Colliery site.

6.

Involve municipalities and property owners in the conservation of the upper Eddy Creek watershed and the Marshwood area.

7.

Promote the use of conservation development in any subdivisions in this area.

21(W) Miles Creek

Miles Creek exists primarily as a storm and sewer shed, originating on the saddle of Bell Mountain, along the Dickson City/Blakely Borough line. It drains a small subdivision off PA Rte.6 and flows through a pipe culvert and rip rapped channel. It passes under Dundaff St. near Sebring Road and Miles Avenue. It is culvertized under the Miles Plot neighborhood. It enters the Lackawanna River in a concrete culvert, downstream of the Hull Creek confluence, at RM 17.6.

Recommendations:

As a storm and sewer shed, Miles Creek has no natural habitat remaining below Dundaff Street. LRCA has no recommendations for Miles Creek. It serves as an example of what not to do with water resource management.

22(W) Hull Creek

Hull Creek is a second order stream that has its confluence with the Lackawanna River at RM 17.7 in the Borough of Dickson City. Its main stem rises from a wetland pond at 1550 feet in Scott Township, along the Lackawanna Mountain range, between Hubbard and Bell Mountains. From its source, Hull Creek flows for 6.0 miles, draining a narrow 3.22 mi² watershed and entering the river at about 750 feet. It has one unnamed tributary which enters the stream within its very upper reaches. From its source downstream to PA Bus. Rte.6, Hull Creek is relatively undisturbed. Downstream of Rte. 6 to its confluence the stream is impacted by past mining operations and is channelized for its final reach through the residential areas of Blakely and Dickson City Boroughs.

The upper 1.8 mile reach of Hull Creek, in the southern portion of Scott Twp., is generally undisturbed, flanked by native trees and understory. Residential development is primarily away from the stream and relatively sparse. Similar conditions exist within the tributary's watershed, which also drains a wetland pond.

As the stream crosses into Blakely, its course closely follows PA Rte. 347 down the mountain, crossing under the highway several times. Stream banks have been stabilized through this reach and very little riparian corridor exists. Runoff from the highway and

residential property along the road most likely have an impact on the stream's water quality. The stream descends a fairly steep gradient and rock ledge outcrops are evident.

As the stream approaches its crossing with Rte. 6, it winds away from the road and through private property. A good cover of mature, native trees and understory line the stream bank, which is stabilized with rock through the property. Immediately upstream of the Rte. 6 bridge, a gas line, which transects the stream, has been rerouted in preparation for a PennDOT highway reconstruction project at the intersection of Rtes. 6 & 347. This project will have an impact on the stream and its corridor.

Just below the Rte. 6 bridge, Hull Creek discharges over a series of two waterfalls. The reconstruction project will involve adding fill over the waterfall area, for the construction of a new bridge. A longer culvert will be installed to convey the stream under the highway.

Downstream of the waterfalls for 0.3 miles, the stream continues in a steep gradient over rock ledges, plunge pools and slides, with native vegetative cover off both banks. Past mining operations become evident through this stretch with a fenced-in mine opening off the north bank.

As the stream enters the residential portion of Blakely, overburden piles cover upland areas off the north bank and encroach into the stream corridor. Heavy erosion into the stream is evident off these piles, which essentially make up the stream bank. Along the south bank, rip rap has been installed behind a trailer park to stabilize the stream. Successional vegetation covers the rip rap, further stabilizing the bank. Flow loss to the deep mines has been identified through this reach.

Downstream of the trailer park the stream enters a flood control basin. From this basin downstream 0.5 miles to the confluence, the stream is contained within an open, concrete box culvert. Homes and parking lots line both sides of the fenced-in channel through this reach, restricting the riparian corridor to concrete and lawn. The culvert is enclosed as it crosses under Main Ave. in Blakely, and for its final few hundred feet through Dickson City to the Lackawanna River.

Recommendations:

- 1.

Scott Township and Blakely Borough should conduct environmental audits of their ordinances and plans to insure maximum protection to Hull Creek and its related natural resources.

- 2.

The acquisition of conservation easements by gift or purchase from property owners along Hull Creek is recommended.

- 3.

Mitigation for the loss of scenic, natural and historical resources resulting from the Rtes. 6 and 347 project should include conservation improvements in Hull Creek and the Lackawanna River.

- 4.

Highway mitigation could be matched with abandoned mine reclamation work to identify and eliminate flow infiltration.

5.

The acquisition of a right-of-way for the Lackawanna River Heritage Trail and the construction of a pedestrian bridge at the Hull Creek confluence is recommended as an implementation action.

23 (W) Lackawanna Outfall

The outlet of the Lackawanna Colliery AMD outfall at RM 18.1 in Blakely Borough, is the likely remnant of a long lost tributary stream. This watershed is now a storm, sewer, and acid mine drainage shed, which drains a surface area in Blakely Borough between Bus. Rte. 6 and Main Street, and from Lincoln Avenue, north to Hospital Street.

A remnant of the stream channel is identifiable along an abandoned Erie railroad corridor from Main Street to Mott Street. At Mott Street, the loading docks at the rear of Quinns Supermarket now occupy the surface. The balance of the channel under the supermarket is routed in a 5'X8' oval concrete culvert.

At the Blakely Borough building, mine water rises beneath a concrete cap on the 800 foot Lackawanna Colliery shaft, and flows into a branch culvert 10 feet below ground surface to join the supermarket culvert, approximately 50 feet in from its downstream portal. The water course, now loaded with orange colored iron oxide deposition from the mine drainage, flows through an open channel for three-quarter miles between the remnant railgrade and the Haband Clothing Company property. The outfall then turns east for 300 feet and discharges into the Lackawanna River between the Haband property and a parcel of abandoned mine land owned by St. Nicholas Church.

Recommendations:

1.

LRCA had begun discussions with representatives of Haband Inc., Blakely Borough and St. Nicholas Church on a proposed AMD mitigation project to possibly include, an anoxic drain channel restoration project and wetland development. LRCA recommends that this project be considered for implementation program funds through the River Conservation Program, and other sources.

2.

LRCA recommends that Blakely Borough consider installation of a storm water drainage system for this sub-watershed, using a naturally analogous design to recreate the stream corridor and hydrologic resources which once existed in this area.

3.

LRCA recommends that Blakely Borough, LRCA and LHVA cooperate on development of greenway and trail linkages along the abandoned Erie and NYO&W rail corridor in this area.

24(E) Wildcat Creek

Wildcat Creek is a third order stream that has its confluence with the Lackawanna River at RM 18.6 in the municipality of Blakely. It arises in the Lackawanna Range between Hubbard and Meyers Mountains in Archbald, at about 1460 ft., flows for 5.0 miles and enters the Lackawanna River at 820 feet. The creek's 4.48 mi² watershed drains primarily residential and commercial development, or sites impacted by past mining activity. This has resulted in channelization of a section of the stream and most of its remainder showing signs of impact from mine rock and urban development. A steep headwaters reach remains the only stretch bearing natural conditions. Wildcat Creek has one second order tributary, Tinkpaugh Creek and an unnamed second order tributary, whose branches rise near Hubbard Mountain.

Stable stream channel and vegetative conditions exist from the headwaters downstream 0.6 miles to its intersection with PA Bus. Rte.6. The well-developed, native tree and understory cover, and stable bank conditions through this stretch are the only semblance of natural conditions along Wildcat Creek, however no stream flow was observed within this and any downstream reaches in November, 2000. Due to the rocky nature of the stream's headwater area and lack of wetlands, it is possible that the stream receives only intermittent flow from its source. In addition, the creek may lose flow to the coal measures, which it crosses within a few hundred feet of the headwaters.

From Rte. 6 downstream to Betty St., the stream is severely impacted by culm piles along the east bank, and the back of commercial lots along the west bank. No stable stream banks exist, as culm has encroached over the entire stream corridor, which is essentially a sediment-choked, storm water ditch, receiving runoff from parking lots and culm piles. Garbage and dumped material is prevalent within the stream and along its banks. Successional vegetation has established itself along some stretches through this reach, however much of the riparian corridor is concrete or bare.

