



***ROARING BROOK
CONSERVATION AND GREENWAY PLAN***

Lackawanna River Conservation Association

January 2022

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Produced by the
Lackawanna River Conservation Association

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image of "Summer Morning on the Roaring Brook, Moscow"

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Introduction and Executive Summary

This Conservation and Greenway Plan for Roaring Brook is the first part of a Major Tributary Streams Initiative by the Lackawanna River Conservation Association (LRCA). The LRCA is a community based, not for profit Conservation Agency, established by local citizens in 1987 as the Lackawanna River Corridor Association. The LRCA's mission is to promote the conservation, protection, and appropriate management of the Lackawanna River and its Watershed Resources, and to involve the community with the river and watershed in mutually beneficial ways.

The LRCA created a master plan for the Lackawanna River Corridor in 1989 that recommended the development of a 40-mile-long greenway and trail system along the river from Pittston and Duryea through Scranton and the Mid Valley to the Upper Lackawanna watershed. This original vision suggested eventual expansion of that system along tributary streams to include conservation of large tracts of natural habitats, ridgetops, and watershed lands.

Many of the local citizens and community leaders who were active in the creation of the LRCA were also involved with the creation of the Lackawanna Heritage Valley Authority (LHVA) in 1990. LRCA and LHVA share a mission to advance what is now known as the Lackawanna River Heritage Trail. Both agencies collaborate to acquire land and develop funding to build and manage the River Trail.

This work is shared also with another non-profit conservation partner, the Northeast Pennsylvania Rail Trail Council (NEPA RTC). Based in Uniondale in the Upper Lackawanna River Watershed, the Rail Trail Council has acquired and developed the 40 mile long, D&H Rail Trail between Carbondale and Lanesboro.

The LRCA created its own land trust affiliate, the Lackawanna Valley Conservancy (LVC), in 1995. The LVC provides LRCA with the capacity to acquire land and conservation easements to facilitate the further expansion of the trail system and broaden the protection of watershed resource lands. The LVC also has a mission to facilitate the cleanup of hazardous industrial sites and the restoration of abandoned mine lands.

In marking the 30th anniversary of the LRCA in 2017, the organization engaged in a strategic planning assessment and initiated several changes in its approach to its mission. The collaboration among LHVA, NEPA RTC, LRCA/LVC and numerous municipalities led to the completion of about 30 miles of the proposed 40-mile Lackawanna River Trail and Greenway. While several significant gaps remain, work is underway to address the missing links over the next 10 years.

The conservation and restoration of large reaches of the immediate lands along the river completes a major goal of our 1989 Citizens Master Plan for the Lackawanna River. Another major goal of that plan relates to the health and habitat of the river and its water quality.

Over the past 30 years, water quality in the Lackawanna River has improved. Significant upgrades have been made to the municipal sanitary systems reducing the number and frequency of Combined Sewer Overflows (CSOs) and treatment plant capacity has been expanded. Urban stormwater pollution remains a critical problem with recommendations for a regional Municipal Separate Storm Sewer System (MS4) a major unmet need. Further opportunities to address abandoned mine drainage (AMD) and mine land pollution can be enhanced with the development of a regional storm water agency. LRCA advocacy for this matter will continue.

The major strategic changes initiated in 2017 relate to the change in the name of the LRCA with the word "Corridor," which implies a focus on the main stem of the river, being replaced with the word "Conservation". This indicates the expansion of the focus of the LRCA to conservation on the scale of the entire 350 square miles of the Lackawanna River Watershed. Our engagement with stakeholders, programs, and projects along the main stem of the river continues to be a strong focus of our ongoing work.

The other major strategic change is in the consolidation of the governance, management and marketing of the LRCA and our land trust affiliate, the Lackawanna Valley Conservancy (LVC). When the LRCA incorporated the LVC in 1995, a cooperative agreement was adopted to provide for the management of the LVC's work by the LRCA. In order to improve the governance of the two boards, the 2017 strategic plan recommended a merger of the boards into one where there is a plurality of board membership. We continue to maintain two separate and distinct non-profit corporations with two distinct boards with common governance and management. These changes have aligned the mission focus of LRCA and LVC on a common watershed conservation basis.

The LRCA has initiated the Major Tributary Initiative to begin implementation of our watershed-wide work. This work is complimented by the establishment of the Lackawanna watershed Conservation Corps program. The Corps is intended to help focus LRCA membership and volunteer resources in local areas of the watershed. A map and description of the Corps' mission is included in Appendix "B".

LRCA has selected Roaring Brook and Leggett's Creek as the first two major tributaries due to geography and demographics. As the largest, Roaring Brook, and the fifth largest, Leggett's Creek, both streams rise on the plateaus to the east and west of the Lackawanna Valley and cut through the flanking Moosic and West Mountain ranges in water gaps generally opposite of one another. Leggett's Gap, also known as "the Notch", and Cobb's Gap form the eastern and western gateways to the Lackawanna Valley. In addition to the streams, these water gaps also carry state and interstate highways and railroads. The two major suburban population areas of Lackawanna County, the Abingtons and North Pocono, are also located along the headwaters and upper corridors of these streams.

Leggett's Creek is covered in the companion study produced by this initiative. This study and plan recommendation for Roaring Brook reviews existing physical, hydrological, ecological, and

economic conditions. It examines conservation needs for natural habitat, cultural, scenic, and recreational resources, and water supply. It summarizes stakeholder perspectives and interests and looks at abilities and needs for better conservation management of the resource.

Lastly, this plan offers a set of recommendations and actions for large area conservation of woodlands, ridgetops, wetlands, reservoir recharge areas, riparian and recreational corridors along streams and abandoned rail and trolley corridors. It suggests roles and responsibilities for various agencies and stakeholders to advance the plan recommendations. It concludes by making a case for the establishment of a Lackawanna County-based Conservation Fund to serve as an anchor to attract state, federal, and philanthropic funds to create and sustain the conservation capacity that will be necessary to ensure the responsible stewardship of our critical natural resources well into the next 100 years.

By 
Executive Director, LRCA

Course and Order



Headwaters East Branch Roaring Brook,
Freytown Marsh, Covington Township.

Roaring Brook is a third order tributary to the Lackawanna River. It has 10 named tributaries and nine unnamed tributaries. Roaring Brook rises in glacial springs and bogs near Lehigh Summit and Freytown at 41.293064 north by 75.449648 west in Covington Township in southeast Lackawanna County and Sterling Township, Wayne County. It flows northwest through Covington Township and confluences with the East Branch near the intersection of Lehigh Road with Jubilee Road at the depleted Hollister Reservoir. After passing the remnant of the Hollister dam, it passes through a large concrete arch culvert under the Lackawanna Railroad's Pocono Mainline.

It then transverses the Hollister Glen in a series of rock ledges and plunge pools surrounded by groves of old growth rhododendron. It then flows another two miles to the Borough of Moscow where it receives the waters of Van Brunt Creek and Bear Brook. After passing route 690 and Market Street/Aberdeen Road, it flows northwest another four miles to Elmhurst reservoir while gathering flow from Kellum Creek, White Oak Run, and four unnamed tributaries.

Upon leaving Elmhurst, it passes under PA route 435 and begins its six mile course through Cobb's Gap. It passes under Interstate 84 and picks up flow from Rock Bottom Creek. Its course follows a 180-degree arc southerly through Cobb's Gap between Scrub Oak Mountain and Barney's Ledge on Moosic Mountain at 41.405324 north by 75.564069 west. It then passes under the Pocono Mainline, the former Erie and Wyoming Valley Railroad, and Interstates 380/84. On its way towards Dunmore Number 7 Reservoir, it passes through the Spetchy-Kopf formation at the Greenville Cliffs.

Immediately east of the Dunmore Number 7 waterworks, it passes under a 400-foot-long steel railroad trestle bridge that carries the Erie and Wyoming Valley's abandoned Jessup Branch. After passing through Dunmore Number 7, it picks up flow from Little Roaring Brook and flows under the Lackawanna Railroad again as it turns southwest between the Sport Hill, Nappin Hill, and Bunker Hill neighborhoods of Dunmore.



Nay Aug Falls

It is now fully within the Lackawanna Valley and in quick succession passes under the Bunker Hill Bridge, the Twin Interstate 81 Bridges and twice again under the Lackawanna Railroad. After passing by the former Dunmore steel works and Erie Railroad shops, now the De Naples Auto Parts facility, it passes under a large stone arch that once carried the Erie and Wyoming Valley tracks into the Dunmore Shops. At this point it continues a southerly course into the city of Scranton, passing under Ash Street and Myrtle Street before entering the Nay Aug Gorge. For the next mile, it flows through the gorge and over the Nay Aug Falls and Basin at 41.401094 north by 75.639766 west, after which it passes under the Lackawanna Railroad Pocono Mainline for the last time.

Its course then arcs to the west for a mile passing over the Step Falls, an abandoned waterpower dam dating to the mid-19th century Scranton Iron works industry. After the Step Falls, it passes under the Harrison Avenue Bridge and a steel girder bridge carrying the Laurel Line/Lackawanna County Trolley Tour line into the Crown Avenue Tunnel. At this point it is effectively out of the Nay Aug Gorge and is passing through the Hill Section, South Scranton, and Central Business

District neighborhoods of Scranton. It passes under the President Biden Expressway/Biden Street Bridge Complex, then it passes by the Scranton Iron Furnaces Historic Site and under the Cedar Avenue Bridge.



Looking upstream from confluence with the Lackawanna River in South Scranton

After Cedar Avenue, it arcs to the South/Southwest and then West for its final half mile to its confluence with the Lackawanna River. Just west of Cedar Avenue, its course has been channeled into a large concrete flood control channel. While in the channel, it passes under South Washington Avenue and the NEPA Rail Authority's Minooka/Carbondale line. The confluence of Roaring Brook and the

Lackawanna River features a large boulder and cobble bar at the termination of the concrete flood channel at 41.401969 north by 75.673354 west.

Tributaries and Ascension Chart

Roaring Brook's tributary streams are both first and second-order streams. Of the ten named tributaries, two are first-order tributaries of tributaries to Roaring Brook. Langan Creek is a tributary to Van Brunt Creek and Emerson Run is a tributary to Lake Run. Several of the unnamed tributaries have local commonly-used names that have not been advanced for inclusion on the National Geographic Names Database. We include those names here in *italics*. The points of confluence and names of the tributaries are included in the Roaring Brook Ascension Chart along with other physical and geographic features.

The following abbreviations are used in the Ascension Chart: (UNT) Unnamed Tributary; (DLRRB) Delaware-Lackawanna Railroad Bridge; (D-L RR) Delaware-Lackawanna Railroad; (E&WV RR) Erie & Wyoming Valley Railroad; (STP) Sewer Treatment Plant.

This Ascension Chart includes important manmade and natural features as well as mile and half mile stations. Some of the more remote stations are also geo-referenced with latitude and longitude citations. The railroad, street, roadway and highway bridges, and culverts along with water supply reservoirs and waterworks are often concentrated sources of human-generated impacts to the natural habitat and water quality of a stream.

The natural features of Roaring Brook include the Nay Aug Falls and Gorge, a listed Natural National Geological Landmark. Hollister Glen, the Bunker Hill and Nay Aug Tubs, the Greenville Cliffs, Cobb's Gap, Barney's Ledge and the Cobb's Gap Bend are also important and scenic natural features along Roaring Brook.

Roaring Brook Ascension Chart

Confluence with Lackawanna River	Mile 0.0	Confluence UNT north	8.1
DLRRB	0.1	West of Throop's Tank	
South Washington Avenue Bridge	0.15	(41.394013 x 75.555702)	8.5
Cedar Avenue Bridge and Historic		Confluence Rock Bottom Creek	
Scranton Iron Furnaces	0.5	(adjacent PA Routes 435 & 348)	8.8
Spruce Street Bridge Complex	0.7	Interstate 84 Twin Bridges.....	9.0
Poly-Hi Plant	1.0	Confluence UNT south.....	9.3
Laurel Line Trolley Bridge	1.1	Main Street, Elmhurst (adjacent)	9.5
Harrison Avenue	1.2	Elmhurst Twp. STP & Park south & UNT	
Step Falls.....	1.3	(Mud Pond Run) north.....	9.8
Arthur Avenue (adjacent)	1.5	Elmhurst Township Road 718 Bridge.....	9.85
UNT (East Mountain Run)	1.7	PA Route 435 Culvert.....	9.9
DLRRB and Nay Aug Tunnel West Portal	1.9	Upstream of PA Route 435 Culvert.....	10.0
Nay Aug Gorge and Falls.....	2.0	Elmhurst Dam	10.3
Davis Trail/Kanjorski Bridge	2.2	Elmhurst Reservoir/Confluence of	
Myrtle Street	2.5	White Oak Run	10.5
Ash Street	2.6	East of Elmhurst Reservoir Island	
E&WVRR Arch and Scranton Dunmore		(41.362899 x 75.531802)	11.0
Boundary.....	2.7	Confluence Kellum Creek.....	11.5
DLRRB	2.9	Confluence UNT (Hideaway Run) south	12.0
Smith Street (adjacent).....	3.0	Braided Channel (41.346896 x 75.517200)	12.5
DLRRB	3.1	Moscow STP.....	12.8
Interstate 81 Twin Bridges and		Market Street Bridge, Moscow.....	12.9
Bunker Hill Bridge.....	3.2	Confluence Van Brunt Creek.....	13.0
Bunker Hill Tubs.....	3.25	Confluence Bear Brook	13.1
Bush Street (adjacent)	3.5	PA Route 690 Bridge	13.2
DLRRB	3.6	Covington Township STP	13.5
Waterline crossing.....	3.8	ATT Line (de-commissioned)	14.0
Roaring Brook Washery Basin site		Downstream Hollister Glen/	
/Scrap yard area.....	4.0	Beck's Crossing.....	14.5
Confluence of Little Roaring Brook.....	4.25	Hollister Glen	15.0
Dunmore Number 7 Reservoir &		Delaware-Lackawanna Railroad	
Water Works	4.5	Arch Culvert.....	15.2
E&WVRR Jessup Branch Trestle.....	4.75	Hollister Dam	15.4
Rock Junction E&WVRR (adjacent)	5.0	Hollister Reservoir Peninsula	15.5
Lower Greenville Cliffs site	5.5	Confluence East Branch Roaring Brook	15.7
Nay Aug Village.....	6.0	Jubilee Road.....	15.8
Interstate 380 Twin Bridges /		Confluence Lake Run	16.0
Erie & Wyoming RR Trestle	6.25	Lehigh Road Culvert &	
Nay Aug/Cobb's Gap Tubs	6.5	PPL Pittston/Pocono Line	16.2
DLRRB	6.6	Wetlands between Lehigh Road and D-L RR	16.5
West Arc of Cobb's Gap Bend		Wetlands between Lehigh Road and D-L RR	17.0
(41.399977 x 75.572634)	7.0	Wetlands between Lehigh Road and D-L RR	18.0
West of Chico's	7.5	Culvert under Delaware-Lackawanna Railroad	18.5
Confluence UNT / Chico's Spring Run		Source Springs east of Freytown Road	
(center of Cobb's Gap Arc)	7.6	(41.281582 x 75.450380)	19.0
East Arc of Cobb's Gap Bend			
(41.398752 x 75.56.1862)	8.0		

Geography and Hydrology

Roaring Brook watershed with 53.69 square miles forms a significant portion of the Lackawanna River watershed on the Pocono Plateau east of the Moosic Mountain Range. Along with Spring Brook and Stafford Meadow Brook, these three watersheds cover 122 square miles. This is approximately one third of the entire 354 square miles of the Lackawanna River watershed. The North Pocono area is part of the Low Glaciated Plateaus of the Allegheny Plateau Physiographic Province. The Lackawanna Valley is part of the Ridge and Valley Physiographic Province. All three streams flow westerly from the Pocono Plateau and follow courses cut by glaciers through water gaps in the Moosic Mountain Range.

