Additional Anthracite Mining History & Legacy in the Wyoming & Southern Wyoming Valley

In the early 18th century white settlers from Connecticut, called the Susquehanna Company, moved into the Wyoming Valley seeking land as recounted by Connecticut History.org. Settlers encountered Native populations, which in this case included the Delaware, Nanticoke, and Iroquois (a confederation of six Indian nations) and were attracted to their villages which were built upon the natural resources of the valley. One site in particular was a village of the Nanticoke Indians at the Susquehanna Rapids. In 1754, the Susquehanna Company acquired the Wyoming Valley land for 2,000 pounds from an Iroquois delegation at a conference in Albany, New York, and many called the validity of the transaction into question. Settlement of the area (which also included land west of the Wyoming Valley and made up almost one-third of Pennsylvania) quickly became a divisive issue among Connecticut, Pennsylvania, and several tribal nations, as well as within the Connecticut colony itself. Wars and battles ensued as the setters drove the Native Americans from their ancestral lands. Settlers set up a gristmill, iron forge, and sawmill at the Susquehanna Rapids. The Nanticoke Indians migrated to New York state in 1793. The Susquehanna Coal Company, which still operates mines in Glen Lyon and Mount Carmel, has ties to the original Connecticut settlers of the Wyoming Valley.

Early prospecting for coal was casual and often found with a stroke of luck. Outcroppings, where coal seams were exposed on the surface along the flanks of the Valleys where usually the deepest seams rise from beneath the Susquehanna River in an undulating fashion, were the most readily discovered. Other coal seams that were only feet below the surface in the Susquehanna River Valley where only a shallow layer of sand, fertile soils, topsoil, and overburden were also easily detected and extracted. Outcroppings occurred mostly on the rocky ridges which were traveled routinely by coal prospectors. Black meadowlands and salty soil were clues to shallow-lying beds of coal, as were uprooted trees with coal particles clinging to their roots. As demand for anthracite increased, exploration became more scientific. Test boreholes would be driven in regular patterns and the drill cores examined and measured. In this way depth and thickness of

rock strata and coal seams could be computed and the geology of wide areas plotted. Less commonly, test shafts would be sunk, or tunnels driven to locate coal.

In Images of Modern America: Lost Coal Country of Northeastern PA (Beniquez, 2017), the author did an amazing job of capturing the region's disappearing legacy history that shaped not only the legacy within the Wyoming Valley and the surrounding coalfields but that of the United States of America and the Industrial Revolution. The book serves as a colorful and artistic hybrid history and travel guide of what has been lost and what remains on many of the abandoned mines and landscapes throughout the region, including areas within our project area. Lorena Beniquez is a great-granddaughter of a coal miner who succumbed to black lung disease. EPCAMR's Executive Director provided her with an interview and explanations and relevant histories on landmarks throughout the region to go along with her beautiful photography featured in her book.

Anthracite and Slackwater: The North Branch Canal [1828-1901]**, (F.** Charles Petrillo, 1986), describes the history and importance of the transportation of coal to various markets around the Mid-Atlantic Region of the United States. ***Steamboats on the Susquehanna: The Wyoming Valley Experience*** **(**F. Charles Petrillo, 1993), outlines the history of steamboats on the Susquehanna River in the Wyoming and Southern Wyoming Valley within the project area.

The canals had to compete with the pending advances in the technology of the railroads, the steel industry that began utilizing both, anthracite and bituminous ad coke, and steam locomotives that would eventually run parallel to the canals and become a more efficient and expeditious transportation method to get the anthracite coal to markets north and south of the Wyoming Valley, particularly along the former Lackawanna and Wyoming Valley Railroad, Delaware, Lackawanna, & Western Railroad, Central Railroad of New Jersey, Laurel Line, and Lehigh Valley Railroads that once operated in the Southern Wyoming Valley.

The Central Railroad of New Jersey yards were once located directly behind the EPCAMR Office, in Ashley Borough, Pennsylvania, on what was the former Huber Breaker Colliery owned by the Glen Alden and Blue Coal Corporation and was a major active railroad center.

This railroad hub was directly in the Sugar Notch Run subwatershed of Solomon Creek. Several major railroad companies controlled the lion's share of available coal, either directly or through wholly owned subsidiary companies. The history of the Anthracite mining at the Huber Breaker Colliery can be found on the Huber Breaker Preservation Society website.