From Betty St. in Eynon downstream about 1.25 miles to a flood protection basin, the stream has been impacted by past mining operations and urban development. Some sections are severely impacted by encroaching culm, waste rock, and sediment, leaving stretches of unstable banks and a bottom covered with sediment. Most of the vegetative cover is successional brush. New residential development and dumped urban debris have also begun to encroach into the stream corridor. About a 0.25 mile section of the stream, below Betty St., is fenced in as part of the rear of the General Dynamics Corp. property; this stretch has a stable, more developed forest cover.

Along with the reach described above, the stream below Betty St. receives and carries significant storm water runoff from surrounding urban development. During heavy storm events or quick snowmelts the creek often flooded, prompting construction of a flood control basin and box culvert channel.

The last mile of Wildcat Creek was reconstructed in 1994-97 and is contained in an open, concrete box culvert that stretches between flood control works constructed near Rte. 247, to the confluence. The culvert is bordered by lawns and houses, and access to the stream is restricted by a fence. No natural channel or riparian conditions exist within this final reach.

Both tributary streams enter Wildcat Creek within this stretch. The second order stream enters at the flood control basin. Its headwaters lie above Rte. 6 on Hubbard Mountain and are steep, relatively undisturbed reaches. At and downstream of Rte. 6, the stream banks are stabilized with rock and the stream drains reclaimed stripping pits and

residential and commercial developments. No flow was observed within this tributary in November, 2000. The second tributary, Tinklepaugh Creek, enters Wildcat between the flood works and confluence. It is described below.

Tinklepaugh Creek

Tinklepaugh Creek is a 2.5 mile, first-order tributary stream to Wildcat Creek. It enters Wildcat about 0.5 miles upstream of its confluence with the Lackawanna River. Its entire watershed has been developed and the stream has been substantially impacted by past mining operations and urban development. It generally does not carry any base flow, but does receive substantial amounts of storm water from its watershed. No flow was observed throughout any section of the stream in November, 2000.

The stream's headwaters lie in a strip mine area off the east side of the Eynon-Jermyn Road, near the turn-off to the Valley View Middle and High Schools. Headwater springs seep from under mine rock piles and into a small ditch, which runs parallel to the road. The ditch runs along houses, driveways and lawns, before crossing under the road near its intersection with Kennedy Drive.

From this point the stream runs parallel to the Eynon-Jermyn Road off its west side, behind commercial and residential lots. It is heavily impacted by invasive vegetation and urban debris in its channel and along its banks. Approximately 0.8 miles below Kennedy Drive, the stream enters abandoned mine lands which have been regraded and are being developed for residential purposes. Upland areas are bare of vegetation, however the stream corridor is overgrown with invasive and successional vegetation. The stream disappears into a mine opening on the site and there is no discernable stream course below it.

The stream channel becomes evident again as a rip rapped channel, running parallel to Main Ave. in Blakely, off Smith Street. The stream is stabilized as a rock channel for a few thousand feet and then leads into a flood control basin off Union St. From this point for one mile to its confluence with Wildcat Creek, the stream is contained in an open box culvert, similar to the one constructed for Wildcat. Conditions along the stream are also the same as those on Wildcat; no riparian corridor, with the fenced-in channel bounded on both sides by residential development. This channelization was completed as part of the Wildcat Creek flood protection project.

Recommendations:

- 1.

Due to the intensive and newly installed concrete culvertization, the lower Wildcat and Tinklepaugh watersheds have minimal conservation opportunities. LRCA recommends creation of an upgraded Canoe-a-thon launch site at the confluence.

- 2.

LRCA and LVC are interested in a conservation and maintenance easement on a specimen white oak tree owned by Vivan Walsh, adjacent to Tinklepaugh Creek, on Keystone Avenue. This tree is estimated to be in excess of 250 years old. It is a special place resource. River Conservation funds are recommended for its conservation as appropriate.

- 3.

This plan supports the pending completion by the PA-DEP Bureau of Abandoned Mine Reclamation of stream channel work in the Hills of Archbald portion of Tinklepaugh Creek, to address flooding problems from storm water runoff and eliminate flow diversion into the Gravity Slope mine outfall.

4.

The headwaters portion of Tinklepaugh Creek have numerous encroachments and mine impacts. LRCA recommends a greenway and mine reclamation program for this area.

5.

The reach of Wildcat Creek, from Sturgis through Betty Street, to the rear of the Eynon Drug Store Plaza, contains remnants of a O&W railroad branch line. This rail corridor has the potential to link the Archbald Pothole State Park to the Lackawanna River Heritage Trail and to a rail-trail greenway network in Peckville. LRCA recommends that this project be considered for a feasibility study with River Conservation funds.

6.

The upper headwaters of Wildcat Creek and its tributaries on Blakely and Myers Mountains are recommended for acquisition or special protection, through updated municipal ordinances and consideration in the pending Lackawanna County Open Space Plan.

25(E) Sterry Creek

Sterry Creek is a large, first-order tributary which joins the river at RM 19.2. It rises in a catchment area defined by a 6-acre water supply reservoir, the O'Connor Dam at 1500 foot elevation, on a terrace of Moosic Mountain, in the Borough of Jessup. The headwaters area borders the Valley View Business Park site to the west and the Moosic Mountain ridge top barrens natural area to the east. The creek immediately encounters abandoned mine impacts as it approaches the culvert under PA 247. It is heavily impacted by mining, for the balance of its 3.5 miles to the river. It meanders into Olyphant at the old Moosic Mountain Coal workings where large piles of overburden from stripping and culm dumps and silt piles all contribute to a significant sediment transport problem. This area is visible from the new Robert Casey Highway (U.S. Route 6) between the Olyphant and Jessup exits.

The PA-DEP Bureau of Abandoned Mine Reclamation (BAMR) and the Department of General Services (DGS) have both installed channel improvement projects from the area of the highway down through the Mid Valley Industrial Park and the Constitution Avenue residential area of Jessup to the confluence. The channel improvements from the Casey Highway to Lane Street feature, stream bed sealing and grouted rip-rap which retains and supports natural morphological and habitat values.

The channel from Lane Street through Constitution Avenue and the Lackawanna County Rail Authority corridor to the confluence is a gabion basket, concrete u-channel, trapezoidal rip-rap combination.

The channel continues to loose flow in the Mid Valley Industrial Park near Specialty Records. BAMR intends to identify and correct the remaining infiltration problems in this reach in conjunction with additional work from the Casey Highway

upstream to the PA Rte. 247 culvert. This reach contains the very visible culm and silt bank owned by Pagnotti Coal Company adjacent to the Casey Highway. This bank was not included in the first phase of BAMR work due to an initial lack of cooperation by the landowner. BAMR installed gabion basins to intercept the excessive quantities of silt and culm eroded from these piles which had previously flowed downstream causing flooding at Lane Street and Constitution Avenue in Jessup.

With the completion of the next phase of BAMR work nearly all reclamation work on the Sterry Creek corridor will be achieved.

Recommendations:

1.

Complete Bureau of Abandoned Mine Reclamation channel restoration work from the Casey Highway to PA Rte. 247.

2.

Identify and seal remaining infiltration points.

3.

Conduct upland reclamation to backfill stripping pits and grade overburden piles.

4.

Integrate a greenway conservation and recreation corridor along Sterry Creek with conservation subdivisions in upland areas.

5.

Identify and protect remnant habitat features such as rhododendrons and laurel groves and rock ledges in the context of subdivision development.

6.

Develop a conservation plan for the O'Connor Dam and upland headwaters springs.

26(E) Grassy Island Creek

Grassy Island Creek drains a 5.4 mi² watershed on Moosic Mountain in the Borough of Jessup and Jefferson Township. The headwaters of this 6.0 mile long creek rise in mountain springs and flow through some steep hemlock ravines on property owned by the Theta Corporation, the Pennsylvania Game Commission, and The Nature Conservancy.

These headwater springs have their origin in the geological structures of the Moosic Mountain summits at 2000 feet. The Moosic Mountains support a globally unique scrub oak, pitch pine and heath barrens. These plant communities exist in shallow, extremely well-drained, rocky soils along the ridge top. Occasional mesic barrens occur along the dry ridge tops in perched wetlands. Rain water and snow melt run-off from the ridge tops percolate through the soils in these perched wetlands and then through cracks and faults in the Pocono conglomerates and sandstones, to emerge as springs from glacial deposits of sand and gravel in ravines on the lower slopes of the summits.

These conditions are common to all Lackawanna River tributaries rising on the Moosic or Lackawanna mountains. The headwater runs approach the Pocono/Llewellyn formation boundary at about 1500 feet. Here again as is common on many of the ridge line tributaries water supply reservoirs are located.