The source waters for Roaring Brook and the East Branch of Roaring Brook are springs and an extensive area of wetlands and glacial bogs in the neighborhoods of Freytown and Lehigh Summit in Covington and Madison Townships in Lackawanna County and Sterling Township in Wayne County. This area and similar wetland glacial bog complexes in adjacent Coolbaugh Township, Monroe County are nationally critical water resources. These glacial bogs and springs are the sources of Roaring Brook, Spring Brook, and Stafford Meadow Brook in the Lackawanna/Susquehanna/Chesapeake Bay watersheds. The bogs and springs are outputs from the glacial sands and gravels that serve as the water table on the Pocono Plateau. The Lehigh River rises nearby from springs that feed Pocono Peak Lake and the Klondike Ponds. Nearby to the north, the Thousand Acre Swamp feeds Butternut Creek, a tributary of the Wallenpaupack Creek. These are critically important source waters for both the Chesapeake and Delaware watersheds.

Roaring Brook is a major source of potable water supply for the city of Scranton and urban communities in the Lackawanna Valley. Pennsylvania American Water Company (PAWC) is the main regional water supply public utility. The Company operates Elmhurst and Curtis Reservoirs



Elmhurst Reservoir Dam, Elmhurst

in Elmhurst and Madison Townships, and Dunmore Number 1 and Number 7 in Dunmore.

PAWC also has withdrawal rights from the Klondike Ponds in Lehigh Township, Wayne County if needed in drought emergencies. A fifth reservoir owned by the company, the Hollister Dam in Covington Township, is presently being removed and its reservoir area is being returned to wetlands and open space habitat.

Topographic elevations around the source water areas of Roaring Brook range from 1900 to 2100 feet in elevation above sea level. The elevation of the confluence of Roaring Brook with the Lackawanna River in Scranton is at 590

feet. This gives Roaring Brook an average gradient of 71 feet per mile. This drop in gradient provides Roaring Brook with the latent energy and ability to cut and erode its channel and move significant amounts of bed load during high flow events. The availability of glacial till in the stream channel and banks along many reaches increases the stream's erosive capacity when the channel courses through the numerous outcrops of bedrock. This has resulted in the creation of several notable geological features along Roaring Brook. These include: the Hollister Glen, the Nay Aug Tubs in Cobb's Gap, the Bunker Hill Tubs visible upstream of the Bunker Hill bridge in Dunmore, and the Nay Aug Gorge and Falls in Nay Aug Park, Scranton.

The power of water and climate to affect the topography of the planet is evident in the many "water gaps" along the Appalachian Mountains. Locally this is exhibited in Cobb's Gap on Roaring Brook and "The Notch" on Leggett's Creek. While they are referred to as "water gaps", it is generally understood that they were carved by glaciers during the "Ice Ages". Over the past several hundred thousand years, there were four glacial periods when ice sheets up to 2,000 feet thick scoured the landscapes of the planet. The present elevations on the Moosic Mountain ridgeline are between 1900 and 2000 feet. The elevation of Roaring Brook as it passes the axis of the Moosic range summit is 1200 feet. This yields a 700- to 800-foot-deep cut through the Moosic Mountains. The vast deposits of sands and gravels on the Pocono Plateau and the wetlands and bogs that are the result of glacial melting serve as a reservoir to provide perennial flow to the source waters of the streams and rivers along the Appalachian range.

The latent energy of Roaring Brook is also manifest in major storms of record. The Lackawanna River watershed experiences major flood events from hurricanes, tropical storms, and Nor'easters' every 10 to 15 years. Some of these storms of record occurred in 1864, 1911, 1922, 1926, 1936, 1942, 1954, 1955, 1972, 1985, 1996, 2004, 2008, and 2011. Occasional summer thunderstorms will cause local flash flooding. The storm of record for Roaring Brook was Hurricane Diane on August 18, 1955. Nearly a foot of rain fell on the Pocono Plateau overnight. The Lackawanna Railroad was cut in 88 places between Scranton and the Delaware Water Gap.

The flood swollen Roaring Brook destroyed or damaged every rail bridge and culvert between Scranton and Lehigh Summit. Several miles of track and roadbed were flooded and washed away. Flood waters flowed through the Nay Aug tunnels and large panels of concrete retaining walls along the rail grade below Arthur Avenue were dislodged and lie in the stream channel to this day. The "Little England" neighborhood along Richter Avenue was destroyed as was much of the "South Side Flats" neighborhood along South Washington Avenue and around the confluence with the Lackawanna River.

The ability of Roaring Brook to erode and move impressive quantities of material is evident in the numerous gravel bars all along its course from Hollister Dam down through Moscow, between Elmhurst and Dunmore to the large deposit of cobble and boulders at the end of the concrete channel at its confluence with the Lackawanna River in South Scranton. Several witnesses reported observing the flood crest of Hurricane Gloria move a broken piece of rock ledge the size

of a semi-tractor about 100 feet in the reach between the Nay Aug Falls and the Step Falls in October 1985.



Erosion highwall cut at Chicos Bend in Cobb's Gap

An estimated 100 thousand cubic yards of soil, cobble and boulders, and railroad embankment materials were eroded out at the apex of the big bend near the Chico's site in Cobb's Gap by the Hurricane Ivan event in 2004. High flows from Tropical Storm Lee in 2011 eroded more material out at this location. About 1000 feet of the embankment and railbed of the former Erie and Wyoming Valley Railway, now owned by Lackawanna County Parks and Recreation Department, was obliterated.

The land uses and land cover in the Roaring Brook watershed include urban, suburban, industrial, woodland, and agriculture. Intensive urban use and impervious cover is predominant from the confluence with the Lackawanna River up to stream mile 4.5 at the Dunmore Number 7 Reservoir. From Dunmore Number 7 out through Cobb's Gap to the extremities of the headwaters, 70 percent of the landcover is mixed deciduous hardwood forest and wetlands. Open successional fields and agriculture is evident on about 20% of undeveloped land. The balance of land uses are suburban villages with residential subdivisions, and commercial strip malls along arterial roadways. Transportation, primarily highway use, is a significant land use from the perspective of impervious cover and stormwater-generated water pollution impacts.

Interstates 81, 380, 84, and US Route 6 run along and across Roaring Brook and several tributaries. The junctions and interchanges of these Interstate routes also occupy land use in and along Roaring Brook. Pennsylvania Routes 435, the Scranton-Daleville Highway, runs from Dunmore to Covington Township. PA Route 307, the Scranton-Pocono Highway, runs through portions of the watershed. PA Routes 348, 590, 690 and 502 also traverse portions of the watershed, as do several hundred miles of PA legislative routes, city and borough streets, and township roads.

The main east-west line of the former Delaware, Lackawanna and Western Railroad follows Roaring Brook from Scranton to Lehigh Summit. This railroad is now owned by the Pennsylvania Northeast Railroad Authority (PNERRA). It continues over the Pocono Plateau serving several freight shippers through Monroe County to Slateford Junction in the Delaware Water Gap. Freight rail service is provided by the Delaware-Lackawanna Railroad. This rail corridor is the preferred route to receive upgrades for the restoration of rail passenger service between Northeast Pennsylvania and the metropolitan New York area.

Roaring Brook flows through all/or portions of the following Municipalities: the city of Scranton, the boroughs of Dunmore and Moscow, Roaring Brook, Jefferson, Madison, Elmhurst, and Covington Townships in Lackawanna County and a small part of Sterling Township in Wayne County. The Population of these municipalities is approximately 112,000. Over the past several census periods, the city of Scranton has lost population but the suburban townships in the North Pocono area have gained populations, housing units, and developed commercial sites. Median household income has risen slightly, but the percentage of people at or below the poverty level has also risen.

Geology

The geological history of Northeast Pennsylvania including Roaring Brook and its watershed is extensive, visible, and dynamic. It is extensive over a time range greater than 500 million years. It is visible in the topographic landforms of the Pocono Plateau, the Moosic Mountain Range with Cobb's Gap and the Lackawanna Valley with the Nay Aug Gorge and Falls. It is dynamic and manifest with the presence of anthracite coal and the evidence of multiple periods of glaciation.

The tectonic movement of continental plates, the rise of mountains in several orogenies, and the related opening and closing of oceanic basins has produced the continental landforms and oceans that are the key features of the Earth's surface today. The rise of mountains, their subsequent erosion and deposition, and the rise and fall of sea levels are part of what produced today's landforms. The drifting and bumping of continental plates and oceanic rifts are evidence of the tectonic forces that still drive this process. Critical perspectives related to these geologic phenomena and their local manifestations are explored in "The Geology of the Wyoming-Lackawanna Valley and its Mountain Rim, Northeast Pennsylvania". (Guidebook for the 62nd Annual Field Conference of Pennsylvania Geologists, PA Geologist 1997).

Extending from about 350 to 300 million years before the present, as mountains rose and eroded and sea levels rose and fell, vast forests and swamps covered the land and fringes of Laurentia, as the protocontinent of North America is named. Coastal waters of the Lapetus Ocean, and later the Tethys Sea rose and flooded these swamps covering the vegetative debris with layers of sediments eroding from the Acadian Mountains.

This cycle repeated itself dozens of times over millions of years. This created the extensive coalbeds that lie throughout the Appalachian Mountains today. A similar process with oceanic plants and animals another 100 million years earlier resulted in the Marcellus formation and perhaps other gas and oil formations that also underly the Appalachians.

The tectonic drifting of continental plates and the spreading and closing of oceanic floor rifts also resulted in the folding and deforming of the sedimentary and metamorphic strata of the mountains created in the last orogeny, the Alleghenian. The tectonic-driven folding was greatest in the arc of mountains in northeast Pennsylvania. The folding and deforming of the rock strata

exerted tremendous pressure on what would have been bituminous coal, turning it into anthracite coal. The tectonic pressure over millions of years, forced volatile compounds like methane and butane out of the coalbeds and concentrated the carbon content creating harder and denser coal.

The tectonic folding of the geologic strata of the Anthracite Region is the main force that created the shape of the mountains and plateaus between the Delaware and Susquehanna rivers. Created over a time span of millions of years, the folded topography is known to geologists as the Anthracite Synclinorium. It holds the four anthracite coalfields in a series of synclines and anticlines that form the ridgelines and valleys of the region. To use the analogy of wave notion, a syncline is the trough or bottom portion of a wave where the rock strata generally follow a concave curve. An anticline is the crest of a wave where rock strata are folded in a convex pattern.

The Northern Anthracite field lies in the base of the Lackawanna Syncline extending from Shickshinny in the southwest to Forest City in the northeast. Also known as the Lackawanna Valley and Wyoming Valley, it is one geologic feature shaped in the form of a canoe that is 75 miles long and about 12 miles wide. It is considered by some geographers to be a northern extension of the Ridge and Valley Physiographic Province thrust into the Allegheny/Pocono Plateau. The Moosic and West mountains are part of the Allegheny Front range that uniquely doubles back on itself to form the flanks of the syncline.

The strata which form the structure of the Valley include the Llewellyn Formation that contains the major portions of the anthracite deposit, interbedded with shales and sandstones. Just below that is the Pottsville Formation. It also contains coal and shales as well as sandstone and conglomerate. A few outcrops of the Mauch Chunk Formation can be found between the Pottsville and Pocono Formations. The Pocono forms a major structural formation beneath the Valley, and it outcrops significantly along the flanks of the Moosic and West Mountains. It contains very dense sandstone and conglomerate. Below the Pocono is the Catskill Formation. This extensive formation underlies the plateaus east and west of the Lackawanna Valley.

At some locations between the Pocono and Catskill Formations the presence of an interesting interval strata is exhibited. Geologists now consider it a distinct formation. It has a peculiar name and properties: it is known as Spechty Kopf. This term, meaning "flakey head", is the German language reference for "dandruff". The Spechty Kopf contains very soft siltstone and mudstone with about a 60% matrix of clay, bedding sands, gravels, and cobble.

As Roaring Brook passes through Cobb's Gap, it cuts along the base of the Greenville Cliffs just below the village of Nay Aug. The cliffs are composed of an outcrop of the Spechty Kopf that forms a brownish to grey band of clay-based mudstone flanked by sandstone bands. The Spechty Kopf was quarried in this vicinity between the 1890s and 1920. The mudstones were milled to produce bricks by the Nay Aug Shale Brick Company. Nay Aug pavers were used to pave many streets in Scranton, Dunmore, and adjacent towns. Nay Aug vitreous bricks were used for the construction of manholes, catch basins, and sanitary sewer culvert lines.

The Nay Aug Gorge and Waterfall, in Nay Aug Park in Scranton, is now listed as a National Natural Landmark. The nomination narrative describes it as, “an excellent example of a *fluvial nick point* the immediate cause of which is the erosion of the stream through differentially resistant strata.” In the Nay Aug Gorge, Roaring Brook cuts through a boundary between the Pottsville and Mauch Chunk Formations. The softer Mauch Chunk shales underlie the harder Pottsville sandstone and conglomerate. The streamflow erodes the shales at a faster rate than the harder sandstones creating the waterfall and splash pool below. The waterfall will gradually migrate upstream. A *National Natural Landmark Evaluation Report on Nay Aug Gorge and Waterfall*, University Park, 1987, also indicates that the gorge and waterfalls are relatively “youthful” and suggests a recent post-glacial origin.

