COAL AND COKE RESOURCE ANALYSIS

Western Pennsylvania • Northern West Virginia

1993-M001-042

America's Industrial Heritage Project

At the heart of the coal and coke story are the people who lived and worked in the coalfields of western Pennsylvania and northern West Virginia. A portion of their story is told in the photographs interspersed in this document.

All photographs are from the Patch/Work Voices project, Penn State University, Fayette Campus, Uniontown, Pennsylvania.

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Coal and Coke Resource Analysis

Western Pennsylvania • Northern West Virginia

November 1992

AMERICA'S INDUSTRIAL HERITAGE PROJECT

United States Department of the Interior • National Park Service • Denver Service Center

SUMMARY

Coal mining families, Lambert, Pennsylvania, July 4, 1924.

This *Coal and Coke Resource Analysis* is part of the America's Industrial Heritage Project (AIHP). The AIHP involves nine counties in southwestern Pennsylvania: Bedford, Blair, Cambria, Fayette, Fulton, Huntingdon, Indiana, Somerset, and Westmoreland. AIHP preserves, promotes, and interprets the coal, iron and steel, and transportation resources of the area as they relate to the industrial development of the region and the nation. In November 1988, Congress created the Southwestern Pennsylvania Heritage Preservation Commission to direct the AIHP. The National Park Service (NPS) serves as technical adviser to the commission.

The *Coal and Coke Resource Analysis* is phase 1 of a coal and coke study of alternatives being undertaken by the National Park Service at the direction of the Southwestern Pennsylvania Heritage Preservation Commission. The purpose of the analysis is to establish the following key planning elements that are necessary for completion of the site-specific portion (phase 2) of the study of alternatives:

- interpretive stories and themes
- geographic areas of emphasis with respect to the development of the coal and coke industry
- site evaluation criteria

To define these elements, the partners recommended that a historical overview of coal and

coke resources be prepared. As a result, the project team has completed the "Historical Overview" section in the resource analysis. The historical overview includes a broad analysis of the coal and coke industry in western Pennsylvania and northern West Virginia. The overview represents a synthesis of existing data and provides the historical context needed to identify important stories and themes, geographic areas of emphasis and site evaluation criteria.

The emphasis of this study is on coke manufacturing within the context of the coal industry. This approach was taken because plans are underway to preserve and interpret elements of the coal industry at other AIHP sites such as Windber, Eureka Mine 40 at Scalp Level, and Seldom Seen Valley Mine. Although elements of the coal story can be understood at those sites, the coking industry is a unique component of the overall coal story that has not been addressed within AIHP. In addition, the coking industry played a key role as a direct link between coal mining and development of the iron and steel industries. This study defines this role and describes the relationships between these industries.

In preparing the resource analysis, the NPS team used existing studies so as to avoid duplicating previous efforts. The team relied on two primary sources: a draft history of the Pennsylvania bituminous coal and coke industry being produced by the Pennsylvania Historical and Museum Commission (Diciccio 1992), and several draft reports on northern West Virginia coalfields prepared by the West Virginia University Institute for the History of Technology and Industrial Archeology (Workman 1992; Salstrom 1992a, 1992b).

The team also utilized the "Historic Site Survey of the Greater Monongahela River Valley," prepared by the Historical Society of Western Pennsylvania for the National Park Service, the Pennsylvania Historical and Museum Commission, and the Steel Industry Heritage Task Force (Hist. Soc. West Penn. 1991). In this study, the significance of the industrial and related historic resources of the Monongahela River valley (the "Mon Valley") are identified and evaluated. Various journals, agency reports, theses, maps, and photographs also were important in development of the study.

The coal and coke industries of western Pennsylvania and northern West Virginia played a crucial role in the industrial development of the United States during the last quarter of the 19th century and well into the 20th century. The combination of coal mining and coke operations, transportation systems, labor efforts, corporation development, and growth of communities all contributed to the nation's vast industrial expansion.

The industry was marked by intense competition between coal companies for limited markets. That competition resulted in overproduction, unstable coal prices, and recurring periods of unemployment for miners. Adjustments to fluctuations in market demands often dictated coal and coke companies' activities and resulted in labor-management struggles that drew the nation's attention to conditions in the coalfields.