The Olyphant Nos. 1, 2, and 3 Reservoirs were constructed by the Winton Water Company in the 1890's. These reservoirs are now part of the Theta properties and are no longer in active water supply service. Olyphant No. 2 was breached by PG&W Company in 1994 in compliance with dam safety requirements and in anticipation of the receipt of storm water flows from the then proposed federal prison project. The water quality classification of the headwaters reach of Grassy Island is ranked as a high quality, cold water fisheries.

Below Olyphant No. 1, the impacts of anthracite coal mining activities begin to catastrophically degrade the habitat, water quality and channel morphology of Grassy Island Creek. Historic mining activities were conducted by the Sunnyside and Dolph Collieries. These sites have been documented by a highway construction mitigation study conducted by the Department of Transportation in 1994.

Remnants of buildings and foundations of the Sunnyside patch town can be encountered on the hillsides along this reach of Grassy Island Creek. A small coal company reservoir constructed of large blocks of conglomerate is located about 1000 feet southwest of Olyphant No. 1, on a small spring-fed tributary run. Another coal company dam, since breached, is located about one-quarter-mile upstream of the Casey Highway. Along this reach, the creek is impacted by piles of tunnel rock, a burned culm bank, stripping overburden and pits.

The Robert Casey Highway transects the Grassy Island Creek watershed on a huge earth fill. Grassy Island Creek is routed for 400' through a concrete box culvert under this fill. The creek emerges along Sunnyside Road, which provides access to St. Michaels and Holy Ghost Cemeteries from Hill Street (PA Rte. 247) in the uptown residential neighborhood of Jessup. The Creek flows through some scenic rock ravines and ledges with remnant habitat of rhododendron and laurel groves, with a few specimens of hemlock, white oak and chestnut oak trees.

As the Creek reaches Rte. 247, it encounters a high wall ledge of Llewellyn sand stone shale and anthracite coal. The ledge is approximately 40 foot in height with a 4 foot thick seam of anthracite coal at its base. At this site the creek turns 90E and flows west on its final three-quarter mile long reach to its confluence with the Lackawanna River.

This reach of Grassy Island contains the most severely impacted section of its watershed. There are old railroad trestle abutments upstream and downstream of the Breaker Street culvert. A portion of the creek bed and stream banks were reclaimed through a WPA project in the 1930's. Mortared and dry-stone masonry retaining walls are evident for two to three thousand feet. In an effort to reduce streams flow loss, the streambed has been lined with knapped stone.

The upland areas on both sides of the Creek featured large colliery operations. The Sterrick Creek, Mount Jessup and Pompey Collieries are evident in culm piles and four to five hundred acres of unvegetated mine soils.

The Creek passes under the Carbondale line of the Lackawanna County Rail Authority about 300 feet upstream of its river confluence. The downstream bank of the confluence contains the 200,000-cubic-yard Rose Pile, a culm dump. In 1996, the ice flood of January 19 caused the Creek to jump its channel and flow along the base of the Rose Pile. It has since eroded over 30,000-cubic-yards of culm into the Lackawanna. A channel restoration project conducted by Lackawanna County Conservation District has completed a relocation of the channel at the confluence in 2001.

Recommendations:

The outlook for the restoration and conservation of Grassy Island Creek and its watershed as of 2001 is excellent. Several reclamation and economic development projects are currently in the engineering and permitting phase. It will be crucial for all participants to insure that the project designs incorporate strong habitat, morphological and water quality principles. Follow up with property owners, developers, and the municipalities is suggested, to insure that the reclamation work being undertaken with public funds is maximized by a greenway protection program.

The creation and protection of a Grassy Island Creek Greenway can enhance the development values for upland developable sites in the entire watershed both, at the Pompey Colliery sites and in the Sunnyside district.

Starting from the confluence this plan recommends the following:

1.

The Lackawanna County Conservation District has restored the stream channel at the river confluence to its original location using a natural morphological design. Installation of additional natural vegetation is a recommended action.

2.

The Bureau of Abandoned Mine Reclamation will conduct a major site reclamation project including the Rose Pile at the confluence, the stream corridor through Breaker Street, the Pompey site from the stream and river corridors eastward to the Breaker Street neighborhood and installation of a new bridge at St. Michaels Cemetery to replace the existing coal company era span. To maximize conservation potential, these additional actions are suggested:

*

the Borough should adopt a stream set back ordinance in their subdivision and land use regulations to require a 75-foot building setback from each side of the creek's channel center and from the bank full line along the Lackawanna River for all new development

*

property owners should work with the Borough, the Lackawanna Valley Conservancy, and the LRCA to develop conservation and where appropriate recreation easements or acquisitions along the stream corridor

*

the Borough may consider instituting recommendations for greenways in its comprehensive plan

*

these steps can augment the reclamation project, construction easements and follow up requirements from the BAMR projects

*

subdivision and development proposals should require setbacks and recreation/ open space set asides to include the greenway corridor along the Creek and river.

*

special efforts should be made by all parties to protect and enhance remnant stream habitat along lower Sunnyside Road from the PA 247 highwall to St. Michaels Cemetery.

3. The stream corridor from the Robert Casey Highway to Olyphant No. 1 Reservoir should be restored with morphologically appropriate designs. Abandoned mine impacts should be removed from the stream corridor and a greenway design should be developed to enhance the proposed upland industrial and business park.

4. The Borough of Jessup and SLIBCO should consider working with the Lackawanna Valley Conservancy to design and develop a conservation and recreation easement program through the business park site.

*

This program could include elements for conservation and recreation management at the reservoir and archaeological sites, rhododendron groves, steep slopes and hemlock ravines throughout the business park.

*

This program can enhance the management of these water features and increase the value of the features in marketing the site to potential clients.

5. The upland headwater areas of Grassy Island Creek should be managed long term for conservation use, exclusively. The development of conservation easements on, or a conveyance of the Theta properties to a conservation agency are recommended actions in this plan.

6. All development and construction activities should be carefully monitored to prevent the further introduction of noxious weeds into the habitats of the Grassy Island watershed.

27(E) Winton Run

Winton Run is an intermittent stream draining a two-square-mile watershed. It rises on a ridge between the Olyphant reservoirs and the Lackawanna River. Several hundred acres have been reclaimed by BAMR in 1991. The upland areas are within the boundaries of the Valley View Business Park being developed by SLIBCO.

Information on Winton run was collected by two reconnaissance visits, one to the confluence area at Winton and the other to the upland area. Other information has been derived from aerial photography.

Recommendations:

Due to its intermittent nature, LRCA recommends that the management recommendations suggested for the SLIBCO sites on Grassy Island Creek be extended where appropriate to the Winton Run shed. The Borough may also wish to include the protection of Winton Run in its ordinances and comprehensive plan.

28(E) Laurel Run

Laurel Run is a second-order stream that has its confluence with the Lackawanna River at RM 22.0, in the municipality of Archbald. It rises in a wetland at 2150 ft. along the Moosic Mountain range in Jefferson Twp., flows for approximately 4.0 miles, draining a 2.75 mi² watershed, and enters the River at 850 ft. Between the confluence and the Robert Casey Highway (RCH) the stream and its riparian corridor are impacted by overburden and other waste mine rock from past mining operations. From the RCH upstream to the headwaters the stream remains relatively undisturbed in largely undeveloped private property. Laurel Run has one unnamed tributary.

From Laurel Run's headwater wetland downstream for approximately 2.75 miles to Laurel Run Reservoir, a former water supply reservoir at Francis Cawley Dam, stream channel conditions remain unaltered and the riparian corridor is composed of native forest and understory cover. A small residential development just downstream of the headwaters wetland, along Salem Mt. Road, offer the only possible impacts to the stream and its corridor. These impacts are and will most likely remain minimal however, as full development of the area is unsuitable, due to difficulty in the construction of proper septic systems in the rocky terrain. The upper section of the stream's watershed in Jefferson Twp., is composed primarily of State Game Lands, which will insure that it remains in its present condition. A small parcel of undeveloped Theta Corporation property and an electrical utility line right-of-way also transect the upper watershed, with minimal impact. Laurel Run's tributary enters the stream just above the reservoir, and also drains undisturbed watershed in Jefferson Twp. and Archbald Borough.