After continental tectonics and mountain orogenies, the other significant force that shaped landforms of the region were glaciers. North America experienced four periods of glaciation during the past one million years. The last of these events, the Late Wisconsin, receded between 20 thousand to 15 thousand years ago. At the full extent of these “Ice Ages”, ice sheets up to 2,000 feet thick covered and scoured the land from the Arctic to a glacial limit from the area around the coast of Maine to Cape Cod and Long Island, across central Pennsylvania, the upper Mid-West, and northern Rockies to the Pacific Northwest. These advancing and retreating ice sheets carved and re-carved the valleys, watercourses, mountains, and plateaus of the Northern Appalachian Mountains. These ice sheets are the primary force that cut the many water gaps in our region. The glaciers also helped to form, reform, and deform many of the courses of our rivers and tributary streams.

There is agreement among several geologists that before the Nay Aug Gorge was formed after the Late Wisconsin retreat, Roaring Brook flowed on a course where the Erie and Wyoming Valley’s Scranton Branch crossed through a “Wind Gap” along Mill Street and Wheeler Avenue in Dunmore. It followed a course later followed by Pine Brook down to the river. This theory further suggests that the gradual melting of large blocks of residual ice and the erosion of glacial debris eventually opened the course through the Gorge.

The legacy of the ice ages also has a strong influence on the soil types in the Roaring Brook watershed. There are numerous gradations and variables that affect soils, soil depth, and composition at any scale and location. The five major soil associations present in the Roaring Brook watershed are responsive to geological and more recently human-based impacts.

The soil associations, found in the Roaring Brook watershed, are described in the *Soil Survey of Lackawanna and Wyoming Counties* (produced by the US Department of Agriculture, Soil Conservation Service [now Natural Resource Conservation Service, NRCS] in collaboration with Penn State University in 1978).

Beginning in Scranton and extending through urbanized Dunmore, the survey indicates *Urban Land Association*. These are soils highly impacted by urban development, with impervious surfaces. *Udorthents*, *Mine Dump Associations* are also evident in several limited locations along

Roaring Brook, adjacent to the Lackawanna Rail line. Mine Dump Associations are more evident in Dunmore between Bunker Hill and Sport Hill. Several collieries were operated along this reach by the Carney and Brown Coal Company, the Spencer Coal Company, and successors between the 1870s and 1930s.

Along the Moosic Mountain and Cobb's Gap, *The Rock Outcrop-Arnot-Dystrochrepts Associations* predominate along the mountain tops and mountainsides. These exhibit as large sheets of bedrock with no soil cover to shallow sandy-to-stony soils in crevices and around the perimeter of the outcrops. These soils support globally rare scrub oak/pitch pine and heath barrens such as the "Dunmore Balds," that are post-glacial successional communities with links to similar communities in the Catskills, Adirondacks, Laurentians, and Arctic. Other outcrop manifestations are evident with the "Barney's Ledge" escarpment and the "Greenville Cliffs". At lower elevations along the flood plain and terraces of Roaring Brook are shallow to deep soil deposits of fluvial and glacial till.

Between Elmhurst and Hollister Reservoirs, *The Wellsboro-Morris-Oquaga Association* predominates. These soils tend to be deep to moderately-deep. Historically they supported forest cover and with clearing supported modest agriculture, predominantly dairy farming.

From the breached Hollister Reservoir site out to the source waters of the East Branch, and Main Stem in the Freytown swamps and wetlands around Lehigh Summit and up the Lake Run tributary, *The Mardin-Bath-Volusia Association* has deep to moderately well drained soils. Extensive wetlands, bogs, and deep sand and gravel deposits of glacial origin are common.

Flora and Fauna

The Roaring Brook watershed provides a habitat for a rich diversity of plants and animals typical across the Mid-Atlantic Highlands. The headwaters areas around Freytown and Lehigh Summit have seen traditional agricultural settlement and forest clearing in the 19th century. By the 1890s and on into the 1920s, there were significant acquisitions of farmlands, wetlands, and successional woodlots by the Scranton Springbrook Water Company that served to protect the source waters of Roaring Brook for water supply.

A robust second growth forest of red maple and beech quickly regrew on abandoned pastures. The deeper wetland areas that were not cleared by earlier settlement still support boreal forest communities that include tamarack and black. Native sugar maple in woodland stands and roadside plantings is also common around the North Pocono area. Hickory trees and a range of oaks are also common in the forests. Hemlocks are plentiful around wetland perimeters and stream corridors. White pine is present but in much fewer numbers than common in the pre-settlement forest. The ongoing loss of both green ash and white ash due to the invasive emerald ash borer across the region is evident in any view of today's forest. The invasive spotted lantern fly has not yet impacted the region's forests or orchards in any discernable way.

The beech/maple forest community predominates along the headwaters areas of the plateau with hemlock/rhodora groves common along the stream corridors and wetland littorals. River birch, yellow birch, red and silver maple, sycamore, and box elder are also common along the riparian corridor.

In the Cobb's Gap area there is a greater presence of various oaks along higher elevations. White oak, mountain oak, and chestnut oak transition to dense thickets of scrub oak along the summits of the Moosic Mountains flanking Cobb's Gap. The Moosic Mountain ridgeline hosts the Moosic Mountain Barrens, a Northern Appalachian Acidic Rocky Summit Natural Community. The "Dunmore Bald" features chokeberry, low-sweet blueberry, and hairgrass, transitioning to scrub oak, pitch pine, and black huckleberry communities.

The Moosic Mountain Barrens have been identified as a top priority for conservation in the Natural Areas Inventory of Lackawanna County (Pennsylvania Science Office of the Nature Conservancy 1996), The Lackawanna River Watershed Conservation Plan, (LRCA 2001) and the Lackawanna and Luzerne Counties Open Space, Greenway, and Outdoor Recreation Master Plan (PA Environmental Council, LRCA et al. 2004).

Roaring Brook is classified by PADEP as a High-Quality Cold-Water Fishery (HQ CWF) from its headwaters to the Elmhurst Reservoir. Several reaches of the headwaters of Roaring Brook support macroinvertebrate populations indicative of Exceptional Value (EV) waters according to data collected by LRCA for a Cold-Water Conservation Plan for the North Pocono Tributaries of the Lackawanna River Watershed (LRCA 2006). These waters support native brook trout as well as stocked and acclimated brown trout and a variety of non-game fish, turtles, and amphibians.

The terrestrial habitat of forests, wetlands, and open and successional fields support the range of fauna typical of the Northern Appalachians. This includes black bear, white-tail deer, coyote, bobcat, fisher, mink, muskrat, racoon, red fox, woodchuck, beaver, porcupine, possum, rabbit, snowshoe hare, grey squirrel, and chipmunk. A small population of American river otter has been reported in the headwaters area of Roaring Brook. There are also several species of bat native to the area that are in decline due to the white-nose syndrome.

The Roaring Brook watershed supports the range of avian species common to the Northern Appalachians. Along the riparian corridor green-back heron, great blue heron, belted kingfisher, wood duck, mallard, and merganser are common. Neotropical migratory birds such as vireos and warblers are common in season along the stream corridors, and in the wetland source water bogs and marshes. Osprey and bald eagle also frequent these habitats as do great horned owl and barred owl. As part of the Allegheny Front Range, the Moosic Mountain ridge line provides an important migration corridor and habitat for neotropical migratory species. Prairie warbler, chestnut-sided warbler, rufous-sided towhee, and common yellowthroat are summer occupants of the Moosic Mountain Barrens. The thermal air currents along the ridgeline attract turkey vulture, red-tailed hawk, sharp-shinned hawk, cooper's hawk, and bald eagle.

There are a wide range of rare and endangered plants and animals that are known to exist in the habitats of the Roaring Brook watershed. The Natural Areas Inventory and the Bi-County Open Space Plan identifies the primary habitats of concern and regional interest for preservation. The Planning and Policy recommendations of these documents are further discussed later in this Plan.

Watershed

Roaring Brook occupies a critical space within the larger Lackawanna /Susquehanna/Chesapeake Bay watershed. It is a primary source water location for the potable water supply of the Scranton/Wilkes-Barre metropolitan region. It forms a part of the Northeastern boundary of the Chesapeake Basin with the Delaware Basin. The wooded wetland and marsh ecosystems along this portion of the Pocono Plateau are critically important natural habitats for both the Chesapeake and Delaware Basins and a major part of the Mid-Atlantic region.

The North Pocono Plateau is a critical source water area for the following streams in addition to Roaring Brook. The glacial groundwater tables of the plateau have flows that source Roaring Brook, Spring Brook, and Stafford Meadow Brook in the Chesapeake Basin, and Butternut Creek, Wallenpaupack Creek, the Lackawaxen River, Marsh Creek, and the Lehigh River in the Delaware Basin.

Presently, the Pennsylvania American Water Company owns and operates the larger water supply reservoirs: Hollister, Elmhurst, Curtis, and Dunmore Numbers 1 and 7. Elmhurst reservoir's dam structure was recently reconstructed in compliance with Pennsylvania Dam Safety Act requirements. The high flow spillways were expanded and their capacity to transmit flood flows were expanded to meet present and future anticipated flows. PAWC is currently decommissioning the Hollister reservoir. The Aqua PAWC operates the Moscow Water Company with a small reservoir, supply intake, wells, and filtration installation on Center Street in Covington Township.

The PAWC owns and maintains several hundred acres of forested buffers around its reservoirs. Aqua PA has a smaller acreage of buffers around its intake and filtration site. Prior to 1997 the PAWC system was owned and operated by the Pennsylvania Gas and Water Company (PG&W).

PG&W was formed in 1954 by the merger of several older public utilities, notably the Scranton Gas and Water Company founded by Worthington Scranton in the 1880s and the Spring Brook Water Service Company founded by Colonel Louis Watres also in the early 1880s. These and other local water utilities, some associated with coal mining companies and railroads were created in the late 19th century to develop the water supply system for the rapidly growing communities in the Lackawanna and Wyoming Valleys.

With foresight, the reservoirs were developed just outside the geologic boundary of the coal measures. Smaller reservoirs were built on tributary streams rising on the flanks of the Moosic

and West Mountain ranges. Larger reservoirs like Elmhurst, Lake Scranton, Nesbitt, and Watres were built on the Plateau on the larger tributary streams.

This process included the acquisition of the hundreds of acres needed for the water bodies as well as thousands of additional acres of forests and wetlands to provide substantial buffers to protect source water springs and first and second order streams flowing into the reservoirs.

The protection, conservation and prudent management of these water resources and their integral ecological habitats is critical to the future viability, sustainability, and resilience of the human community, its built environment, and the economy of the Mid-Atlantic region.

The traditional methods of processing sanitary wastewater in the North Pocono area were centered on septic tanks and leach fields. This system has been common in rural America for much of the 20th century and is an advance from the outhouse and privy pit of earlier times. Soon after the development of the Elmhurst Reservoir, there were outbreaks of waterborne disease in the population served by the Scranton Water Company.

In 1906, according to reports in the Scranton Times, public health investigations found several pig and chicken farms along Roaring Brook near Moscow as direct sources of bacterial contamination entering the Elmhurst Reservoir. Orders were issued to remove the animals from proximity to the waterways and to better manage the composting of animal waste from those operations. Chlorination inputs were increased in the water supply system and the immediate health problems were resolved.

The region experienced suburban expansion and a decline in agriculture in the later part of the 20th century. By the 1980s, the land uses in the once rural townships and villages had changed with the development of numerous suburban residential subdivisions on what had been farmland and wood lots across the middle and upper Roaring Brook watershed. This was paralleled by the installation of shopping areas and strip malls along local roadways and the construction of two interstate highways through the watershed, Interstates 380 and 84.

The term “urban sprawl” was coined to refer to the rapid automobile-based expansion of urban land use typology in the 20th century. It is characterized by large areas of impervious surfaces composed of concrete and asphalt to accommodate the use of automobiles and trucks. Shopping centers, malls, and institutional and commercial buildings with expansive flat roofs are at the center of these huge islands of impervious surface.

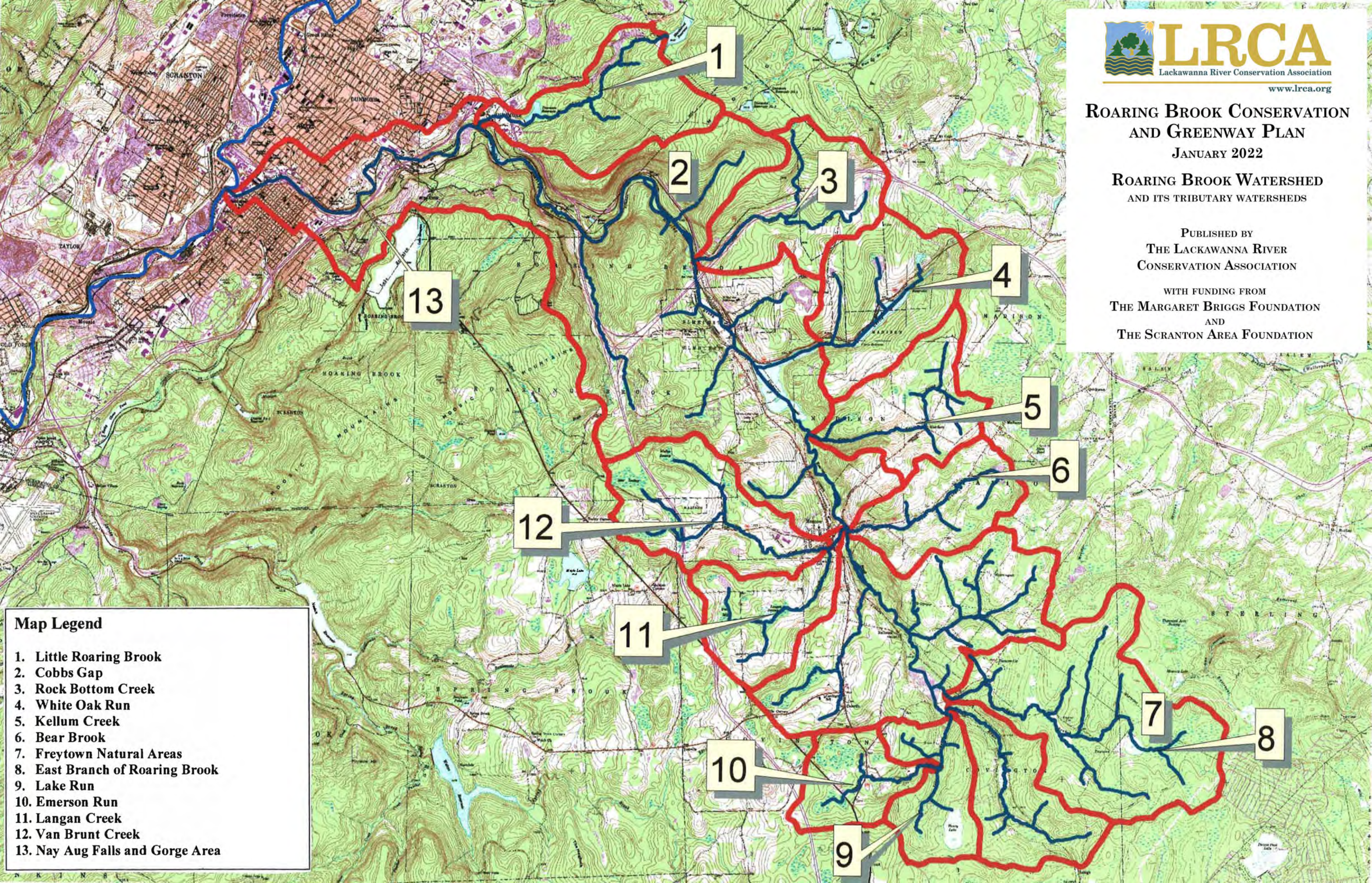
A more recent manifestation of the rise of impervious surface growth is the “Big Box” facility. Mall-centered in-person retail commerce is declining as a type of commercial exchange. With the beginning of the 21st Century, “on-line” commerce also known as “e-Commerce”, has become a major part of the retail market. The COVID-19 pandemic has accelerated this trend with more consumer purchases made from home according to an article in the July-August 2021 edition of The Bay Journal.