Judge Jesse Fell of Wilkes-Barre made an important breakthrough when he succeeded in burning hard coal in an open grate in his tavern on Northampton Street in 1808. Jacob Weiss of Carbon County and Jacob Cist, a Philadelphian who married the daughter of Matthias Hollenback of Wilkes-Barre, were strong and unrelenting advocates of anthracite. Both did missionary work on its behalf among the craftsmen and manufacturers of the Lehigh Valley and Philadelphia, who needed heat in the production of their goods.

Underground, except for steam-powered hoisting engines, the mule exclusively provided the power for transport for almost an entire century. Even after the advent of electric and compressed-air locomotives, the mule stayed on in the smaller mines and the secondary haulage ways of large mines.

Once coal is mined it must be prepared for market, that is, it must be cleaned of impurities such as slate, rock, and bone (often pronounced boney by the miners), a stratified mixture of slate and coal, crushed into workable sizes, then sorted by size. This is done in a large structure called a breaker. Breaker is a word peculiar to Pennsylvania's hard coal country. Elsewhere in the world of coal mining, it is called a tipple. In the old days, coal was cleaned by young boys working over chutes in the breaker. As the coal passed beneath them the boys would pick out the rock and slate by hand. This was a mean, dirty, and often dangerous job. In the 1920s machinery began to take over this work. No two breakers seemed to look exactly alike. They were odd-looking, asymmetrical buildings with all sorts of architectural protuberances with shed-type roofs. One feature they all had in common was a covered conveyor line running from the head of the mineshaft to the top of the breaker where the run-of-the-mine coal began its journey down through the cleaning and crushing machinery and the sizing screens. An exhaustive postcard gallery of collieries and coal breakers can be found on the Up the Woods website by county.

The use of anthracite in the production of iron and steel expanded the demand for hard coal. Eventually, coke, made from bituminous, replaced anthracite in the smelting of iron and steel. Nevertheless, demand for anthracite continued to increase. Steam locomotives and stationary steam engines used great quantities of it, and other industrial uses for it proliferated. Improved anthracite-burning cooking stoves were developed as well as furnaces for homes and larger buildings, and new markets opened.

For years America's surging industrial revolution was fueled by Pennsylvania anthracite; and as foundries multiplied, so did coal mines. Manpower was required and the demand soon outstripped the supply of native labor. The industry then looked eastward to Europe for workers, and they came in great waves. First to come were the skilled miners of Great Britain- the Scots, English, and Welsh. Soon to follow were hundreds of thousands of Irish fleeing the famine caused by a succession of blighted potato crops. Central and Eastern Europe would nourish the human tide, as would Italy. Among the Italians, there was a smattering of workers from the sulfur mines of Sicily. Finally, from the Middle East came Syrians and Lebanese. And the steel towns and mine patches of Pennsylvania would attain a cultural richness and variety unrivaled across the United States.

World War II brought about a temporary revival of the hard coal industry, but the end of the war brought even more vigorous competition from oil. Now for the first time, domestic heating by oil came to coal country, and, though some considered it a breach of regional patriotism, oil burners proliferated. Images of America's Early Coal Mining in the Anthracite Region (Richards, 2002) provides a pictorial overview of the miner, mining operations, mules, drivers, spraggers, and the infamous breaker boys and coal breakers and the colliery complexes that surrounded them.

Then pipelines brought in natural gas that provided even greater convenience in home heating than oil and another nail was driven in the coffin of King Coal. Other factors eroded the demand for coal. Diesel locomotives replaced coal-burning ones, even on anthracite railroads. Oil-

burning power plants, and then nuclear-powered plants, reduced the need for coal in the production of electric power.

The book Voices of the Knox Mine Disaster: Stories, Remembrances, and Reflections on the Anthracite Coal Industry's Last Major Catastrophe, January 22, 1959 (Wolensky et. al., 2005) relives the drama of the Knox Mine Disaster through the voices of survivors, the victims' families, contemporary newspaper accounts, and the literature and music generated by the tragedy. Very blunt and to-the-point narratives and often shocking first-person accounts of those who lived through one of the most devastating mining disasters in American mining history are shared. This companion volume to the best-selling book The Knox Mine Disaster (Wolensky et. al., 1999) by the Pennsylvania Historical & Museum Commission, also offers a detailed study on how the citizens of northeastern Pennsylvania have memorialized and remembered the last major catastrophe to strike Pennsylvania's anthracite industry.