As the stream discharges over the spillway at Cawley Dam in Archbald, it begins to descend a steep gradient consisting of a series of waterfalls, ravines, slides, and water-worn ledges, which run downstream for about 0.3 miles to the culvert under the Robert Casey Highway. Combined with an impressive riparian growth of rhododendron, this reach is very scenic and listed on the LRCA's List of Special Places and Natural Areas. Though past mining operations existed on upland areas through this reach, the stream and its corridor has remained relatively unimpacted. Mine drainage from small seeps does enter the stream just below the reservoir, however iron oxide deposition in the channel is localized to a few hundred feet downstream. A mine reclamation project on an upland slope off the north bank of the stream near the highway, has addressed some of the impacts of mine spoils to the stream in this area.

From the highway downstream to the confluence (approx. 0.8 miles), Laurel Run's channel and banks are composed primarily of mine waste rock. Though most of the stream banks are now overgrown with successional vegetation, some stretches are flanked by unstable waste rock that has covered the banks and encroached into the

channel. Often visible underneath the waste rock are signs of the original ledges that made up the stream's banks and channel. A section of the streambed through this stretch was moved and reconstructed after a flood event in 1972. Since then, additional work related to the development of the highway and the PG Energy Power Plant co-generation site, has included stabilizing the stream bank with rip-rap and culvertizing the stream for about 400 ft. under the highway. In September 2000, loss of base flow in Laurel Run was observed approximately 0.3 miles upstream of the confluence.

Recommendations:

1.

LRCA recommends that the Theta Company lands in the Laurel Run watershed should be preserved through acquisition or easements and included in the pending Lackawanna County Open Space Plan.

2.

The Borough of Archbald and Jefferson Township may consider environmental audits of their comprehensive plans, zoning, subdivision and land use ordinances to insure that the watershed resources of Laurel Run and White Oak Run are protected with the most current municipal regulations consistent with the municipality's planning code.

3.

The Laurel Run gorge area, downstream of the Francis Cawley Dam, is included in the LRCA's List of Special Places and Natural Areas. The geological and aesthetic resources at this site require permanent conservation and more active management, to prevent littering and vandalism. LRCA recommends inclusion of this site in the Lackawanna County Open Space Plan.

4.

The reach of Laurel Run from the culvert under the Robert Casey Highway to the confluence, has several sections where flow loss is evident. Previous channelization structures have been compromised by storm flows and the LRCA recommends that the property owner, PG Energy, cooperate with the Bureau of Abandoned Mine Reclamation and other agencies to restore a naturally analogous system through this reach. The potential also exists for an educational trail in the reach, to interpret geological and mining resources.

29(E) White Oak Run

White Oak Run is a second order stream that has its confluence with the Lackawanna River at RM 22.5, in the municipality of Archbald. Its main stem and headwater tributaries rise at 2100-2200 ft. on the Moosic Mountain range in Jefferson Twp. From its source it flows for 4.0 miles and enters the River at 900 ft., draining a 5.11 mi² watershed. Its lower stretches in Archbald are impacted by urban development and past mining activity, while middle and upper reaches remain relatively undisturbed. It has two named tributaries, Spruce Swamp Creek and Indian Cave Creek and five unnamed tributaries.

Similar to the upper reaches and watershed of Laurel Run, White Oak Run remains undisturbed with a stable cover of native forest and understory from its headwaters to the dam at White Oak Run Reservoir. State Game Lands in Jefferson Twp. and Archbald

Borough comprise most of its pristine upper section. At the confluence with Indian Cave Creek, just above the reservoir, the tributary flows over a 40-foot waterfall to enter the stream (this waterfall is locally known as “40 Foot Falls”). Below this confluence, the stream flows through a ravine lined by a riparian stand of hemlocks and rhododendron. The waterfall and ravine area is very scenic and listed by the LRCA on its Special Places and Natural Areas List. Tributaries to the stream within the upper watershed of White Oak Run also remain relatively undisturbed.

Below the reservoir’s dam, downstream 0.3 miles to the Robert Casey Highway, the stream corridor enters into mining disturbed areas. Overburden piles along the stream have altered the channel’s course and small mine seeps immediately below the dam contribute some iron oxides, though their impact is localized. The riparian zone is well vegetated by stable successional growth, as are upland spoil piles. Water withdrawals from the reservoir, for power generation at the downstream PG Energy Power Park, have reduced discharge over the dam’s spillway, restricting downstream flow from the dam. In September 2000, flow in the stream disappeared at a point about 300 foot below the dam.

Most of the final 0.8 miles of the stream, from the highway down to the confluence, is confined in a steep sided ravine of rock ledges. The stratigraphy of bedrock is clearly visible within the ravine, which includes an occasional coal seam. The stream’s substrate consists of bedrock, overstrewn by large boulders and broken rock ledges. The ravine is heavily shaded by overhanging riparian trees and mature trees have even developed within the channel itself. Along with the boulders and ledges in the channel, a jumble of fallen trees have resulted in a disordered streambed and corridor. Urban litter and debris have been discarded into the channel, as has a good amount of construction debris at the Goers St. Bridge.

Spruce Swamp Creek, which has its confluence with the stream just above Goers St., has been heavily impacted by past mining activity and urban development and debris. Its streambed is similar to White Oak’s and is overgrown by successional vegetation. Except for during storm events, it contributes no flow to White Oak.

The last 600 ft. of White Oak Run is channelized with concrete or old rock walls, from the culvert under the LCRA tracks to along Salem Road and under the parking lot of the Archbald Borough Building. Combined sewer overflow and storm water pipes discharge into the stream within this stretch.

Recommendations:

1. This plan recommends a municipal environmental audit to promote protection of White Oak Run watershed resources.
2. This plan recommends that a cleanup of trash and debris be conducted in White Oak Run from its confluence to the Robert Casey Highway.
3. This plan recommends that geological resource, interpretive access sites should be considered at several sites along White Oak Run.
4. This plan recommends the development of a scenic, interpretive area at the White Oak Run reservoir and at the “40 Foot Falls,” the confluence of Indian Cave Creek and White Oak Run.

5. LRCA lists two reaches of White Oak Run on the List of Special Places and Natural Areas: the Robert Casey Highway to confluence reach and the White Oak Run Reservoir to “40 Foot Falls” reach.

6. LRCA recommends that PG Energy consider other sources of water supply for its co-generation plant. Consumptive use of the entire flow of White Oak Run, observed during this survey, is an ongoing concern of the LRCA.

30 (E) Powder Mill Run

LRCA has not included a survey or recommendation report for this small, first order tributary, along the Jermyn-Archbald border.

31(E) Aylesworth Creek

Aylesworth Creek is a second-order stream that has its confluence with the Lackawanna River at RM 24.3, in the municipality of Jermyn. Its main stem rises from a small wetland pond on the Moosic Mountain range in Carbondale Twp. at about 1570 feet. Two first order tributary streams to Aylesworth also rise in the mountain range and enter the creek within its upper reaches. A third, first order tributary drains mining disturbed areas and enters just upstream of Aylesworth Reservoir. From its source, the creek flows for about 4.3 miles through Carbondale Twp., Archbald and Jermyn, draining a 6.7 mi² watershed and entering the river at 950 feet. Except for its lower section, the creek’s watershed remains relatively pristine and undeveloped. Past mining operations and urban development have had impacts on the stream and its corridor from the confluence upstream through the Nebraska section of Jermyn, to above Aylesworth Reservoir.

From its source downstream for approximately 2.0 miles to Edgerton Reservoir, Aylesworth Creek and its corridor retain nearly pristine conditions. Headwater reaches of the stream, and the two small, upper tributaries of the creek, cascade through a riparian corridor of native vegetation, flanked by a well-rooted, stable forest cover. The upper watershed reaches also contain small wetlands and hemlock-lined ravines, which add to the stream’s pristine nature. Most of this upper watershed is composed of State Game Lands and private property, which is used by a hunting club.