**ROARING BROOK CONSERVATION
AND GREENWAY PLAN**
JANUARY 2022

**ROARING BROOK WATERSHED
AND ITS TRIBUTARY WATERSHEDS**

PUBLISHED BY
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AND
THE SCRANTON AREA FOUNDATION**



- Map Legend**
- 1. Little Roaring Brook
 - 2. Cobbs Gap
 - 3. Rock Bottom Creek
 - 4. White Oak Run
 - 5. Kellum Creek
 - 6. Bear Brook
 - 7. Freytown Natural Areas
 - 8. East Branch of Roaring Brook
 - 9. Lake Run
 - 10. Emerson Run
 - 11. Langan Creek
 - 12. Van Brunt Creek
 - 13. Nay Aug Falls and Gorge Area

Retailers, such as Amazon, are building numerous regional “fulfillment centers” linked with the global supply chain to stock, select, and deliver the plethora of commercial items available through the global market to local consumers. Big Box warehouses being developed to facilitate this e-Commerce range in size from 500,000 to 1.5 million square feet. They are surrounded by a roughly equal amount of concrete and asphalt covered truck staging, loading bay, parking areas, entry and egress roads. Taken together these Big Boxes are creating about 2 million square feet of new impervious surfaces with their roof coverage and parking access areas for each facility created. That is between 45 to 50 acres of new impervious surface for each facility.

The expansion of auto/truck/e-Commerce based lifestyle generates large, long term negative impacts to water quality, the hydrological flow regimes in local watersheds, and overall environmental quality across the Mid-Atlantic region. The Interstate 81/78 corridors which include I-380 and I-84 in the North Pocono area are the fastest growing areas for this type of development in the United States as of 2021 according to the Bay Journal article.

The impact of these developments on management of local Municipal Separate Storm Sewer Systems (MS4) is critical. When these factors are considered with the increasing volumes, velocities, and frequency of climate change-linked storm events, the implications for flood mitigation and damage control are a serious concern to regional municipal agencies and property owners.

The other major water quality impact of recent growth was another episode of waterborne illness experienced by the contamination of the regional water supply with the Giardia cyst, a waterborne parasite that causes acute gastrointestinal disease that can occasionally cause fatalities. Following several outbreaks of Giardia in the mid-1980s, the PA DEP and US EPA required the local water utility (at the time the PG&W Company) to institute water filtration. This led to a reconfiguration of the reservoir and delivery system and the construction of new state of the art water filtration and purification plants on the PG&W system. These plants, including the Lake Scranton Plant, that serve the Roaring Brook reservoirs, came online in the early 1990s.

The construction of new water treatment plants and other upgrades to the PG&W system required an investment of \$400 million dollars in the capital improvements. This investment stimulated the interest of the PG&W parent company, the Wilkes-Barre-based Pennsylvania Enterprises Incorporated (PEI), to sell off the water utility portion of its PG&W holdings.

By 1996, PEI arranged to sell the water business, filter plants, aqueducts, delivery systems, 30 of 45 reservoirs, and 5,000 acres of watershed buffer lands surrounding the reservoirs to the Hershey-based Pennsylvania American Water Company (PAWC).

The plan would result in the PEI group keeping the gas utility and changing its name to PG Energy. PEI would also keep another PG&W subsidiary, the Theta Land Company, which was the owner of record of over 45,000 acres of critical watershed lands and 15 of the older, smaller, and out of service reservoirs across portions of Lackawanna, Luzerne, Wayne, and Susquehanna Counties.

Significant portions of these lands surrounded the reservoirs and watershed source waters for Roaring Brook, Stafford Meadow Brook, and Spring Brook.

Community groups and conservation interests were concerned about the eventual disposition of these critical watershed lands. Since PG&W and PAWC were public utilities subject to regulation by the Pennsylvania Public Utility Commission (PUC), the sale required review and approval by the PUC. The administrative law process with the PUC allowed input from parties concerned about or opposed to the sale to file as “protestants” to secure the ability to bring witness and evidence to the PUC to influence the outcome of the process.

Representatives of the then Lackawanna River Corridor Association (LRCA) and the Luzerne-Lackawanna Sportsmen’s Association filed as protestants and used the process to secure a PUC order to extend PUC protection and jurisdiction on the watershed lands going forward. The PUC order authorizing the sale and divestiture to proceed required a land use plan to be designed and implemented by PEI concerning the Theta Land Company properties to provide for public input and conservation use management of significant portions of the properties.

The sale to PAWC was completed in 1997 and the Theta Land Use Plan was completed in 1998. In 2000, PEI was acquired by Southern Union Company, an Austin, Texas-based utility. By 2002, Southern Union sold the Theta Land Company to locally based private investors. During subsequent years, approximately 30,000 acres of Theta Lands and many of the out of service reservoirs were resold to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry (PA DCNR/BOF) and the Parks Departments of Luzerne and Lackawanna Counties.

Some Theta parcels have been resold to private individuals for hunting grounds. There has been to date very minimal development and many of the parcels identified with high conservation and watershed protection values are being managed for conservation use. The leasing of Theta parcels on Moosic Mountain above the Dunmore Number 1 Reservoir for ATV riding has created excessive opportunities for soil erosion and fragmentation of natural habitat areas. The conservation of the residual 15,000 acres of Theta Lands is discussed later in this document.

The management of municipal sanitary wastewater in the Roaring Brook watershed is a mix of private on-lot systems and publicly operated wastewater systems and treatment plants. Another outcome of the Giardia crisis in the 1980s was the increasing pressure by the Pennsylvania Department of Environmental Protection (PA DEP) to persuade local municipalities to develop wastewater collection and treatment plants. Portions of Roaring Brook and Elmhurst Township are served by the Elmhurst Township Sewer Authority. Moscow Borough Sewer Authority serves Moscow from its plant on Market Street. The urbanized area of Covington Township around Daleville Corners is served by the Covington Township Sewer Authority plant located off Route 435.

Due to the varied topography of the service areas for the North Pocono sewer agencies, there is a reliance on grinder pumps, collection cisterns, and pressurized lines as well as gravity lines to

send wastewater to the various plants. There is some infiltration of stormwater into the systems. Portions of Jefferson Township are served by a collection system that pumps wastewater over Moosic Mountain for treatment by the Lackawanna River Basin Sewer Authority (LRBSA) plant on the Lackawanna River in Throop.

The more rural farmsteads and older subdivisions not connected to the sewer systems are still served by older septic tanks and leach fields. Newer individual homes and homes in subdivisions are served by sand mounds. Some subdivisions and trailer parks are served by private developer installed treatment systems. The newer systems installed over the past 40 years or so have been reviewed by municipal Sewer Enforcement Officers (SEOs).

Scranton and Dunmore are served by a larger and older combined stormwater and sanitary collection system that dates to the 1890s. The 20 plus million gallon per day Scranton Sewer Treatment Plant is located off Breck Street in South Scranton. It discharges into the Lackawanna River. The plant was designed in 1940. It was built and became operational by 1968. Between 2008 and 2014 there were 40 million dollars of upgrades installed to meet new Chesapeake Bay Program requirements to reduce nutrients in the plant discharge.

The city of Scranton sold its Sewer Authority to the Pennsylvania American Water Company in 2015 to retire debt from adverse municipal labor relations arbitration awards. PAWC assumed responsibilities for further collection system improvements under a consent decree in a matter before federal court related to the need to reduce and eliminate combined sewer overflows (CSOs).

Due to the 1890s era design of the Scranton Dunmore sewer system, stormwater from city streets is channeled into catch basins that are connected to the sanitary sewer lines. The original intent was to use stormwater to flush out the sanitary lines and drain the wastewater away via the river. CSOs occur at over 70 locations along the River and several tributary streams including Roaring Brook.

The former Scranton Sewer Authority developed a Long-Term Control Plan (LTCP) to design and construct holding tanks and other improvements to eliminate up to 92% of the overflows on an annual basis. The PAWC is now charged with implementing this plan and will expend \$150 million over 20 years to comply with the court order. Several system improvements along Roaring Brook have recently been completed at East Drinker Street, Myrtle Street, Prescott Avenue, and Birch Street.

The Keystone Sanitary Landfill (KSL) has maintained an industrial waste pretreatment discharge permit to discharge pre-treated landfill leachate into the Scranton Sewer System at two locations. One, the so-called "dedicated" line near Dunham Drive, flows into the Little Roaring Brook interceptor line. The second emergency alternative flows into the Meadow Brook /Drinker Place interceptor line at Monahan Avenue. KSL is presently processing a permit application to allow direct discharge into either Little Roaring Brook or into Eddy Creek. The leachate would be processed via a reverse osmosis technology which when properly and consistently operated can

produce a near drinking water quality output. For hydrological reasons, a discharge into a restored Eddy Creek could complement a proposed watershed restoration program to address legacy abandoned coal mine issues and contemporary storm drainage needs on Eddy Creek.

The Stormwater Management Plan for the Lackawanna River Watershed was developed through PA Act 167 in 1991. Over the past 30 years, newly recognized impacts of climate change on storm events and precipitation levels and frequencies have become manifest in the Mid-Atlantic region.

New requirements for municipal responsibilities for management of stormwater and more local responsibilities for flood and storm damage control, mitigation, and resilience indicate that an update and reevaluation is needed. Opportunities to better manage storm drainage and flood control issues at a watershed level can be advanced through that process.

“Summer Morning on the Roaring Brook, Moscow”

John Willard Raught 1857-1931

John Willard Raught was born in Dunmore in 1857. He worked for several years as a telegraph operator with the Pennsylvania Coal Company. In 1880 he moved to New York City where he studied at the National Academy of Design and began to exhibit his drawings and paintings in galleries and juried exhibits. In 1885, he journeyed to France where he studied art at the Académie Julian in Paris. He traveled extensively in France in the late 1880's, living and painting in rural villages.

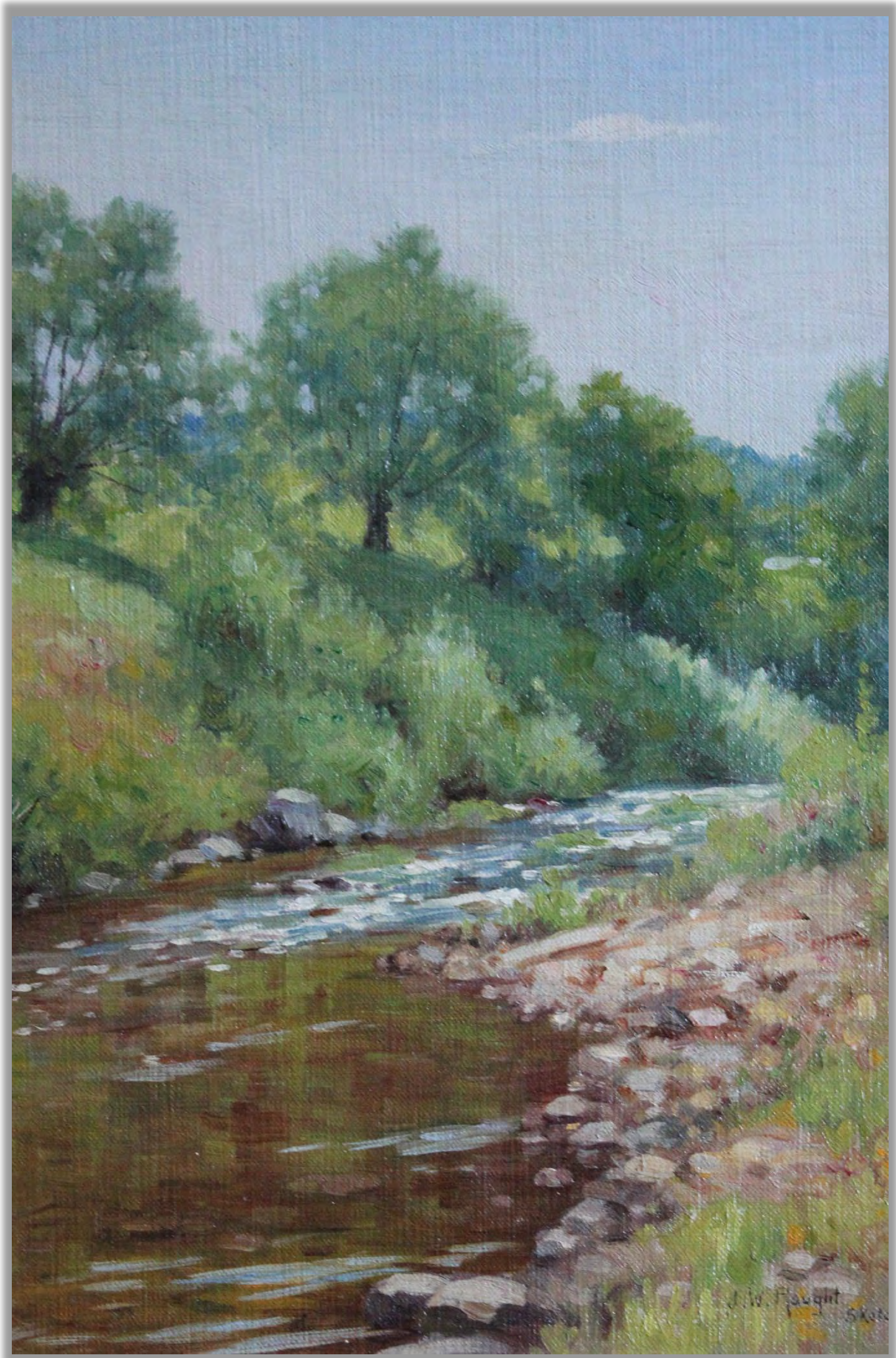
Raught returned to the United States in 1891 and established a studio on West 23rd Street in New York. He was a contemporary with many American painters and writers working in the New York region at that time. He travelled home to Dunmore on many occasions and would spend time hiking and painting along Roaring Brook and the Moosic Mountains.