Within the context of the development of the coal industry in western Pennsylvania and northern West Virginia, the Connellsville coke region developed the reputation for producing a superior grade of coking coal. This hastened the rise of the steel companies in and around Pittsburgh. This intense industrial activity led to the recruitment of thousands of immigrant workers to Fayette and Westmoreland counties between 1880 and 1920. The need to house workers and their families led to the establishment of company-controlled communities throughout the region.

During the study period (1740–1945), but especially between 1880 and 1920, thousands of immigrants, most of them from eastern and southern Europe, moved to the coalfields in search of work and a better way of life. They adopted various strategies in order to adapt to their new surroundings. At the same time American workers resisted the influx of newcomers. The immigrants' strange customs and

docile attitudes about performing even the worst jobs in the mines created an initial mistrust of foreign workers. Only after the newcomers "proved" themselves by supporting the United Mine Workers' strike efforts did they gain the respect of the native miners.

Interactions between workers, diverse ethnic groups, and coal and coke companies are the basis of the history of the bituminous coal industry in western Pennsylvania and northern West Virginia. It is a story of complex relationships between resources and people, a story of regional growth and national industrialization.

Upon review and approval of the *Coal and Coke Resource Analysis,* the coal and coke project team will undertake the site-specific phase of the study of alternatives. This phase, scheduled to begin in November-December 1992, will involve identifying and evaluating alternatives for use, protection, and management of coke resources and sites. The analysis will focus on resources in the Connellsville coke region in Pennsylvania's Fayette and Westmoreland counties. As with the resource analysis, this phase will be conducted under a partnership format, utilizing the expertise, ideals, and concepts of a number of individual partners.

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INTRODUCTION

BACKGROUND

This *Coal and Coke Resource Analysis* is part of the America's Industrial Heritage Project (AIHP). The AIHP involves nine counties in southwestern Pennsylvania: Bedford, Blair, Cambria, Fayette, Fulton, Huntingdon, Indiana, Somerset, and Westmoreland. AIHP preserves, promotes, and interprets the coal, iron and steel, and transportation resources of the area as they relate to the industrial development of the region and the nation. In November 1988, Congress created the Southwestern Pennsylvania Heritage Preservation Commission to direct the AIHP. The National Park Service serves as technical adviser to the commission.

In 1988, a reconnaissance survey of the Brownsville/Monongahela Valley area was commissioned by Public Law 100-698. The National Park Service completed the *Reconnaissance Survey of the Brownsville/Monongahela Valley* in 1991 (NPS 1991b). In the survey, which was the initial step in the NPS planning process, the Park Service assessed a broad area of land in western Pennsylvania and northern West Virginia within a variety of historic themes to provide the basis for future cooperative planning. The purpose of the reconnaissance survey was to examine the resources of the area, determine their significance, identify threats to the resources, and make recommendations for further action, if warranted.

To this end, an NPS team collected data on the cultural, natural, recreational, and scenic resources of the area and documented existing and potential nationally significant resources related to the industrial activities of iron production, steelmaking, coal mining, coke production, transportation, and other industries. The survey addressed several aspects of the coal and coke industry:

- technological and business developments
- the rise of labor movements
- the impact of ethnically diverse cultures on settlement patterns and the social and political development of the region
- the physical effect of this type of industrial operation on the landscape

In addition, in response to Public Law 100–698, the Steel Industry Heritage Task Force completed the *Draft Steel Industry Heritage Concept Plan* in July 1992. The plan provides an inventory and evaluation of steel and related industrial resources, including coal and coke, in six southwestern Pennsylvania counties and the city of Pittsburgh. Alternatives for conserving, interpreting, promoting, and managing these resources are presented in the plan, and a recommended concept plan is identified.

Many resources are present in western Pennsylvania and northern West Virginia, but a complete resource inventory does not exist. The *Reconnaissance Survey* and the *Draft Steel Industry Heritage Concept Plan* recommend further evaluation of a variety of historical resources within a broad contextual framework, including the coal and coke industry. The coal and coke industry was identified as one of several topics considered to be of primary importance in illustrating the cultural, economic, and industrial development of western Pennsylvania and the nation.