From Edgerton Reservoir, a former water supply reservoir, downstream 1.5 miles to Aylesworth Reservoir, the stream crosses the coal measures and transitions from its more natural conditions to one impacted by former mining operations. The US Army Corps of Engineers flood protection project that produced Aylesworth Dam in the early 1970’s, addressed some of the upstream mining impacts that overburden and culm piles had on the stream and its corridor. Stream sections were stabilized with large stones and successional vegetation has developed along its banks, however, unvegetated spoil piles remain in upland areas and in some instances still encroach into the corridor. Stabilization of the stream channel also included the construction of a dry dike along the north bank of the stream, about 0.75 miles above Aylesworth Reservoir, to serve as flood protection between the Aylesworth and Hosey Creek watersheds. Additional mining impacts to the stream through this stretch include mine drainage seeps along the south shore of Aylesworth Reservoir as well as from the tributary that enters the stream above the reservoir. The tributary’s mine drainage is treated by a liming operation, the only one of its kind within the Lackawanna River watershed.

Recreational opportunities, under the supervision of a Recreational Authority, have developed at Aylesworth Reservoir. A spring trout-stocking event has provided fishing opportunities and the site is also used for swimming and hiking.

Immediately below Aylesworth Reservoir lies the Robery Casey Highway and the Nebraska section of Jermyn. Discharge from the reservoir is maintained by valve control within the dam. From the discharge downstream 0.5 miles to the LCRA right-of-way, the creek's corridor has experienced impacts from past mining operations and urban development. Overburden and culm piles have encroached into the riparian zone and urban debris has been dumped along the creek, however successional and remnant native vegetation have developed on disturbed uplands and along the stream, forming a relatively stable stream channel and riparian buffer. Remnants of the former D&H Gravity Railroad and old mill workings along the creek can still be seen through this reach.

For the final 0.2 miles from the culvert under the railroad tracks downstream to the confluence, the creek flows through the Powder Mill Dam River Corridor Preserve, a 12-acre property owned by the Lackawanna Valley Conservancy. In 2000, a stream stabilization project and supplemental plantings in the riparian zone addressed bank erosion problems within this reach. A magnificent stand of black cherry trees with a well-developed understory covers the Conservancy's property, which includes a walking path and access points to the Lackawanna River.

Recommendations:

1. Reclamation of abandoned mine impacts adjacent to the Aylesworth Creek corridor between Aylesworth Dam and Edgerton Dam is the main recommendation for Aylesworth Creek. Opportunities for passive AMD treatment technologies are numerous. Regrading of coal wastes and installation of natural channel improvements will also benefit the conservation of this reach.
2. A conservation development plan to manage and enhance the protection and economic utility of the Edgerton Reservoir and adjacent land is recommended.
3. At the confluence, additional stream bank stabilization work is appropriate on the Powder Mill Dam site. A linkage trail from the Powder Mill Dam area and the Archbald to Jermyn reach of the Lackawanna River Heritage Trail, to Aylesworth Park is recommended.
4. The further development of a forest stewardship program at Powder Mill Dam is recommended. Powder Mill Dam site may also be an appropriate location for the installation of an interpretive kiosk or pavillion.
5. Upgrades to the recreational facilities at Aylesworth Reservoir may be considered by the Recreation Authority. Establishment of a natural resource interpretive trail at the dam may also be considered.
6. The Boroughs of Archbald and Jermyn and Carbondale Township should review their plans and ordinances to insure that protections to Aylesworth Creek include the most current techniques for stream corridor conservation and protection.

LRCA has not included a survey or recommendation report for this small, first order tributary, along the Jermyn-Archbald border.

33(W) Calendar Gap Creek

Calendar Gap Creek flows from Calendar Gap on Myers Mountain and flows four miles through the mountainous northwestern portion of Archbald Borough, crossing under U.S. Business Route 6 before entering Jermyn Borough from Route 6. The Creek completely loses its flow in a stripping sink about 800 feet east of the roadway at its intersection with the driveway of a PA DOT maintenance yard.

From this location for one mile downstream into the residential area of Jermyn, the stream channel has been completely obfuscated by strip mining. The balance of the channel serves as a storm water drainage for the residential neighborhoods in Jermyn. It is primarily culvertized to its confluence with the Lackawanna River, at the Delaware Street bridge. An adjoining property owner is allowing utility trench waste and similar materials to be deposited on private property at the Creek's confluence with the Lackawanna River. This may constitute a violation of Section 404 of the Clean Water Act and Chapter 25 of state water regulations affecting the deposition of fill material along 100-year flood plains. The Borough of Jermyn owns land along the Delaware Street side of the confluence. It contains a grove of maple trees planted as a war memorial and several picnic tables.

Recommendations:

1. The Borough of Archbald should protect the upper reaches of Calendar Gap Creek with a 75-foot building setback and a requirement to maintain the corridor in its natural vegetative land use.
2. The mid portion of Calendar Gap may be a candidate for future BAMR or Lackawanna Watershed 2000 projects to restore the channel and flow. If this occurs, the municipalities should insure that a greenway or conservation corridor is maintained.
3. A confluence park site should be created through a project involving the Borough-owned parcel and possible easement or acquisition of all or a portion of the adjoining private parcel. The site has potential to tie into the Heritage Trail development across the Delaware Avenue Bridge and serve as a Heritage Landing for Jermyn.

34(W) Rush Brook

Rush Brook is a second order stream that has its confluence with the Lackawanna River at RM 25.1, in the municipality of Jermyn. Its sources are Heart Lake, at 1545 feet and a series of wetlands at 1500-1700 feet, all in Greenfield Township. From Heart Lake, the stream flows for about 4.0 miles, draining a 6.0 mi² watershed and entering the river at about 900 feet. Except for its lower reach through Jermyn, most of the creek's corridor is undisturbed. Rush Brook has three unnamed, first order tributary streams that drain primarily undeveloped watershed.

Rush Brook runs within close proximity of PA Rte.107 from its source at Heart Lake 3.5 miles downstream to its intersection with PA Bus. Rte. 6. The few homes and business along the highway are generally set back from the stream and appear to have no direct

impact on the stream channel and its riparian corridor. Impacts to the stream through this stretch most likely occur at points where the stream runs under or along the road and stream banks have been stabilized. The riparian corridor is restricted at these points as well, however a stable cover of native trees and understory generally covers both sides of the stream throughout this stretch.

About 2.0 miles downstream of Heart Lake, Rush Brook flows through Rush Brook Reservoir, a former water supply reservoir. A beaver dam at the reservoir's inflow has created a well-established wetland. Conditions at the reservoir site are relatively undisturbed and the stream discharges over a spillway at the dam. All three of Rush Brook's tributaries enter the stream above the reservoir.

From Bus. Rte. 6 downstream through Jermyn to the confluence, stream banks have been either stabilized or channelized. From under Rte. 6 downstream for 0.2 miles to the beginning of the residential area of Jermyn, stream banks are stabilized with rip rap. Successional vegetative cover has emerged over the rock, providing a riparian cover that remains relatively undisturbed. At its entrance into the residential area, gabion baskets or concrete floodwalls line both sides of the stream down to the Washington Ave. Bridge. The stream bottom has not been stabilized and remains composed of cobbles and boulders. Streets, parking lots and the backyard of homes border the creek on both sides, however invasive vegetation has grown over the bank stabilization areas and begun to grow within the stream channel itself. The few hundred feet from the bridge to the confluence is generally rip rapped and overgrown by successional vegetation.

Recommendations:

1. This plan recommends environmental audits to promote updates to municipal regulations related to the protection of Rush Brook and its watershed resources.
2. This plan suggests that former PG&W watershed lands, now owned by Theta Company, should be considered for conservation by acquisition or conservation easement. These and related lands should be included in consideration through the pending Lackawanna County Open Space Plan.
3. This plan recommends that the Borough of Jermyn and the Lackawanna Heritage Valley Authority consider acquisition of land adjacent to the Rush Brook-Lackawanna River confluence, to support a greenway area linked to the Lackawanna River Heritage Trail.

35(E) Hosey Creek

Hosey Creek is a small first-order run which originates in seeps near a dry dike along the Archbald - Mayfield boundary. The dry dike was developed as part of the Aylesworth flood control dam project in 1960 by the U.S. Army Corps of Engineers.

Hosey Creek is an alternative glacially deformed outlet for Aylesworth Creek. The dry dike serves to prevent a flood event pool at Aylesworth Dam from back flowing down the Hosey channel.

As it currently exists, Hosey Creek is an intermittent stream draining a 2-square-mile watershed completely affected by anthracite mining activities. The upland portions of the

watershed to the eastern section of Mayfield Borough are both undermined and surface strip mined, with an extremely challenging topography.