In 1911 he moved home to Dunmore and established a studio on Washington Avenue in Scranton. His strong sense of place is evident in his paintings of landscapes of our region. He enjoyed the “en plein aire” style of painting, literally painting outdoors. His approach to painting, influenced by late 19th century French Impressionism worked well for quick sketches across the landscapes of northeast Pennsylvania. His en plein aire sketches and studies form the basis for many of the larger landscapes which he completed in his studios.

Raught is well known for his paintings of coal breakers which were a once dominant feature in the “built environment” along the Lackawanna Valley. His love of landscapes and environments of northeast Pennsylvania speaks to that sense of place that can develop when individuals come to value and understand the environment in which they live.

The Lackawanna River Conservation Association (LRCA) is pleased to include this painting by John Willard Raught on the cover of this Roaring Brook Conservation and Greenway Plan. We reproduce it as the centerpiece of this document as well to help share the inspiration that can be found along Roaring Brook.

“Summer Morning Roaring Brook, Moscow,” circa 1924, is reproduced for this Plan courtesy of the Stanislaus Collection. The image of “Summer Morning on the Roaring Brook, Moscow” is copyright 2021 by the Stanislaus Collection and is used here with permission.



History

The history of human habitation along Roaring Brook is estimated to have begun as the last glaciers melted and vegetation returned to the ice-scoured hillsides and valleys of the region between 10 and 15,000 years ago. Members of the Pennsylvania Society for Archaeology have documented the earliest known human habitation at the confluence of the Lackawanna and Susquehanna Rivers at Coxton Point between Duryea and Pittston. Fire pit charcoals were radiocarbon dated to that time, approximately 9000 years BPE (Before Present Era).

Ongoing studies indicate continued habitation at that site through the present day. The earliest occupants were descendants of Siberian megafauna hunters who led human immigration into North and South America in the post-glacial Pleistocene Era.

Across the Mid-Atlantic region, the major known sites of early human habitation have been found at points of confluence and along the floodplains and terraces of major rivers. The hunter-gatherer cultures would follow the rivers, and gradually, as cultures changed and acclimated, pathways and trails across upland and headwaters areas would be developed for trade and hunting. Along these corridors, sometimes following tributary streams such as Roaring Brook or ascending to ridgelines like the crest of the Moosic Mountain range, transitory habitations have been found along overhanging rock ledges.

By the time of contact, the Lenape, an Algonquin speaking people, were the predominant inhabitants along the coastal and middle portions of the Hudson, Delaware, and Susquehanna Rivers. These areas were the last portions of North America to manifest the practice of corn agriculture. To the immediate north and west of the Lenape and other coastal Algonquin speaking peoples, the five tribes of the Iroquois inhabited the ridges and plateaus of the upper Susquehanna watershed and Finger Lakes in and along tributaries to the Susquehanna, Delaware, and Hudson Rivers and the Great Lakes along the Niagara frontier with Canada.

Sometime around the time of European contact, the five Iroquoian speaking tribes, the Mohawk, Oneida, Onondaga, Cayuga, and Seneca, joined together in a federation. This was later expanded to include a sixth tribe, Tuscarora. This confederacy became a powerful political, military, and cultural force in eastern North America during the colonial period to about 1800. Their power was diminished following the American Revolution and due to further advances in European settlement of their territories. With the revival of recognition of Native American political, legal and civil rights over the past 50 years, the Six Nations have again become an important cultural, political, and economic player in American and Canadian affairs.

The first European known to visit the Lackawanna-Wyoming Valley was Etienne Brule, a colleague of the French explorer Marquis de Champlain, sometime in the 1650s. In the late colonial period, a Moravian missionary, Count Zinzendorf, visited a Lenape village along the banks of the Lackawanna in what is now Scranton. Zinzendorf records that the village chief was named Capouse of the Muncy clan. The Lenape people had been pushed out of their traditional lands by

European settlement and fraudulent agreements like the “Walking Purchase”. By the mid-1700s, they were vassals of the Iroquois. By 1800 they were pushed west to Ohio and Indiana, eventually migrating to “Indian Territory”, present day Oklahoma. The Iroquois settled on reservations in upstate New York after the American Revolution under treaties with that state.

Colonial settlement in Northeast Pennsylvania began by 1763 at the close of the French and Indian War. This region was claimed by both Connecticut and Pennsylvania. Settlers from these colonies fought a series of skirmishes known as the Yankee-Pennamite Wars before and after the American Revolution.

The Articles of Confederation government empaneled a commission to settle the land disputes. The commission issued the Decree of Trenton in 1782 awarding the land to Pennsylvania. This was contested further by Connecticut settlers and in 1786, the Pennsylvania legislature agreed to recognize the land titles of the Connecticut settlers in exchange for the settlers recognizing the sovereignty of Pennsylvania. Luzerne County was established covering all present-day Luzerne, Lackawanna, Susquehanna, Wyoming, and part of Bradford counties as part of that compromise.

By 1800 the settlement population in the hard-to-access Lackawanna/Wyoming Valley region was just a few thousand people. After the War of 1812, that began to change with the discovery of anthracite coal. More interest from land speculators and investors created greater interest and migration into the area. One land investor was to have long range impact on the Roaring Brook watershed. Henry Drinker, a notable Quaker businessman from Philadelphia, purchased 25,000 acres in warranted deeds from the Commonwealth of Pennsylvania in 1787 for \$5.00 per acre. His son, Henry W. Drinker, inherited the tract known as “Drinkers Beeches” for the beech trees, then a dominant tree in the extensive hardwood forest.

In 1818 Covington Township was incorporated in that part of what was Luzerne County. H.W. Drinker was active in promoting the development of the North Pocono area and the near-by Lackawanna Valley. He expanded and improved the Native American pathway that followed Roaring Brook through Cobb’s Gap and on out to the Pocono Plateau.

Traces of the original “Drinker Turnpike” can be found all along the alignment of PA Route 435 in Dunmore, Elmhurst, Moscow, Covington, Clifton, and on out through Gouldsboro and Tobyhanna. This section of roadway was part of a larger “Philadelphia and Great Bend Turnpike” that wound its way up along the Delaware River, across the Poconos and Lackawanna Valley, and on northward through Susquehanna County to the state line at Great Bend.

Plank roads and turnpikes like these were gradually opening the region for more settlement and commerce. Drinker was also involved in an early railroad charter for what eventually became the Lackawanna Railroad in 1852. Drinker was friends with William Henry from Oxford Furnace, New Jersey. William Henry was the father-in-law of Selden Scranton who was partners with his brother, Joseph Hand Scranton, in the iron works at Oxford.

Henry learned of the presence of iron ore in the Moosic Mountains and knew of the rich deposits of coal available along the Lackawanna Valley. He persuaded the Scrantons to move their iron business to a site on Roaring Brook and acquire a mill and iron forge there from Ebenezer Slocum in 1838. The area at the time was known as Slocum's Hollow.

Other entrepreneurs were also engaged in coal mining, canals, and railroads. Irad Hawley partnered with the Wurts brothers who had built the Delaware and Hudson Canal and Gravity Railroad to exploit the coal measures in the upper Lackawanna Valley. In 1848 they created the Pennsylvania Coal Company (PCC) to mine and market coal from Dunmore and Pittston. The PCC built a Gravity Railroad from Pittston to Dunmore up along Roaring Brook and over the Moosic Mountain to connect with the D&H Canal. While Hawley and most of the PCC investors were based in New York, John B. Smith, their local superintendent, built an imposing mansion on Elm Street in Dunmore. Smith and the PCC were a formidable force along Roaring Brook for a generation.

But it was the Scrantons and their Lackawanna Coal and Iron Company that really set the pace of innovation and change. Over the next dozen years, the Scrantons and their partners created an iron industry that gave birth to a city, eventually by 1878 a new County, and an amazing tide of wealth generation, economic opportunity, and population growth that forever changed the natural habitats and environment along Roaring Brook and the entire region.

The following is a quote from a brief report in the Pittston Gazette of January 24, 1861, that shares a contemporary perspective on "A Trip to Scranton". Although it is written on the verge of the Civil War, it offers a glimpse into the spirit of enterprise that marked the Industrial Revolution. (Excerpt from a blog post courtesy Jake Wynn, Wynning History, posted May 5, 2020).

"On Saturday morning last, we jumped aboard the cars and went to Scranton, where we always find numerous and fresh evidence of enterprise. What gives to Scranton its fame and prominence is its great Iron business, its snorting engines, and its locomotive whistles, its forge hammers and steam pipes – all these, to make a long story short, are the result of that indomitable energy which characterizes the pioneers of that but recently wild and uninviting region."

This dynamic helped to drive the nation to become a world power through the 20th Century. It is still evident in the economic and cultural activities in the communities along Roaring Brook. The anthracite coal industry, the PCC, and the Lackawanna Iron Works have each left a mixed legacy on the land and on the human community. The decision making of the mid and later 19th Century established the physical, economic, and socio-political foundations of Northeast Pennsylvania for the following 150 years.

We are at a similar point of inflection today. As the Northeast Pennsylvania region adapts to climate change and changing global conditions related to resource availability or scarcity to trade, to population migration, and to geo-political forces, the conservation of Roaring Brook's natural

habitats and water resources is critical for the future. Its sustainability is a key element of regional water supply. It remains an important transportation corridor and is growing in importance as a recreational asset. These values need to be understood and respected by all stakeholders.

Current Conservation Status

The Open Space, Greenways, and Outdoor Recreation Master Plan developed by Luzerne and Lackawanna Counties in 2004 is the benchmark for assessment and management of public and private conservation work and priorities in the bi-county region. The plan, developed with funding from PA DCNR and private foundation grants, includes recommendations for trails and greenways along Roaring Brook and along Moosic Mountain.

It also includes an ecosystem-based set of priority recommendations for further acquisition and protection of critical natural habitats, wetlands, and watershed lands. This plan continues as the conservation and recreation element of the County Comprehensive Plan. The Roaring Brook watershed and the ridgeline of the Moosic Mountains figure are central areas of interest for conservation action in Lackawanna County in the 2004 Plan.

The interests of Lackawanna County in conservation and recreation resources along Roaring Brook can be traced to the early 1980s. The Lackawanna County Department of Parks and Recreation (LCDPR) obtained state funding for several property acquisitions. A twelve-mile-long portion of the former Erie and Wyoming Valley Railway (E&WV RR) was acquired between Dunmore and Jefferson Township with the intention that it would be developed as a pedestrian and bicycle trail. A 400-acre tract of farm and woodland was acquired (De Angelis Farm in Covington Township) with the intention that it would be developed as a county park.

The park has been developed and is in use. LRCA collaborated with LHVA and the North Pocono Rotary Club to develop the North Pocono Pedestrian/Bicycle Trail & Greenway Plan in 2004 along the E.&W.V. between Rock Junction in Dunmore, Nay Aug Village & Silverlake, Elmhurst and Wimmers in Jefferson Township. LCDPR developed engineering and permits for a Phase One trail construction project at Elmhurst in 2006 but it did not advance to construction at that time.

A major PennDOT project to replace the Interstate 380 bridges that cross over Roaring Brook near Nay Aug Village and Silver Lake in Dunmore will feature the restoration of a 300-foot-long railway trestle and a first phase of trail development between Dunmore and Elmhurst as the Interstate bridge work concludes by 2027.

Lackawanna County collaborated with the PA DCNR Bureau of Forestry to acquire about 3,600 acres of Theta Land Company parcels along Roaring Brook between Dunmore and Covington in 2005. This includes important riparian flood plain lands, large tracts of the Freytown Marsh, lands along Kellum Creek, and the Hollister Glen.

Pennsylvania American Water Company owns approximately 2,000 acres of buffer lands surrounding the Dunmore Number 1 and Number 7 Reservoirs as well as Elmhurst, Curtis, and Hollister Reservoirs. Aqua PA owns about 80 acres around its water plant in Covington Township.

Lackawanna County and several municipalities own about 800 acres of park and conservation lands. There are 400 acres covered in golf courses and 500 acres used as cemeteries. Institutional use and school district lands cover roughly 500 acres. Approximately 400 acres are protected through agricultural easements.

Altogether, LRCA estimates that there are 7,800 acres of protected natural lands and open space in the Roaring Brook watershed as of 2021. The Bi-County Plan classified 19,000 acres in need of preservation in 2004. This leaves 12,000 or so acres remaining to be preserved in the Roaring Brook watershed.

Current Open Space Recreation Status and Unmet Conservation Needs

This section will briefly review current open space or outdoor recreation status. Athletic sports recreation such as baseball, football, basketball, tennis, soccer, and swimming are covered in individual municipal plans and facilities, through the School District, and through the LCDPR at Covington Park.

Open Space recreation reviewed in this assessment includes walking, hiking, running, bicycling, fishing, hunting, wild food harvesting, paddle sport, nature study, equestrian, and ATV. Currently there are no developed or continuous trail or greenway systems along Roaring Brook and between the Lackawanna Valley and Pocono Mountains. The only opportunities would be to follow local and state roads and highways, or to trespass along an active railroad corridor, utility corridors, and private properties. Individuals and groups of travelers would need excellent way-finding skills both by traditional and digital means.