Following the Knox Mine Disaster and its direct connection to the Susquehanna River that laid above it, the most significant flooding disaster to hit the Wyoming Valley occurred on June 23, 1972, when Hurricane Agnes swept through the region seemingly putting an end to underground, deep mining in the Wyoming Valley and surrounding collieries that did not find it very economical to pump flooded mine water.

In Images of America's Hurricane Agnes in the Wyoming Valley (Glahn, 2017) introduces the Tropical Storm that became a Hurricane, describes the damages to the Forty-Fort Cemetery, recounts the blow that Agnes dealt to the Valley under water, dealing with a flood on someone's wedding day, how College Misericordia campus became a makeshift hospital, and how the "Valley with a Heart" showed their resiliency in returning to their homes, businesses, and jobs and began the rebuilding process.

By the early 1980s, there were left throughout the entire four divisions of the anthracite coalfields only two deep mines, both in the southern division- one at Tower City, and the other nearby at Hegins. Between the two mines, there were employed 150 men. The reign of King Coal in the anthracite region had ended.

The book, The Kingdom of Coal: Work, Enterprise, and Ethnic Communities in the Mine Fields (Miller and Sharpless, 1985) is one of the most comprehensive survey history of the rise and fall of the Anthracite mining industry in Northeastern PA. The book chronicles the discovery of anthracite, the building of canals to transport it to market, the era when anthracite was a major stimulus for the building of railroads and the development of the iron industry, the struggles of miners to organize, and the effects that successive waves of immigrants had on northeastern Pennsylvania. It concludes with an examination of the continuing legacy of anthracite mining in the region, and of the economic and technological factors that brought about the decline of the Kingdom of Coal. The chapters on the people of the anthracite region are very telling about the true grit and hardscrabble life that they had to endure in and around the Anthracite mines, both at home, on the surface, and underground.

The Face of Decline: The PA Anthracite Region in the 20th Century (Dublin and Licht, 2005) told a comprehensive history of the region looking at business, labor, social, political, and the environmental climates. Dublin and Licht dug into coal communities to explore local ethnic life and labor activism, economic revitalization, and the varied impact of economic decline across generations of mining families. The book also featured the responses to the economic crisis of organized capital and labor, local business elites, redevelopment agencies, and State and Federal governments.

The authors drew on a wide range of sources from oral histories and survey questionnaires; documentary photographs; the records of coal companies, local governments, and industrial development corporations; Federal censuses; and community newspapers. The authors examine the impact of enduring economic decline across a wide region of communities.

Additional Anthracite Mining Geology & Legacy in the Wyoming & Southern Wyoming Valley

The Lackawanna Basin and the Wyoming Basin structures are separated by the Moosic Anticline, which is a bedrock structural high located near the Luzerne, Lackawanna County municipal boundary and the confluence of the Lackawanna and Susquehanna Rivers. The Wyoming Basin extends from the Moosic Anticline southwestward to the Borough of Shickshinny, the southernmost tip of the Northern Anthracite Coal Field, and is structurally more complex than the Lackawanna Basin.

According to *Hydrology of the Pleistocene sediments in the Wyoming Valley, Luzerne County, Pennsylvania*, "The rocks bordering the Wyoming Valley suggest a simple synclinal structure. However, the area is structurally anomalous to the Appalachians, and the rocks within the valley are complexly folded and faulted, containing many sub-parallel anticlines, synclines, and related faults. These features are discontinuous and are seldom over a few miles in length. The deepest part of the synclinorium is about 1 mile east of the City of Nanticoke (Hollowell J. R., 1971). Additional information on the geologic structure of the area is found in (Darton, 1940). As with the other Anthracite Coal Fields, the complexity of the geology leads to the complexity of the underground mining patterns. The structure of the Wyoming Basin is complex, and the coal was mined to great depth. For example, the Auchincloss No. 1 shaft near the City of Nanticoke, had a bottom elevation of -975.9 feet, as shown on **Figure 1.1**. The land surface in that area is about 300 feet above sea level, thus the shaft was approximately 1200 feet deep. Nearby, in the Truesdale-Bliss Colliery, the Askam shaft had a surface elevation of +641 feet and a bottom elevation of -1492 feet, for a total depth of 2,133 feet, according to (Ladwig, Kleinmann, Erickson, & Posluszny, 1988).