One of the dirt roadways along Hosey Creek, between Aylesworth Dam, the dry dike and Powderly Creek, were once part of a D&H Gravity Railroad right-of-way.

Hosey Creek flows under the Casey Highway near the Meredith Street exit. It flows past several other strip mine pits and a portion of the Powderly Colliery red ash cinder bank. At its point of contact with the LCRA rail alignment it flows within 100' of Powderly Creek. Hosey and Powderly both run along the LCRA alignment and make parallel 90E turns under the rail grade at the Mayfield - Carbondale road before confluenting with the Lackawanna River 400 feet apart, upstream of the Lakeland Elementary School in Mayfield.

Recommendations:

1.

Restoration of upper Hosey Creek can be achieved with mine reclamation and community development activities. Restoration should utilize bio-engineering and design of development systems to restore and maintain a more permanent flow and enhanced habitat along a greenway corridor.

2.

The Borough of Mayfield may wish to consider inclusion of stream corridor setbacks in their ordinances.

3.

The Hosey Creek confluence area near the river can provide recreational, education and habitat opportunities for the Lakeland Elementary Center.

4.

The flood control berms along the river at the Hosey and Powderly Creek confluences can provide local trail and river access sites and potential links to the Lackawanna River Heritage Trail.

36(E) Powderly Creek

Powderly Creek is a first order tributary stream, which is 4.0 miles long. rising from seeps and mine drainages along the hillside near Russell Park in east Carbondale, and draining a 1.77 mi² watershed. It flows in a southwesterly direction through Carbondale Township to its confluence with the Lackawanna River at RM 26.4 in the Borough of Mayfield.

Powderly Creek has the distinction of ranking as one of the most severely degraded abandoned mine impacted tributaries in the Lackawanna watershed. While it retains a more consistent intermittent flow it also carries large quantities of anthracite silts and clay fines during high flow events.

The creek's headwaters flow from seeps along a D&H Gravity Railroad grade near Salem Mountain Road down through a ditch lined with litter and knotweed, to Russell Park. South of the Park, the Creek meanders through culm piles and strip pits.

One of these flooded strip pits received national media attention in the early 1970's during a UFO scare. Some local youths reported seeing something fall from the sky and disappear into the water. A subsequent search by scuba divers revealed the source of light from the murky depths was a sealed beam, railroad switchman's lantern.

After exiting the strip pits, Powderly Creek flows between culm-lined banks, which once hosted the Langcliff Colliery of the Hudson Coal Company. On a ridge to the immediate west of this reach, there is a significant underground coal seam fire. There is a 300' x 100' x 1000' semi-circular monitoring trench cut into the ridge by the Office of Surface Mines. OSM plans to monitor the fire with hopes that it will burn itself out along the outcrop.

Below the Langcliff reach, Powderly flows across a broad silt-filled flood plain. To the east rises Moosic Mountain and a 250 foot, one to one, rock fill slope which carries the Robert Casey Highway. There is a scenic overlook on the west-bound lane with interpretive signage.

Powderly's next reach contains some remnants of original habitat with native and successional vegetation. This reach transitions into the Bushwick silt basin. This silt basin, like other silt basins, is the remnant of an impoundment created for a washery pool. These water bodies provided wash process water to anthracite coal preparation plants, both breakers and washeries. The recirculated waters deposited tremendous quantities of coal silts and clay fines.

The Bushwick Basin on Powderly Creek is the largest silt deposit identified by LRCA in its stream walks. It covers approximately 30 acres to a depth of 15 feet. In our estimate, there are 1.7 million cubic-yards of silts and fines. Powderly Creek has cut a macabre canyon as it meanders through the Bushwick Basin. The Bushwick junction was an important gravity railroad junction where empty coal cars were routed either to Carbondale or further down the valley to Archbald or Olyphant.

From Bushwick Basin, Powderly Creek descends over some sandstone ledges into the lower Powderly neighborhood of Carbondale Township. As the Creek passes under the culvert of the Bushwick Road, it enters a trapezoidal rip-rapped channel for the remainder of its one-mile reach to the river. The channel constructed by PA DEP-BAMR in 1993 carries the Creek through the devastated remnants of the Powderly Colliery site, of the former Hudson Coal Company. This 500-acre-plus site is bisected by the Meredith Street exit of the Casey Highway. Several large culm and cinder piles in excess of 6-million cubic-yards of material occupy the site and form the upland habitat of the lower Powderly Creek watershed.

Recommendations:

1. A major mine reclamation and AMD watershed restoration program is recommended for Powderly Creek. The following partners have work and projects in planning or at early reconnaissance - feasibility phase:

*

Northampton Fuels, Inc., an important anthracite waste coal electric co-generator, has leased several of the Powderly site culm piles for removal as fuel for their Northampton, PA plant. The residual ash will be transhipped for site reclamation.

*

The PA DEP Bureau of Abandoned Mine Reclamation intends to conduct additional stream channel restoration through the Bushwick site.

*

The U.S. Army Corps of Engineers is preparing to conduct a feasibility assessment in conjunction with PA DEP-BAMR and LRCA on Powderly Creek projects.

*

Lackawanna Watershed 2000, a Lackawanna County project funded by USEPA and PA DEP-BAMR is also preparing coordinated work on Powderly Creek.

2. A post reclamation, reuse/development plan should be created to involve all property owners, municipalities and appropriate county and private development agencies in a coordinated development program for the potential two to three-thousand acres of developable abandoned mine land in the vicinity of Powderly Creek and the Meredith Street exit of the Robert Casey Highway.

3. A more vigorous approach to assessment, prognosis and control for the mine fire site needs to be developed.

4. A greenway program along the Powderly Creek needs to be instituted by ordinance protection, easements and management.

*

D&H Gravity Railroad resources need to be protected and incorporated into the greenway program to support recreational trails.

*

Russell Park can be expandable by inclusion in reclamation activities. It is recommended to serve as a trailhead for a Powderly/D&H Gravity Greenway Trail.

5. The City of Carbondale through its Community Development Program can include enhancements and improvements to the culvert system which conveys the headwater seeps and mine drainage springs into the Powderly corridor.

6. Rail service opportunities for the lower Powderly site should be developed for industrial and commercial uses.

37(W) Lees Creek

Lees Creek is a small first-order run, which rises in wetlands on West Mountain in the northwestern corner of Carbondale Township. It flows for 3.0 miles and drains a 0.73 mi² watershed. The stream feeds the O&W Reservoir, a small 3-acre impoundment, cut into an outcrop of Pocono conglomerate. This reservoir supplied water for the roundhouse and Mayfield Rail Yard of the former New York, Ontario and Western Railway until 1957. It is now privately owned.

From the O&W pond the Creek drops quickly from a 1700 foot elevation to pass under Business Rte. 6 at the Meredith Hose Company and enter the river on the old rail yard site along the Mayfield Borough - Carbondale Township boundary. The confluence and railyard site are now owned by the Lackawanna Heritage Valley Authority. The property features the Lackawanna Heritage Center on the site of the former roundhouse. The Center building itself was an adaptive reuse of a former county vocational school.

Lees Creek is in good condition for most of its course. It begins to loose flow above PA Rte. 6 but still carries a good perennial flow to the Rte. 6 culvert. The creek loses flow completely in its last 1000 foot reach through the former railyard behind the Meredith Fire Company hall. The stream channel cuts through coal waste, rail ballast and cinders in its last reach.

Recommendations:

1.

Channel lining and restoration for 2000 feet up from the confluence will restore good perennial flows to the river. LHVA and BAMR should consider this work when LHVA develops the upper end of its campus.

2.

Carbondale Township should consider stream corridor protection through its comprehensive plan and ordinances.

3.

The Lackawanna River Heritage Trail will cross the Creek near its confluence. A sufficiently sized culvert or bridge installation could include 200 feet of channel restoration along the approaches to the bridge site.

38(W) Brookside Run

Brookside Run, also known as Meredith Creek, is a small 2.0 mile, first order stream severely impacted by strip mining. It retains its channel and a good intermittent flow, however its habitat is degraded and some flow losses to the mines are evident.

From its source on the West Mountain, Brookside Run drops 500-feet in elevation on its course through Brookside Cemetery and adjacent strip mines to its confluence with the Lackawanna River. The confluence is located at the upstream end of the former New York, Ontario and Western Rail Yard at Childs.

Brookside Cemetery, a historical burial ground in the Childs section of Carbondale Township is a significant cultural resource. A revived cemetery association has made recent improvements to the site.