The Roaring Brook Corridor and the adjacent slopes and ridgeline of the Moosic Mountains have been traditionally used by residents for these types of recreation. These traditional uses have been documented for over 150 years in personal letters, family histories, and newspaper and magazine articles. In the absence of publicly-owned open space lands, much of this recreational use has taken place on private lands, coal company lands, and water utility lands generally open for public recreation, either actively or by default.

Changes in land use patterns, ownership, the growth of automobile use and the change from rural to suburban uses and lifestyles since the middle of the 20th century have adversely impacted traditional recreational use patterns and the accessibility to recreational lands. The removal of railroad trackage and the acquisition by the county of the 12-mile section of Erie and Wyoming Valley Railway in 1980 provided an informal way to access the middle reaches of Roaring Brook

for hiking, bicycling, and ATV uses. Footpaths and unmaintained roads, like the Drinker Turnpike, also provide access to Roaring Brook for fishing and other uses.

Numerous water utility maintenance roads have allowed access to mountain slopes and ridgetops. The abandoned trace of the original Connecticut Settlement Road cut along the alignment of the Native American Minisink Trail in 1765 provides a main corridor for the Lost Trails ATV customers to access the Moosic Mountain Ridge line.

In the urban reach of Roaring Brook, there are multiple walkways developed by the University of Scranton to facilitate student and visitor access to and along the numerous field sports venues between the Main Campus along Ridge Row, the Delaware Lackawanna Railroad, the Historic Scranton Iron Furnaces, and the Lackawanna River. These pathways are not continuous and require the crossing of many heavily trafficked streets such as Cedar Avenue and Harrison Avenue.

Nay Aug Park, owned by the city of Scranton and operated by the Scranton Municipal Recreation Authority, is a major conservation and recreational resource for the entire region. Additionally, it contains the Nay Aug Gorge and Waterfalls, a National Geologic Landmark Registered Site. The Davis Trail provides an excellent footpath through the park. The adjacent park road network provides an auxiliary corridor for bicycle passage through the park.

The Roaring Brook Parklands along Richter Avenue, developed by the late John Darcy and community volunteers from East Scranton, provides a wonderful extension of the Davis Trail system to Myrtle Street and Ash Street.

The rise in topography, from Nay Aug Park to the slopes of the East Mountain and the neighborhoods of Bunker Hill and Oakmont, provides a set of constraints to link a usable pedestrian/bicycle trail from the Nay Aug Park area to the eastern portion of Dunmore. The topographic constraints are compounded by the even larger constraint of six lanes of Interstate Highway 81.

Elmhurst Boulevard once connected the Bunker Hill and Oakmont neighborhoods to the Hill Section through Nay Aug Park and across the Nay Aug Gorge on a large steel trestle that was built in the 1890s.

The trestle was demolished by the city of Scranton in 1966. The right of way of that section of Elmhurst Boulevard was obliterated to cut and grade the Interstate Highway around the east side of Scranton and Dunmore at the same time.

The Watres Addition to Nay Aug Park is a twenty-six-acre tract of woodland along Elmhurst Boulevard in the Oakmont/Pen-y-Bryn neighborhood. It was donated to the city by the Watres family with a deed covenant that it be used as parkland as a memorial to their son Harold A. Watres, who died in the influenza pandemic in 1921.

The removal of the Nay Aug Gorge Trestle and the Elmhurst Boulevard switchbacks with the construction of the Interstate Highway has cut off direct communication between Nay Aug Park and the East Mountain Neighborhoods for nearly 60 years as of this writing.

There is another potential recreational resource adjacent to the Watres Addition. It is a seven-mile-long reach of the former Erie and Wyoming Valley Railway. This privately owned, inactive rail corridor could provide a strategic trail and greenway link to the east through Bunker Hill to the county-owned section between Dunmore and Jefferson Township. This corridor also links southward to the Montage Mountain area.

Portions of the county-owned sections of the E&WV RR are being developed for trail use between the Interstate 380 bridge replacement site and Elmhurst. Planning is needed to develop connections south and west into Dunmore and Scranton and further east from Elmhurst.

The E&WV RR Corridor bears north along the arm of Elmhurst Reservoir towards the White Oak Reservoir. Trail improvements along that alignment will end at Wimmers Road in Jefferson Township. There is a longer-term potential to continue a trail corridor on the E&WV. RR through Jefferson Township and into Salem Township, Lake Ariel, and Hawley in Wayne County.

Prior to 1972, a township road crossed the White Oak arm of Elmhurst Reservoir on a three-section iron truss bridge between PA Route 590 and Yedinak Lane in Madison Township. The remnants of the truss frames were removed recently by the PA American Water Company. The stone piers were left in place. A restoration of this bridge crossing could provide a link to an extensive network of trails and hiking paths developed by the North Pocono Trails Association, (NPTA).

The NPTA trails extend along the northeastern side of the Elmhurst Reservoir from a trailhead along Yedinak Lane. The NPTA trails are located on lands owned by the PA American Water



Elmhurst Reservoir bridge site along E&WV RR and PA Route 590

Company, the PA DCNR Bureau of Forestry, and the Borough of Moscow. The NPTA trail system has been developed and is maintained by volunteers through a cooperative agreement with the landowners. The trails proceed in an easterly direction, crossing Kellum Creek and follow Roaring Brook to the Moscow Borough wastewater plant and a trail head along Roaring Brook at Market Street in Moscow.

East of Moscow there are large tracts of former water utility lands now owned by the PA DCNR Bureau of Forestry. These tracts extend along Roaring Brook into Covington and Madison Townships. These Bureau of Forestry

lands include the Hollister Glen adjacent to the PA Water Company's Hollister Reservoir. The PA Water tract surrounding the Hollister Reservoir extends to Jubilee Road in Covington Township.

The Forestry lands include a narrow panhandle with a fisherman's footpath beginning along Roaring Brook adjacent to the bridge that carries Brook Street (PA Route 690) over Roaring Brook in Moscow. The footpath links up with a timber management road that parallels Roaring Brook eastward to the vicinity of an abandoned portion of Becks Crossing Road in Madison Township.

The timber management roadway may have been a public road from the late 19th century. Most of its alignment is located well above the flood plain and there is a solid knapped rock sub course and several very functional stone culverts. There is another abandoned township road in Covington Township that runs from an underpass of the Delaware-Lackawanna Railroad off Center Street to a former bridge crossing site in the Hollister Glen. That roadway continues to the north and proceeds to a point near the intersection of Howe and Havenstrite Roads.

There are a series of rock ledges with waterfalls, riffles, and large splash pools in Roaring Brook in the Hollister Glen. The stream cuts downgrade through sandstone creating twenty- to thirty-foot-high escarpments that create a small gorge area that is the prevalent geologic structure in the Glen. The woodlands hold some hemlock and white pine and several large groves of old growth rhododendron.

A fifty-foot-long wood-planked steel truss bridge owned by Lackawanna County carried the township road over the Glen. It was closed due to structural issues in the early 1970s. The township road transiting the Glen from Center Street to Havenstrite Road was closed at that time



The Hollister Glen off Havenstrite Lane, Covington Township

as well. The bridge was removed around 2000. The wider Glen area has been a popular spot for various parties, hiking, fishing, and swimming for generations. It is an exceptional natural area in need of proper stewardship, improved public access infrastructure, and appropriate and regular management.

The Delaware-Lackawanna Railroad separates the Hollister Glen and Forestry lands from the Hollister Reservoir. There are two alternative routes to provide links between these sites. On the North side of Roaring Brook the abandoned Glen Road extends to Havenstrite

Road and then to Jubilee Road. On the South side, Glen Road connects to Center Street. The PA Water Company Driveway into the Hollister Reservoir property is located approximately 1200 feet east along Center Street from its intersection with Glen Road at the railroad underpass. The Water Company roads continue through the reservoir property to a point where there is access onto Jubilee Road.

From Jubilee Road eastward to the headwaters of Roaring Brook, there are two Covington Township roads that form an eight-mile loop. Lehigh Road runs east from Jubilee Road at the confluence of the east and west branches of Roaring Brook to a grade crossing of the Delaware-Lackawanna Railroad at Lehigh Summit.

This geographic location is the boundary between the Lackawanna and Lehigh watersheds and the larger Delaware River/Susquehanna River/Chesapeake Bay watersheds. From this railroad grade crossing, Lehigh Road continues east into Sterling Township, Wayne County, and the village of Gouldsboro. This corridor provides future opportunities for trails and greenway development to Gouldsboro and Tobyhanna State Parks and to other recreational, greenway trails, and conservation resources in the Pocono Plateau and Monroe County area.

From the Lehigh Summit crossing, Freytown Road bears left and follows a northerly then a westerly direction for several miles back to Jubilee Road. As it continues west, it crosses the headwaters of the East Branch of Roaring Brook and the Freytown marshes. Several tracts of Bureau of Forestry property and State Game Lands number 312 cover over one thousand acres of land and wetland. There are numerous off-road trails used by ATV riders in this area.

There are significant unmet needs for regulated access points and facilities to better accommodate multiple use trail users in the Hollister Glen, Hollister Reservoir, and Freytown areas. Recreational use and demand of all types will increase at these sites in the future. A coordinated and adequately-funded and staffed management program is a critical unmet need.

There are several additional recreational links to consider in the upper Roaring Brook watershed. Public interest in walkable/bikeable communities and safe streets is growing as more people look to healthier lifestyles and less dependence on automobiles. The further development of a greenway and trail network with a pedestrian and bicycle friendly focus is a major public mobility need that can be partly addressed by an improved trail system along Roaring Brook.

Expansion of the main corridor of a Roaring Brook Greenway & Trail System can look to develop a route from Moscow out along Van Brunt and Langan Creeks through the St. Catherine's Cemetery and the Moffat Estate to Covington Park. A link from the vicinity of Van Brunt Street and Orchard Street could provide a safe connection to the North Pocono School District Elementary and Intermediate campus.

Safe trail connections between the Daleville Corners commercial area, the North Pocono High School Campus, and the Roaring Brook Greenway in the vicinity of the Hollister Reservoir are another unmet need. Trail systems like this can also accommodate disabled persons using personal mobility devices and individuals using pedal assist bicycles.

Longer term, a Trail and Greenway system extension can look to enhance and improve bike lanes and walkable areas along existing lower-density township roads. Municipal Subdivision and land development ordinances can be amended to require greenspace conservation and pedestrian

bicycle trails that would connect with existing and planned trails on adjacent public rights of way and private parcels to help address these unmet needs.

The safe and responsible use of All-Terrain Vehicles (ATVs) is a significant issue for public safety, environmental protection, and private property protection. There is noticeable use of ATVs across the Northeastern Pennsylvania region. Property owners use a variety of ATVs for property management and recreational uses on their own properties and on neighboring properties with permission. ATVs can also provide mobility for people with disabilities.

As of 2021 there are no public lands open for regulated use of ATVs in Lackawanna County. A privately operated ATV facility, Lost Trails, operates on leased private land along Moosic Mountain in the Little Roaring Brook watershed in Dunmore and Throop. It has been in business for about 10 years and is attracting several hundred riders a day on seasonal weekends.

There is extensive use of ATVs along the Roaring Brook corridor and on Moosic Mountain. This use is evident as trespass on posted private property and on publicly-owned lands such as sections of Lackawanna County owned the E&WV RR and on the active Delaware-Lackawanna Railroad in Dunmore, Roaring Brook, Elmhurst, Madison, and Jefferson Townships. Trespass use by persons on ATVs is also common on PA Water utility lands and tracts of Pinchot Forest.

Excessive and improper ATV use in the Roaring Brook watershed is causing profound environmental damage including soil erosion, sediment generation, and destruction and fragmentation of native natural habitats. ATV use also causes air, water, and soil pollution with the use and combustion of hydrocarbon fuels. ATVs often generate noise pollution, which is also disruptive to wildlife and to nearby residents. Trespass by ATV users is damaging private property and public property. Illegal ATV use is causing a disruption in the quality of life and health of residents living near heavily trafficked illegal ATV corridors.

Personal Mobility Devices (PMDs) are another type of motorized vehicle that is growing in prevalence and is an allowable and welcome means of providing accessibility to the outdoors and natural areas to persons with disabilities. The US Department of Justice (DOJ) has developed criteria that classify and govern PMDs in the context of the Americans with Disabilities Act (ADA). Many state and local recreation agencies have responded to accommodate persons using PMDs by creating facility use assessments delineating where various devices can be safely used and where the use of some devices needs to be restricted.

The same rechargeable lithium battery technology that powers PMDs is also becoming widely used in the form of electrically-operated pedal assist bicycles or e-bikes. E-bikes seem to have a similar impact to that of mountain bikes and may be slightly more physically impactful to the environment and public safety than regular bicycles. E-bikes also provide the functions of a PMD to disabled persons.

In summary, the unmet conservation and recreation needs identified in the Roaring Brook watershed through this planning work are as follows:

- The need to achieve conservation by acquisition, easement, or conservation subdivision set aside, an additional 12,000 acres using criteria developed in the 2004 Bi-County Open Space, Conservation, and Recreation Plan.
- The need to develop a contiguous greenway and trail system along Roaring Brook from its confluence with the Lackawanna River in Scranton to its headwaters at Lehigh Summit in Covington Township.
- The need to resolve challenges to that goal with alternatives and strategic links such as alternative trail along existing municipal streets and roads where needed and overpasses of highways and reservoirs where needed.
- The need to advance greenway and trail links from the main corridor such as continuation of the E&WV RR Trail to Wimmers and potential future links to Lake Ariel and Hawley, and links to North Pocono schools and Covington Park.
- The need to develop a partnership or coalition of stakeholders: Local and County government agencies, state agencies (PA DCNR, PA F&BC, PA GC, PA DOT); public utilities (PAWC, Aqua PA, PPL, sanitary authorities); community organizations (LRCA/LVC, NPTA, Trout Unlimited, sporting associations and hunting clubs); educational and health institutions, private landowners, and business interests.
- The need to provide opportunities to better manage the use of ATVs and similar vehicles, to provide proper facilities and rights of way, and to eliminate trespass and degradation of environmental and community values associated with illegal use of ATVs.

Conservation and Greenway Plan Recommendations

This section is intended to provide recommendations and suggestions to begin to address the unmet needs described above. The first recommendation of this plan is to redefine the unmet needs as short-term goals achievable over a 5-to-10-year period; near-term goals achievable in a 5 to 15 year period; and longer-term goals to be reached over a 20 to 30 year period.