There had once been considerably more coal in PA, but the forces of erosion, particularly glaciations during the Wisconsonian Period, wore away the outermost, exposed layers of the deposits, leaving about 98 billion tons, estimated to be the original reserve that existed when mining of Anthracite and Bituminous coal began in the late 19th century (Census, 1960) (Dublin, 2005).

Additional Mine Pools and Mine Water Flow Paths

Excellent information on the mine pools of the Northern Anthracite Coal Field is contained in two PA Geologic Survey Reports by (Hollowell J. R., 1971) and (Hollowell J. a., 1975). Before these two publications, a great deal of information was contained in the series of US Bureau of Mines publications by (Ash, et al., 1947), (Ash S. a., 1948) (Ash S. a., US BOM #727, 1949), (Ash, Kynor, Fatzinger, Davies, & Gilbert, 1950a), (Ash S. , Buried Valley of the Susquehanna River, Anthracite Region of Pennsylvania, 1950b), (Ash S. a., US BOM Report of Investigations 4700, 1950c), (Ash S. a., US BOM Bulletin 513, 1952a), (Ash, Kennedy, Link, & Romischer, 1953), (Ash S. , Mine Drainage Problems, Anthracite Region of Pennsylvania, 1954a), (Ash S. , BOM Bulletin 538, 1954b)and (Ash & Dierks, BOM 560, 1956). In addition, stratification of the mine pools was investigated in a US Bureau of Mines Report by (Ladwig, Kleinmann, Erickson, & Posluszny, 1988). Finally, information on the mine pool discharges is found in two US Geological Survey reports by (Growitz, 1985) and (Wood, 1996).

The presence of multi-colliery hydrologic units is evident in the Northern Anthracite Coal Field because there are many more collieries than the number of sizable mine discharges. A 1905 map in the archives of the PA DEP Bureau of Deep Mine Safety (PA DEP DMS) shows **189** collieries at that time, and a more recent inventory by the PA DEP Bureau of Abandoned Mine Reclamation (PA DEP BAMR) in 2009 lists **121** abandoned collieries.

PA DEP BAMR has tried to maintain **55** boreholes in the Northern Anthracite Coal Field that are used to monitor mine pool elevations; Of these, **28** boreholes are in the Wyoming Basin.

EPCAMR has also digitized historic mine pool reports from Stephen H. Ash and others from the Federal Bureau of Mines (1949-1953) by (Ash, et al., 1947), (Ash S. a., 1948) (Ash S. a., US BOM #727, 1949), (Ash, Kynor, Fatzinger, Davies, & Gilbert, 1950a), (Ash S. , Buried Valley of the Susquehanna River, Anthracite Region of Pennsylvania, 1950b), (Ash S. a., US BOM Report of Investigations 4700, 1950c), (Ash S. a., US BOM Bulletin 513, 1952a), (Ash, Kennedy, Link, & Romischer, 1953), (Ash S. , Mine Drainage Problems, Anthracite Region of Pennsylvania, 1954a), (Ash S. , BOM Bulletin 538, 1954b)and (Ash & Dierks, BOM 560, 1956) that helped us show the levels of the mine pools and the estimated volumes of water that were pumped down by the Anthracite Mining industry before its collapse around the 1970s.

EPCAMR digitized underground Anthracite abandoned mine barrier pillars for the Wyoming Valley. The archived Federal Office of Surface Mining Folio Maps in the National Mine Map Repository (NMMR) has been used to accurately develop these data layers. From the collection and detailed research of this data, EPCAMR made determinations on the integrity of the barrier pillars to analyze if solid, breached, partially breached, submerged, or entirely removed by the coal companies as they retreated from the mines as they began to develop other sections.

Table 1. shows the **5** major discharges within the study area with flows measured by (Growitz, 1985). The flows by comparison in the Northern Anthracite Coal Field are as follows: **5** of the AMD discharges, including the ***Solomon Creek Boreholes*** from the South Wilkes-Barre Mine at 39 cfs or 17, 506 gallons per minute (gpm), ***Airshaft No. 22*** from the Nottingham-Buttonwood Mine at 27 cfs or 12,119 gpm, the ***Askam Shaft borehole*** from the Truesdale Mine at 11 cs or 4,937 gpm, seepage from the ***No. 7 Mine*** at 3.5 cfs or 1,571 gpm, the ***Susquehanna No. 2 Shaft*** from the ***Number 7 Mine*** at 8.5 cfs or 3,815 gpm, are all within our project study area.