Recommendations:

1. Channel lining and regrading of strip mine pits could help restore a perennial flow to Brookside Run.

2. Carbondale Township may wish to adopt watershed protection ordinances, which would apply to Brookside Run, the river and other streams in the township.

3. The Lackawanna Valley Conservancy is available to work with the Township, the cemetery association and property owners or developers to help plan and manage greenway projects for Brookside and other creeks in Carbondale Township.

39(W) Fall Brook

Fall Brook is the fifth largest tributary of the Lackawanna after Roaring Brook, Spring Brook, Leggetts Creek and Stafford Meadow Brook, exclusive of the East and West branches.

Fall Brook flows for 5.0 miles through a 12.46 mi² watershed on the West Mountain above Carbondale. Fall Brook watershed is drained by seven tributary streams, which rise in ponds and wetlands along the West Mountain ridge, or further afield on the plateau in Greenfield and Fell Townships at Newton and Crystal lakes.

The upper Fall Brook watershed is primarily forested with some open fields, dairy farms, golf courses and residential areas around the lakes. Lackawanna County owns 1200-plus acres around Merli-Sarnoski pond on the West Mountain summit. The Pennsylvania American Water Company's Fall Brook Reservoir and Water Treatment plant are located about midway down the watershed along PA Rte.106.

Fall Brook crosses into the coal formation at an elevation of 1300 feet, as it cuts through Fall Brook Gap in West Mountain. This site is marked by Fall Brook Falls, the largest waterfall in the Lackawanna watershed, which drops 60 feet, discharging into the stream bed below. The falls are located adjacent to PA 106, across from the Mt. Carmel Cemetery in Fell Township. The Falls are protected to some degree by being located within the geographic property boundary of Merli-Sarnoski Park, owned by Lackawanna County.

The county has no management program for the falls. There is no provision for visitor access or parking. There is some developmental activity on an adjoining property. There are numerous abandoned mine related structures, equipment and machinery in the upland portions of the stream corridor at the falls. Steep escarpments with 100' drops are common in the one-quarter-mile reach below the falls.

Fall Brook enters the City of Carbondale at the site of the former Carbondale General Hospital, now the Tri County Mental Health Services facility. From this point to its confluence with the Lackawanna River, Fall Brook flows through an artificial constructed trapezoidal channel for one mile. The channel was constructed to route the creek through the Carbondale mine fire site.

The Carbondale underground mine fire burned under 300-plus acres of the west side neighborhood of Carbondale in the 1940's to 1960's. The neighborhood was condemned and an enormous trench excavated over a 20-year period ending in 1970 to extinguish the fire. The surface topography and hydrology of this area have been severely altered. The area is now partially redeveloped as the Carbondale High School and Elementary centers, as well as for commercial and residential uses along Brooklyn Street (Business Route 6).

Fall Brook continues to lose water to the underground mine pool through its reconstructed reach, as the channel was not grouted or otherwise designed to reduce flow loss. There is a maintenance roadway or elevated levee along the stream from the Tri County site to Brooklyn Street. The channel design does not accommodate a riparian corridor. A successional riparian corridor has taken hold but due to the absence of suitable soils, trees have not grown to any appreciable size.

Recommendations:

The Fall Brook corridor has the potential to serve as a greenway link from Carbondale to Merli-Sarnoski Park and future linkage to the Tunkhannock Creek watershed in Scott and Greenfield Townships. There are also ongoing needs for channel restoration related to flow loss to the mine pool. Also, the riparian habitat can be better conserved by a comprehensive program to create and maintain a greenway along Fall Brook. The following recommendations constitute elements suggested for a Fall Brook greenway:

1.

The Corps of Engineers is developing a feasibility study to address mine reclamation issues along Fall Brook and one of its tributaries, Murin Run, which flows from Mountain Mud Pond in the county park. This work should include stream channel sealing and restoration of the natural morphology and riparian corridor.

2.

A study is recommended to plan a greenway - recreational trail along Fall Brook from the confluence to the falls. Potential links to Merli-Sarnoski Park and other points in Fell, Greenfield and Scott Townships may be included in the Fall Brook Greenway plan.

3.

The City of Carbondale and the adjoining townships should include appropriate conservation measures in their comprehensive plans, and ordinances to insure the protection of the Fall Brook stream corridor. Conservation audits of municipal plans and ordinances are recommended. Specific conservation measures such as, building setbacks, riparian vegetation maintenance and greenway corridors are suggested for municipal consideration.

4.

Additional greenway sites and links may be included along several Fall Brook sites including the high school and middle school campus, the commercial strip along Brooklyn Street, the west side residential neighborhoods, the Tri County health site.

5.

Lackawanna County may wish to consider development of public access - interpretive site and management program at Fall Brook Falls and a trail linkage to the developed portion of Merli-Sarnoski Park.

Racket Brook is an important second-order tributary draining a 5.0- mi² watershed along the western flanks of Salem Hill, the 2200' summit of the Moosic Mountains on the Lackawanna - Wayne county border. Springs and seeps, which are the source of Racket Brook, drain the ridge top scrub oak - pitch pine barrens. Several first order tributaries of Racket Brook have been dammed to form Carbondale Reservoirs #7 and #4, and the Brownell Reservoir.

The reservoirs are operated by Pennsylvania American Water Company and supply a filtration plant at Brownell, which provides potable water to the City of Carbondale and nearby municipalities. The upland areas have several tracts of Theta Land Company parcels, State Game Lands, state correctional institute lands and large private properties. In addition, a wind powered electric farm is proposed (April 2001) to be constructed along the ridgeline of Moosic Mountain.

Below Brownell Reservoir, Racket Brook flows through a steep hemlock - rhododendron ravine. The upper reach of the ravine has been filled to accommodate the right-of-way for the Governor Robert Casey Industrial Highway, U.S. Route 6. The stream then flows southwesterly into the City of Carbondale.

As Racket Brook exits the Brownell Ravine it crosses into the coal formation. Anthracite coal was first mined in 1820 along the Lackawanna River near the confluence of Racket Brook by William and Maurice Wurts, co-founders of the Delaware and Hudson Enterprise, a canal, coal and railroad operation which was singularly responsible for the development of the anthracite coal and transportation industry in the mid and upper Lackawanna River watershed.

The Wurts brothers and others incorporated the Delaware and Hudson Canal Company in 1823 to transport their anthracite coal from the mines at Carbondale to markets in New York.

The D&H canal reached Honesdale, but a gravity railroad was developed to cross the Moosic Mountains. Significant structural remnants of the Gravity Railroad incline planes, retaining walls, engine house foundations and culverts can be identified along Racket Brook.

The shops of the railroad were once located at the Racket Brook/Lackawanna River confluence adjacent to North Main Street in Carbondale. The lower reaches of Racket Brook, in the urban, residential and commercial districts of Carbondale, show the typical signs of encroachment of fill material and urban litter, neglect of maintenance of public infrastructure and presence of invasive knotweed. There are good quantity, perennial flows with very minor infiltration loss to the mine pool (SCARLIFT, 1978). The primary impacts to channel morphology are urban flows, rather than abandoned mine impacts, although there is some minor evidence of mine impacts.

Recommendations:

Racket Brook presents several opportunities for cultural, recreational and habitat improvements. The Gravity Railroad alignment and structural remnants are eligible for nomination to the National Register of Historic Places. The Gravity also offers economic and cultural justification to serve as a link in the regional trail system and heritage tourism infrastructure. This can also become the basis for a Racket Brook Greenway.

1.

This plan suggests a partnership be developed among LRCA, Lackawanna Heritage Valley Authority, the City of Carbondale and its agencies, the Carbondale Chamber of Commerce, the Carbondale Historic Society, the Rail Trail Council of North East Pennsylvania and other interested parties to develop a greenway, trail and heritage corridor along Racket Brook.

2.

To facilitate the greenway, the LRCA recommends the acquisition of all available parcels of the D&H Gravity Railroad along Racket Brook from Carbondale through Whites Crossing in Lackawanna County and the light track, later Honesdale branch alignment, from Whites Crossing through the Carbondale Number 4 tract and through the correctional institute and federal prison tracts in Canaan Township, Wayne County.

3.