The first goal, and one that is achievable within the first five years, is to develop the suggested coalition of stakeholders and further define roles and responsibilities and interests of the numerous stakeholders in participating in a more formal coalition committed to attaining the other goals and objectives recommended in this plan.

A critical factor necessary to attain this and several subsequent goals would be the designation of one or two convening agencies and allocation of funding to support agency costs and staffing to develop and conduct the work.



Pedestrian Bridge over I-81 at Avoca

The next factor will be to determine how a trail network with various potential property ownerships will be managed in a comprehensive manner.

The further development of the trail system along the Erie and Wyoming Rail Corridor by Lackawanna County Department of Parks and Recreation is another short-term goal that can advance within five years.

Development of trail connections to link the Erie and Wyoming Valley trail to the NPTA trails can be another short-term goal.

Development of cooperative agreements to manage public access around the Dunmore Number 1 and Hollister Reservoirs is presently under discussion with LRCA and PA Water Company and agreements for additional trail links around Elmhurst Reservoir is another goal achievable in the short term.

Development of cooperative agreements among stakeholders to create plans and a management program for the trail links between Moscow and Hollister Glen and Hollister Reservoir can follow the procedures established among NPTA, Bureau of Forestry, LCDPR, and PA Water Company. Covington Township and the Borough of Moscow will be important stakeholders in this process.

The local municipalities, the North Pocono School District, and private property owners will be critical partners to advance linking trails to school campuses and commercial areas.

The city of Scranton, the Scranton Recreation Authority, the Lackawanna Heritage Valley Authority, the University of Scranton, the Pennsylvania Historic and Museum Commission, Geisinger CMC, Pennsylvania Northeast Railroad Authority, the PA Department of Transportation, the Lackawanna County Department of Parks and Recreation (LCDPR), D&L Realty, other private property owners, and the borough of Dunmore are important stakeholders and critical partners with portions of the greenway and trail plans.

This plan recommends using the alignment of numerous city and borough streets along with passage along pedestrian and bicycle corridors through the Historic Iron Furnaces, on the University of Scranton Campus, and along park roads and Davis Trail system in Nay Aug Park.

From Nay Aug Park, this plan recommends the creation of a trail alignment crossing Interstate 81 via a pedestrian/bicycle bridge like the pedestrian bridge that crosses the interstate near the Avoca exit.

This bridge would reconnect Nay Aug Park to the Watres Addition to Nay Aug Park, a 26-acre woodland area along the Elmhurst Boulevard in the Oakmont and Bunker Hill Neighborhoods.

This Greenway and Trail proposal would restore a link that was broken with the demolition of the Nay Aug Gorge/Elmhurst Boulevard trestle in 1967 and the subsequent construction of the Interstate Highway.

From the Watres Addition the preferred trail alignment would follow the Erie and Wyoming Valley Rail Corridor eastward through Bunker Hill to Rock Junction where it connects to the 12-mile portion of the rail line owned by Lackawanna County. Alternative alignments follow city and borough streets to connect with the Drinker Turnpike in the Sport Hill neighborhood in Dunmore. A complete description of the preferred Trail alignment and alternative alignments is contained in Appendix "A".

The conservation of an additional 12,000 acres along the Roaring Brook watershed is dependent on several factors including the interests of willing sellers, the capacity of available conservation agencies, and the availability of funding to support acquisitions and long-term management of acquired parcels.

Conservation goals can also be reached with the voluntary donation of conservation easements by property owners to conservancies like the Lackawanna Valley Conservancy (LVC). LVC will increase its outreach to property owners in the Roaring Brook watershed to promote the creation of more voluntary easements and donation of fee title to properties with critical conservation values. Outreach will also look at the possible interests of parcel owners for complete or partial acquisition of properties.

Other conservation goals can be secured through conservation set asides in the municipal zoning, subdivision, and land development process. Existing SALDO (Subdivision and Land Development Ordinances) ordinances can be amended or new ones instituted to require developers to set aside conservation areas and trail corridors through the subdivision. These can be combined with set asides for stormwater management to link to conserved areas, trail alignments, and water courses on adjoining parcels. This network can be anticipated through the development of an "Official Map" as part of the Municipal Comprehensive Plan.

The promotion of public health, wellness, and safety is an important goal and consideration in this plan. This plan recommends several goals related to motorized and non-motorized trail and open space recreation. Most of the goals and intent of this plan are to encourage and promote non-motorized recreation and to promote respect for the private property rights of property owners along and adjacent to the trail and conservation areas proposed in this plan.

This plan also recognizes that there are a considerable number of people who choose to use ATVs to access natural areas for hunting, fishing, camping, sightseeing, and related activities. Most of the trail infrastructure recommended in this plan, and the critical conservation and natural habitat areas described along Roaring Brook, are not appropriate places to allow ATV use.

Residents along the Erie and Wyoming Valley Rail Corridor have identified ATV usage in Scranton, Dunmore, and Elmhurst as a nuisance. There are regular reports of trespass and damage to

private and public properties. There are many illegal trails cut through portions of Pinchot State Forest parcels and PA American Water parcels along Roaring Brook.

Lackawanna County Planning Commission is beginning a study of ATV issues and needs. This plan recommends that the Roaring Brook Corridor and these issues should be included in that assessment.

Modifications to the existing Lost Trails ATV operation should be considered in that plan to address environmental concerns identified on the Moosic Mountain natural habitat site currently being used. The identification of new areas for recreational riding linked to the development of abandoned mine site areas proper for “sport/extreme” riding should be developed. If the use of portions of the Erie and Wyoming Valley Corridor is determined to be feasible for multi-use that would add ATV transit to existing pedestrian/bicycle/equestrian use, proper speed and operational controls should be required. This should also include a method to monitor and police ATV use to protect other trail users, environmental values, and adjacent property owners.

It is beyond the scope of this plan, but it is evident from many perspectives, that improper and illegal ATV uses are an acute problem across the Commonwealth that degrades environmental values related to habitat quality, water resource protection, as well as the enjoyment of private property, and public safety. This plan recommends that greater resources should be provided by state agencies to provide safe places and procedures for responsible motorized and non-motorized recreation uses to co-exist. This plan recommends that the Pennsylvania Legislature should conduct hearings on ways to address ATV issues and improve the ability of state and local law enforcement to police ATV uses on public lands, promote safe places for ATV use, and better protect private property, public property, and the public from irresponsible and illegal ATV use.

The Case for a County Conservation Fund

While the focus of this plan is the Roaring Brook watershed, the issues that have been examined, the needs that have been assessed, and the recommendations that are being made have a commonality across the entirety of Lackawanna County. In years past, Lackawanna County Commissioners and the electorate have responded to critical community needs by developing funding mechanisms to provide funds at a local level that have improved local capacity to address particular needs. The increased local capacity has also served as a local match to secure even greater amounts of state and federal funds.

In the late 1970s, faced with having to close our libraries, Lackawanna County voters by a strong majority, approved a referendum establishing a dedicated library tax. This tax is collected and disbursed through a non-political process. It has helped to develop and run one of the best public library systems in the Commonwealth.

In the 1990s, the County was faced with a need to better fund and promote new tourism-related attractions like Steamtown National Historic Site, the Lackawanna County Coal Mine Tour, and Triple "A" baseball. The County Commissioners collaborated with our state legislators to secure and authorize a Hotel Room Tax. This tax funds the Lackawanna County tourism agency and marketing for all tourist-related sites and businesses in the county. Tourist visitation and hotel occupancy have increased significantly over the past 25 years during which the hotel tax has been in place.

In the early 2000s, faced with increasing need for arts and culture funding, the Commissioners established a dedicated millage for the support of arts and culture programs and institutions through a Department of Arts and Culture. These funds help the Everhart Museum, the Scranton Cultural Center, County Library System, and other institutions to meet operating costs and conduct programs. The funds support grants to a wide range of arts, culture, and educational organizations, and individual artists to produce art and cultural programs, events and activities.

In the late 1980s and through the 1990s, voters in numerous counties across Pennsylvania authorized a dedicated tax and bond issues to create conservation funds to provide local matching funds to help secure state and federal grants for the acquisition of land for open space conservation.

There are no allocations of funds by, from, or through Lackawanna County specifically for the conservation and management of open space and natural areas outside of the county parks department. There is no county conservation fund available to support the work of the LRCA, LVC, Countryside Conservancy, nor North Pocono Trail Association.

These not-for-profit community organizations depend on fundraising through membership donations, raffles, and special events. Several grants from private foundations and other sources are often needed to match state and federal grants. This puts our region at a great disadvantage for conservation when compared to other nearby Pennsylvania counties.

Lackawanna County does fund small "Community Re-Invest" grants that are very helpful in matching projects in the \$10,000 to \$50,000 range. The costs typically associated with the projects of the type recommended in the Roaring Brook Greenway Conservation and Trail Plan are in the range of \$200 thousand to \$1.5 million dollars. The Lackawanna Heritage Valley Authority (LHVA) receives some operational funding from federal and state sources. But it also has similar challenges for matching funds to secure more federal and state grants for trail development projects.

Clearly there is a need and a case for establishment of a Conservation Fund for Lackawanna County. There are several related needs and opportunities that suggest a common strategy to bring several sources of funding together to support land and water resource conservation and management.

One opportunity can be found in the collective need to better address Municipal Stormwater Management. County leadership to establish a Joint Municipal Stormwater Authority could be the key to raising upwards of \$15 to \$20 million dollars a year in new local public works revenue. Allocations of one million dollars per year of that revenue to support green stormwater infrastructure assets like conservation of open space and stewardship of forests, wetlands, and waterways could help balance the probable construction of a dozen or more one million square foot big box warehouses in the near future. Several of these facilities have recently been announced and more are being planned.

Another source that should be reconsidered is a Voluntary Host County fee from the two Municipal Solid Waste Landfills that operate in Lackawanna County. Pennsylvania regulations allow but do not require landfills to pay a host county fee on a voluntary basis. Lackawanna County is the only county hosting landfills in Pennsylvania that has not negotiated agreements with the landfills operating within the county.

Looking at agreements in other counties prorated to the daily tonnage there is a potential to generate between \$500 to \$800 thousand dollars a year from this revenue source. Taken together and supplemented with a small, dedicated millage from the general fund, it could generate up to \$2.5 million dollars of funding to address conservation needs across the county. This only begins to approach the level of funding needed to sustain our open space resources into the middle of this century. Without a dedicated Conservation Fund, our Forests and Waters will remain in increasing peril and our needs for quality open space recreation will go unmet.

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***ROARING BROOK
CONSERVATION AND GREENWAY PLAN***

***APPENDIX A
TRAIL ROUTE NARRATIVE***

**Lackawanna River Conservation Association
January 2022**

Introduction

The Roaring Brook Conservation and Greenway Plan proposes as a main goal the development of a continuous pedestrian and bicycle trail system along Roaring Brook from its confluence with the Lackawanna River in Scranton to its headwaters area in the Freytown and Lehigh Summit neighborhoods in Covington Township. In making this recommendation, the Lackawanna River Conservation Association (LRCA) suggests that this goal can be achieved in a 20-to-30-year time span.

The collaboration of all stakeholders will be necessary to achieve this goal. Several alternative routes are suggested as interim measures to allow trail users to navigate the corridor. Preferred links may not be available or useable for many years due to the need to designate lead agencies, establish interagency agreements, funding, procedures for right of way acquisition, project construction, project operation and maintenance. Several new bridges over roadways and waterbodies are proposed.

There are potential connections at Lehigh Summit to extend regional trails into Monroe County through Gouldsboro and Tobyhanna state parks, state game lands, and other conserved lands in the upper Lehigh watershed. There is also potential to extend a trail through Wimmers along the Erie and Wyoming Valley Rail (E&WV RR) corridor into Wayne County to Lake Ariel and Hawley where and when rights of way can be obtained. Other links could be developed along the E & WV RR south towards the Montage Mountain area and a potential future trail system along Spring Brook on the long-abandoned Wilkes Barre and Eastern Railroad.

It is important to note that the preferred alternative and portions of several alternative routes may require the acquisition of private property. Any acquisition of private property suggested in this plan is intended to be voluntary between a willing seller and a willing buyer. It is the intent of this plan to promote the use of alternative routes and routes along public streets and roads wherever portions of the preferred route are unavailable until such a time that they may become available on a voluntary basis.

The balance of this narrative is keyed to the 22 maps included in the map folio in Appendix "B". **Map number 1.** is the index map. The preferred and alternate routes begin on map number 2.

Map 2

The preferred route begins at the Intersection of the Lackawanna River Heritage Trail with Elm Street in Scranton. It proceeds eastward over the River on Elm Street Bridge to the flood control levee along South Wyoming Avenue. It follows that levee northward for a quarter mile to the confluence of Roaring Brook with the Lackawanna River at the rear of the Idle Hours South Bowling Alley. It then follows the Flood Control channel wall along a privately-owned parcel to South Washington Avenue. It then crosses the intersection of South Washington Avenue with Birch Street and a railroad grade crossing to continue upstream along a Flood Control right of way. Improvements to this intersection are recommended to include traffic control signals.

The preferred route then crosses over Roaring Brook on a pedestrian / bicycle bridge at the intersection of Mattes Avenue with Hickory Street. There are two alternate routes at this location. One alternative follows Hickory Street westerly to cross over the river and to meet the Heritage Trail at Broadway Street. The second alternate continues easterly on the flood control land to intersect Schimpf Court and the 300 Block of Cedar Avenue. It then follows Cedar Avenue to the Scranton Iron Furnaces Historic Site.

The preferred route follows the curb lane and sidewalk eastward along Mattes Avenue to the driveway into the flood control basin below the Cedar Avenue Bridge. A pedestrian/bicycle bridge /catwalk is suggested to take the trail route under the Cedar Avenue Bridge and on to the Iron Furnaces Site. The preferred route then proceeds along the Iron Furnaces site upgrade to the Laurel Line Rail Grade along Laurel Line Drive just underneath the Biden Street Bridge. This preferred route gets trail users under Cedar Avenue in a safe manner. It will require expensive and complicated bridge /catwalk structures and flood level permit clearances. Trail-user safety benefits should be greater than the permitting needs and structural costs entailed in this routing choice.

The preferred route follows Laurel Line Drive along the curb lane eastward for approximately 1800 linear feet to intersect with a switchback driveway upgrade to a University of Scranton parking lot and athletic facilities along Ridge Row. Trail improvements will include re-grading the switchbacks up from Laurel Line Drive and installation of a defined trail alignment through the University parking areas and out across the rail grade crossing to Ridge Row. The trail route proceeds across a grade crossing of the Delaware Lackawanna Railroad main Pocono/New York line to proceed eastward along Ridge Row upgrade to its intersection with Prescott Avenue.

This intersection is functionally obsolescent, and an improved intersection is recommended that will widen Ridge Row with pedestrian /bicycle lanes. This will require acquisition of a portion of a business property and relocation of a watchman's shed and employee smoking area.

Also, at this point the preferred route will require the acquisition of one or two privately-owned residential properties in the 200 block of Prescott Avenue and Schultz Court. We recommend that these acquisitions be voluntary and at fair market value by a willing seller. Since this plan has a 30-year timeline, there may be several opportunities for this transaction to happen. A reserve fund for this purpose should be established by project stakeholders.

Maps 2 / 3

Prescott Avenue and Ridge Row are also points of origin for two alternative routes to Nay Aug Park using city streets. The trail can be routed north on Prescott Avenue to Linden Street and / or Mulberry Street and then follow either of those streets eastward to Nay Aug Park. These routes are favored by the University of Scranton as both streets have signal-controlled intersections with Harrison Avenue.

The preferred route recommended by this plan then crosses Schultz Court into 209, 211, and 223 Harrison Avenue which are publicly owned and adjacent to the new Harrison Avenue bridge. It is the recommendation of this plan that the preferred route be conveyed under the new Bridge from these lots to the monument lot on the easterly side of Harrison Avenue at its intersection with Roselynn Street.

The new bridge abutments are setback about 30 feet from a retaining wall along the Delaware Lackawanna Railroad right of way. This area is covered in rip rap stone. There appears to be adequate clearance to allow the installation of a catwalk/bridge structure with ADA compliant ramp grades to get trail users safely under the heavily trafficked Harrison Avenue.

We note that the lots at 209, 211, and 223 Harrison Avenue were used as the contractors temporary project office and laydown yard for the bridge construction project. This site is the only one of the four

quadrants of the Harrison Avenue Bridge that has not been improved with landscape architecture and monuments. This site has important public value and should be improved with monuments.

This Plan suggests that a structure like the Historic Hill Section Gateway monument installed by the University of Scranton at the intersection of Mulberry Street and Jefferson Avenue should be installed at this site on Harrison Avenue in conjunction with the pedestrian/bicycle trail underpass improvements. We recommend that LRCA and the city of Scranton take the lead with one or more institutional stakeholders to move this project forward in the near term.

Map 3

The preferred route proceeds eastward on Roselynn Street along the curb line with wayfinding signage on poles to Arthur Avenue and on into Nay Aug Park at the James Barrett McNulty Greenhouse. Nay Aug Park is an important destination on the Roaring Brook Trail and Greenway. It also provides a right of way to bring the trail further upstream towards Dunmore.

The preferred route of the trail enters Nay Aug Park at the Greenhouse on Arthur Avenue. Trail users will need to select alternative routes using park roadways & pathways and portions of the Davis Trail depending on their mode of transit, pedestrian or bicycle. A detailed final preferred route through Nay Aug will need to be developed.

The preferred route will direct all users down-grade on the Davis Trail to the Kanjorski Bridge that crosses over Roaring Brook above the Gorge, and proceeds upgrade to the eastern side of the Gorge above the railroad tunnels. At this point the trail intersects with a remnant portion of the abandoned reach of Elmhurst Boulevard where it intersects with the Interstate 81 right of way line.

Map 3

At this point, the preferred route requires that a pedestrian bridge be installed over Interstate Route 81. This bridge would be similar to one that crosses the Interstate near the exit for Avoca Airport. After crossing the Interstate, the preferred route is proposed to run eastward along the right of way of the E&WV RR through the Oakmont and Bunker Hill Neighborhoods.

Should the preferred route along the E&WV RR not be available, a primary alternative route could cross the E&WV RR and proceed upgrade through the Watres Addition to Nay Aug Park to Elmhurst Boulevard and follow Elmhurst Boulevard through its closed section to the intersection with Lake Scranton Road. From that point, the primary alternative continues along Elmhurst Boulevard for approximately one mile to a point where an easement would be needed to cross privately-owned land down-grade to the E&WV RR in the vicinity of Rock Junction.

Maps 3 / 4

Another alternative route would begin at Nay Aug Park and proceed along Richter Avenue to Myrtle Street, James Avenue, Ash Street, and Bunker Hill Street to a remnant of a branch line that links up-grade to the E&WV RR south of its grade crossing at Sadler Avenue. This alternative could be developed if the Interstate Overpass is not feasible.

A third roadway alternative also begins at Nay Aug Park and follows Richter Avenue to Ash Street, Union Street, William Street and Mill Street to the Bunker Hill Bridge. This alternative route then proceeds across multiple privately-owned parcels that host large billboards parallel to Interstate 81 from the Bunker Hill Bridge and the end of Mill Street to East Drinker Street in Sport Hill. Easements would need to be developed for this reach of alternative route.

Map 5

From East Drinker Street the alternative route proceeds to a potential link on the E&WV RR Jessup Branch and trestle for a connection to the County-owned portion of the E&WV RR at Rock Junction. The alternative route could also be developed further on public right of way by following the Drinker Turnpike to the Nay Aug Village/Silver Lake Neighborhood to then intersect with the County-owned portion of the E&WV RR.

Maps 5 / 6

Rock Junction is the station location on the E&WV RR where the abandoned Jessup Branch joined the main line. It is the westerly end of County ownership of the E&WV RR. It is a landlocked site and presently cannot serve as a beginning or ending point of the Roaring Brook /North Pocono Trail. Access to Drinker Street, Elmhurst Boulevard or the southerly portions of the E&WV RR are necessary for this site to allow public access.

Maps 7 / 8 / 9

Public access is available at Silver Lake and Nay Aug Village from PA Route 435 and from Elmhurst Boulevard via an abandoned township road. At Silver Lake the E&WV RR Mainline crosses over Roaring Brook and the Delaware Lackawanna Pocono Mainline on a 300-foot-long trestle and truss bridge. The deck of this bridge has recently been repaired and is being used by contractors working on the replacement of the Interstate 380 twin bridges that cross Roaring Brook at this location.

The bridge improvements will be retained by the Lackawanna County Department of Parks and Recreation and incorporated with added improvements to the E&WV RR to create the first section of the North Pocono Rail Trail following the completion of the Interstate 380 Bridge project in 2026.

Maps 10 / 11

The Roaring Brook Conservation and Greenway Plan recommends further trail improvements along the County-owned portion of the E&WV RR all the way to Wimmers Road in Jefferson Township. Trail improvements should include a new bridge to carry the trail over PA Route 435. The preferred route continues on the E&WV RR along Elmhurst Reservoir to a site near the intersection of Bomersheim Road where a township road once crossed the Elmhurst Reservoir on a three-section iron truss bridge. Portions of the bridge abutments and two stone piers are still in place and could possibly be restored to support a new pedestrian/bicycle bridge to carry the preferred Roaring Brook Greenway trail over the reservoir to Yedinak Lane in Madison Township.

Maps 11 / 12 / 13

The western trail head of the North Pocono Trails Association (NPTA) trail system is located on PA DCNR (Department of Conservation and Natural Resources) Pinchot Forest parcel at Yedinak Lane. The NPTA has developed a trail system via cooperative agreements on tracts of Pinchot State Forest and Pennsylvania American Water lands between Elmhurst Reservoir, Kellum Creek and Roaring Brook to the vicinity of the Moscow Borough Sewer Treatment Plant on Market Street in Moscow.

The trails are primarily for walking and mountain biking. The preferred route of the Roaring Brook Greenway Trail would need to be engineered to a more usable standard with heavier subbase and drainage, wider traveled ways and shoulders, improved lines of sight to allow multi uses with pedestrians and commuting/touring bicycles and grades less than 2%. A bridge or culvert will be needed to carry the trail over Kellum Creek.

Maps 13 / 14

The borough of Moscow and the NPTA maintain the Trailhead at Old Mill Park adjacent to Roaring Brook at Market Street in Moscow. To extend the trail further upstream and across PA Route 690 along Brook Street, there are two scenarios. The preferred route would require the purchase of easements from three or four residential property owners, followed by the design and construction of trail improvements. The second scenario would be to route the trail along Market Street and Brook Street to access a panhandle of Pinchot State Forest land along Roaring Brook where Brook Street/Route 690 crosses over the stream. The preferred route proceeds upstream along Roaring Brook through the Pinchot Forest tract for three and a half miles to the vicinity of Hollister Glen.

Other considerations at Brook Street and Bryant Lane would involve the acquisition of easements along Bryant Lane and Brook Street or the acquisition of one or more parcels to accommodate the eventual construction of a trail head and parking area. Portions of one or two residential properties are in the flood plain of Roaring Brook. The use of Flood Hazard Mitigation funding to secure a voluntary acquisition of the properties could be considered.

The Pinchot Forest lands provide exceptional access to this reach of Roaring Brook. Flood plain and wetlands determinations will influence the location and route of the trail and adjacent uses such as a suggested trailhead. Stream access for fishing should be another consideration in the scope of any trailhead which may eventually be developed at this site.

Approximately 800 feet east from the Brook Street bridge over Roaring Brook the topography rises 40 feet along a series of rock ledges with traces of abandoned stone and shale quarry work evident. From this point for the next three miles, there is a well-defined roadway subbase of gravel and knapped rock with several fieldstone box culverts still supplying drainage for springs from the hillside down towards Roaring Brook. The road runs parallel to the Brook at an elevation about 40 to 60 feet above the flood plain and about 250 feet to the northeast of the Brook.

This road may be the remnant of an abandoned township road from the 19th century due to the substantial nature of its extant features. It will provide an excellent subbase for trail improvements along the alignment of the preferred route almost the entire way to Beck's Crossing Road and Hollister Glen. A bridge over Howe's Run, a first order tributary that confluences with Roaring Brook downstream of

Hollister Glen, will be needed to carry the trail towards the Glen and the abandoned township roads that provide access into the Glen area from Havenstrite Lane in the north and Center Street on the south.

This plan recommends a collaboration among several stakeholder groups and the Bureau of Forestry to develop a conservation and public use program to open the Hollister Glen vicinity to allow and regulate broader public use. The plan recommends that a new bridge should be installed over the Glen to facilitate creating multiple preferred routes for the Roaring Brook Greenway Trail through the Glen and around the nearby Hollister Reservoir property owned by Pennsylvania American Water.

Map 15

From Hollister Glen the preferred route of the Trail will have two courses. On the south it will follow the access roadway out to an underpass of the Delaware Lackawanna Pocono Mainline to Center Street. It will then proceed east on Center Street for approximately 1500 feet to a driveway into the Hollister Reservoir property. This route continues on the driveway for one mile to intersect with Jubilee Road. LRCA Covington Township and PA Water have been considering the development of a cooperative agreement that would allow and facilitate the management of public use of the Hollister reservoir property for passive recreation. This agreement would include the operation of the Greenway Trail through the property along the preferred route alignment. Physical improvements to the driveway for that purpose may be included in the dam removal and site restoration project presently being conducted by PA Water.

The second course of the preferred route would proceed northeast from Hollister out along a decommissioned portion of the Glen roadway to the intersection of Havenstrite Lane in Covington Township with Howe Road in Madison Township. This site would be a suitable location for a large parking lot and trail head to support public use and access to the Hollister Glen. The preferred route would then follow Havenstrite Lane east for one mile to intersect with Jubilee Road.

These primary and secondary routes serve to create an approximate four-mile trail circuit from Hollister Glen around Hollister Reservoir and return. A branch trail from the south side of the Hollister Reservoir Property is also recommended to run on easements along several private parcel boundaries out to Center Street. From there the branch trail would connect through the North Pocono High School campus out to the Daleville Corners commercial area at the intersection of PA 435 and 502. (Map 16)

Maps 17 through 22

The final reach of the Roaring Brook Greenway trail also forms a loop using public roads. This route forms a seven-mile-long circuit that returns the trail user to Hollister Reservoir. It also provides the option of continuing on Lehigh Road another two miles to the village of Gouldsboro in Sterling Township, Wayne County. We recommend using these low traffic count township roads as the most cost-effective and environmentally-responsive choice to safely facilitate the passage of trail users through and along the headwaters reaches of Roaring Brook. There are many corridors that already fragment the natural forest and wetland habitat of this sensitive ecological area. These include the railroad, several new PPL electric transmission routes, the township roads, and private developments.

The existing township roads can be improved with better shoulder lanes and wayfinding signage for trail users. Additionally, there are many opportunities to create interpretive stations along the route to provide kiosks having information on the forest and wetland communities. The public use access points on state

and county-owned lands and related onsite public use regulations can also be developed in the context of the Roaring Brook Greenway Trail.

The preferred route leaves Jubilee Road and follows Lehigh Road for three miles to Lehigh Summit, the watershed boundary between the Lackawanna River and the Lehigh River. The return circuit follows Freytown Road four miles back to Jubilee Road. Freytown Road provides access to several Pinchot Forest tracts and State Game Lands 312. The Freytown marshes form the headwaters of the main stem and the East Branch of Roaring Brook.

Map 19

This Plan recommends the design and installation of an informational kiosk adjacent to the Lehigh Road grade crossing of the Delaware Lackawanna Railroad Pocono Mainline. This kiosk could provide the public with information on the significance of Lehigh Summit as a watershed boundary point between the Lackawanna and Lehigh River watersheds and the larger Delaware River/Bay and Susquehanna River/Chesapeake Bay watersheds. The kiosk could also provide information to trail users and provide wayfinding, mapping to access points, and public use regulations for nearby state and county recreation sites.

There may be several locations along the right of way boundaries of the township roadway and the PNERRA rail right of way to accommodate a kiosk and a few parking slots for visitors. Alternately a small parcel could be developed by easement or purchase to site a larger trail head /welcome station to host the kiosk and support facilities.

The long-term management of appropriate public use on the Pinchot Forest tracts and the opportunities to develop further bicycle and pedestrian trail programs through both state- and privately-owned lands into Wayne and Monroe County are beyond the scope of the Roaring Brook Greenway Plan. Within the Roaring Brook watershed there are needs to develop and involve more stakeholders with the trail and conservation projects recommended in this plan. Cooperative agreements among several key stakeholders are recommended to facilitate funding and management of the proposed Roaring Brook Trail and Greenway.

The LRCA welcomes public comments on this document. We encourage public involvement and participation with projects and activities to implement the Roaring Brook Greenway Trail system. LRCA can be contacted via email at lrca@lrca.org by calling 570-347-6311 or by visiting www.lrca.org.