This plan recommends development of a Heritage Gateway adjacent to the Ben Mar Restaurant in Carbondale, to serve as an strategic junction in linking the Lackawanna River Heritage Trail with the D&H and O&W rail trails to the north, and the developing D&H Transportation Heritage Corridor to the east.

4.

LRCA suggests that the municipalities take a lead in a physical cleanup of Racket Brook, the river and other stream corridors to address urban dumping of trash, yard waste and coal waste. The cleanup could also address ongoing maintenance issues for urban storm water, invasive species and protection of residual natural habitat.

5.

The LRCA recommends that municipalities consider inclusion of conservation measures for Racket Brook in updates to their comprehensive plans and ordinances.

41 (W) Coal Brook

Coal Brook is a first-order tributary stream which enters the Lackawanna River at RM 29.2 in the City of Carbondale. It rises at about 1700 feet in Fell Township, just west of Dundaff Road, and flows for 2.4 miles to its confluence, draining a 1.92 mi² watershed. As its name implies, Coal Brook's course flowed through areas of coal mining; most of its corridor has been severely impacted by former mining operations. Only the upper 0.4 miles of its corridor above the coal measures remained unimpacted.

The headwaters corridor of Coal Brook is well forested by native trees and understory. Some logging has occurred off the north bank, however the immediate riparian cover is undisturbed and stable. This upper reach is managed and used by a private hunting club.

Just upstream of Dundaff Road, a reclamation project conducted by the Bureau of Abandoned Mine Reclamation was completed to fill in stripping pits and regrade waste rock piles along the stream corridor. Stream flow disappeared through this reach in October of 2000.

From Dundaff Road downstream 1.3 miles to the Carbondale Nursing Home, the stream corridor lies within an extensive area of culm and waste rock piles and stripping pits

associated with the former Coal Brook Colliery. Successional and invasive vegetation lines the stream channel, however, signs of bank instability and erosion are evident. Dumping of urban debris appears common through this stretch as well. Within an area from the nursing home upstream for about 0.5 miles, the stream channel has been completely obliterated by former mining operations and only storm water runoff channels from waste piles are visible where the stream must once have been.

The stretch of Coal Brook between the nursing home and the confluence is contained in an underground culvert. Though the exact course of the underground culvert was not determined, the beginning of the culvert system most likely lies near the nursing home, which was constructed on a reclaimed portion of the colliery site. Below the nursing home the culvert runs under the newly developed Carbondale Industrial Yards, which also sits on former colliery land. Storm water pipes draining Carbondale are connected to the underground culvert through this reach. Discharge from leaking sewer pipes must also get into the culvert, as a trickle of the discharge was evident at the mouth of the pipe discharge into the river.

Recommendations:

1.

Fell Twp. and the City of Carbondale may wish to consider an environmental audit of their comprehensive plans and zoning, subdivision and land use ordinances to insure that they are employing state-of-the-art requirements for the protection of water resources, streams, stream corridors and natural areas. A comprehensive program is needed to restore the water course and natural flow to Coal Brook.

2.

A Coal Brook restoration may provide opportunities for public and private partnerships to reclaim abandoned mine lands, restore water resources and redevelop upland areas for residential and institutional uses. LRCA, the municipalities, state agencies, and property owners may wish to cooperate on such partnerships.

3.

The Coal Brook Colliery buildings and the D&H roundhouse offer opportunities for adaptive reuse. Public and private partnerships are recommended to advance cleanup and adaptive reuse of these sites.

4.

The City of Carbondale, PA DEP and the Lackawanna River Basin Sewer Authority should investigate and remedy the sewage inflow in the Coal Brook-Dundaff Street culvert. Other sewage streams on the east bank near the Maplewood Cemetery and Belmont Street neighborhood also need to be investigated.

42 (W) Wilson Creek

Wilson Creek is a first-order tributary stream that enters the Lackawanna River at RM 30.6, in the Borough of Simpson. It rises from a wetland pond in Fell Township, just west of Richmondale, at about 1900 feet and flows for 5.0 miles, draining a 3.81 mi² watershed. The stream closely parallels PA Rte. 171 for most of its course into Simpson and so is impacted by development along the highway. Wilson Creek is also significantly impacted by past mining operations; stripping pits and waste rock piles lie

along its banks and in upland areas, and it receives large amounts of acid mine drainage. Only the first mile from its headwater source remains unimpacted, and in its natural state.

As Wilson Creek flows east towards Rte. 171 from its source, its corridor remains intact, flanked by native trees and understory. Very little development exists within this upper portion of the watershed. However, as the stream begins to parallel the highway, it passes through the Richmondale Pile, a mining disturbed area of stripping pits and waste rock piles, which have encroached into the stream corridor and its channel. Though most of this area is well covered with successional vegetation, a few sparsely vegetated culm piles lie immediately adjacent to the stream within this stretch. A loss of base flow was observed as the stream flowed through the Richmondale Pile in September of 2000.

From the Richmondale Pile downstream for about 1.5 miles, the stream flows within close proximity of Rte. 171. Stream banks are generally stable and well vegetated through this stretch and a vegetated buffer zone usually exists between the roadway and the stream. Waste rock piles generally lie in upland areas off the stream bank opposite the road however they are generally well vegetated as well. One culm pile does encroach directly onto the stream bank, across from the St. Basil Hall property, resulting in small stretches of bank instability.

Three acid mine drainage discharges are evident along the stream as it enters the residentially developed portion of Simpson along Rte. 171. The first two occur along the stream as it flows off the east side of the highway and the third behind an automotive dealer off the west side of the highway. The following is a brief description of the three discharges, from upstream to downstream:

1.

Upper Wilson Outfall - created by a roof drop near the outcrop of a coal vein, which resulted in mine water emerging from a crevice in the streambed. At the time of this stream walk, barely any flow was observed from this source.

2.

Lower Wilson Outfall - just a few yards downstream of the upper outfall, this drainage enters the river from a drift opening about 5 yards off the north bank. About a 10 gal/min. flow was observed from this source.

3.

Molensky Slope Outfall - occurs at a point directly along the stream bank, from which mine water seeps into the stream from a slope created to drain the underground mine workings. Flow from this source was significant at the time of the stream walk, estimated at about 80 gal/min, and except for the insignificant flow from the two upstream discharges, accounted for the entire flow from Wilson Creek into the Lackawanna River. A slight sulfur smell is evident from the mine water, however metal levels are relatively low and the flow is an important addition of cold water to the river.

As the stream flows through its final reach in Simpson, it is bounded by residential properties. Vegetative cover along the stream is either mowed or composed of successional and invasive understory plants. Immediately above the confluence, Wilson Creek is channelized along building foundations through the Doyle & Roth property and by a large concrete box culvert under the LCRA right-of-way.

Recommendations:

1. A complete channel restoration of Wilson Creek is recommended to eliminate infiltration into the mine pool from Richmondale to Simpson.
2. Subsequent to the removal or regrading of the Richmondale Pile, the site would be appropriate for residential, institutional, or mixed village, commercial, residential development; a public and private partnership may be useful in advancing the appropriate redevelopment of this area.
3. AMD flows at the Upper and Lower Wilson Outfalls and Molensky Slope should be assessed and mitigated, if necessary.
4. The Doyle & Roth site has potential for historic adaptive reuse. LRCA recommends that the property owners, the township and other interested parties consider a partnership to redevelop this site.
5. Opportunities for a Wilson Creek greenway and trail to link Simpson and Richmondale may be developed in conjunction with the D&H trail and Lackawanna River Heritage Trail.
6. Fell Twp. should consider an environmental audit to update its municipal ordinances, to maximize protection of Wilson Creek and its natural resources.

C.6 Information Available on the LRCA Webpage

The LRCA's webpage at www.lrca.org, has additional information regarding acid mine drainage and abandoned mine lands. Under the "LRCA Publications and Photographs" link, you can read about and view pictures of AMD outfalls and AML sites in the Lackawanna Watershed. The most recent water quality data collected by LRCA staff is also included for selected AMD outfalls. In addition, a report on water quality of the Lackawanna River, based on macroinvertebrate data collected by volunteers under the LRCA's River Watch program, is also available under the same link.

Pictures:



**Mountain Mud Pond
along the East Branch
of the Lackawanna
River**

**The “Little
Virginia”
wetlands
along
Stafford
Meadow
Brook**





**Lackawanna
a River in
Old Forge**

**Waterfalls along Indian Cave Creek, a
tributary to White Oak Run**