The next step in the NPS planning process is preparation of a study of alternatives. The purpose of such a study is to identify and evaluate alternatives for management, use, and protection of resources. In February 1992, the NPS team held a "kickoff" meeting with the project partners to discuss the findings of the reconnaissance survey and the direction of the proposed study of alternatives. Attending the meeting were representatives from the NPS Historic American Buildings Survey/

Historic American Engineering Record (HABS/HAER), the NPS Mid-Atlantic Regional Office, the Steel Industry Heritage Task Force, the Pennsylvania Historical and Museum Commission, the Folklife Division of AIHP, and the Pennsylvania Department of Community Affairs. The group concluded that several key elements needed to be determined before site-specific development alternatives could be formulated, including the following:

- interpretive stories and themes
- geographic areas of emphasis with respect to the development of the coal and coke industry
- site evaluation criteria

To define these elements, the partners recommended that a historical overview of coal and coke resources be prepared. The historical overview would provide the context in which the elements would be defined. From the items identified, it was determined that a resource analysis of the coal and coke industry should be completed as the first phase of a study of alternatives. Following completion of the resource analysis, the site-specific phase of the study of alternatives would be prepared.

PURPOSE

The purpose of this *Coal and Coke Resource Analysis* is to establish the key planning elements identified above that are necessary for completion of the site-specific portion of the study of alternatives. The resource analysis will serve as a bridge between the reconnaissance survey conducted for the Brownsville/Monongahela River valley region and the site-specific portion of the study of alternatives. Included in the study is a broad historical overview of the coal and coke industry in western Pennsylvania and northern West Virginia (see Region and Study Area maps). The historical overview represents a synthesis of existing data and provides the historical context needed to identify important stories and themes, geographic areas of emphasis, and site evaluation criteria.

The emphasis of this study is on coke manufacturing within the context of the coal industry. This approach was taken because plans are underway to preserve and interpret elements of the coal industry at other AIHP sites such as Windber, Eureka Mine 40 at Scalp Level, and Seldom Seen Valley Mine. Although elements of the coal story can be understood at those sites, the coking industry is a unique component of the overall coal story that has not been addressed within AIHP. In addition, the coking industry played a key role as a direct link between coal mining and development of the iron and steel industries. This study defines this role and describes the relationships between these industries.

METHODOLOGY

In preparing the resource analysis, the NPS project team used existing studies so as to avoid duplicating previous efforts. The team relied on two primary sources: a draft history of the Pennsylvania bituminous coal and coke industry being produced by the Pennsylvania Historical and Museum Commission (Diciccio 1992), and several draft reports on northern West Virginia coalfields prepared by the West Virginia University Institute for the History of Technology and Industrial Archeology (Workman 1992; Salstrom 1992a, 1992b).

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The team used a variety of other secondary sources in the development of the resource analysis. Various journals, agency reports, theses, maps, and photographs were important in developing the study. Other sources used were survey forms from the Pennsylvania Historical and Museum Commission, historic maps from the Carnegie Library, and a draft of the *Connellsville Coal and Coke Study* (NPS 1991a, Quivik). Further bibliographic information is presented in the Works Cited.

In addition to published sources, the project team also utilized the expertise of project partners in two key steps during preparation of the resource analysis. First, in late April 1992, project partners were asked via memorandum to identify the important components of the coal and coke story. The information was used to focus data collection efforts, steer planning activities, and define the thematic framework for the project.

Second, once a preliminary or working draft of the resource analysis document had been assembled, a workshop was conducted in September 1992 to discuss the document to date. Workshop participants outside the project team were limited to key historians and cultural resource specialists having specific expertise in the history of the coal and coke industry. Participants included representatives of HABS/HAER, the Pennsylvania Historical and Museum Commission, the Folklife Division of AIHP, the West Virginia Institute for the History of Technology and Industrial Archaeology, the Fayette County AIHP Committee, and Penn State University, Fayette Campus.

The focus of the workshop was on the "Historical Overview" part of the document. Topics of discussion included the relationship between western Pennsylvania and northern West Virginia, the focus on "people" or social stories, and interrelationships between the various topics (such as communities, labor, technology, corporations) presented in the historical overview. Also discussed at the workshop were the project team's preliminary compilation of stories and themes and the preliminary site evaluation criteria. After the workshop, the team revised the preliminary draft document on the basis of feedback from the partners.

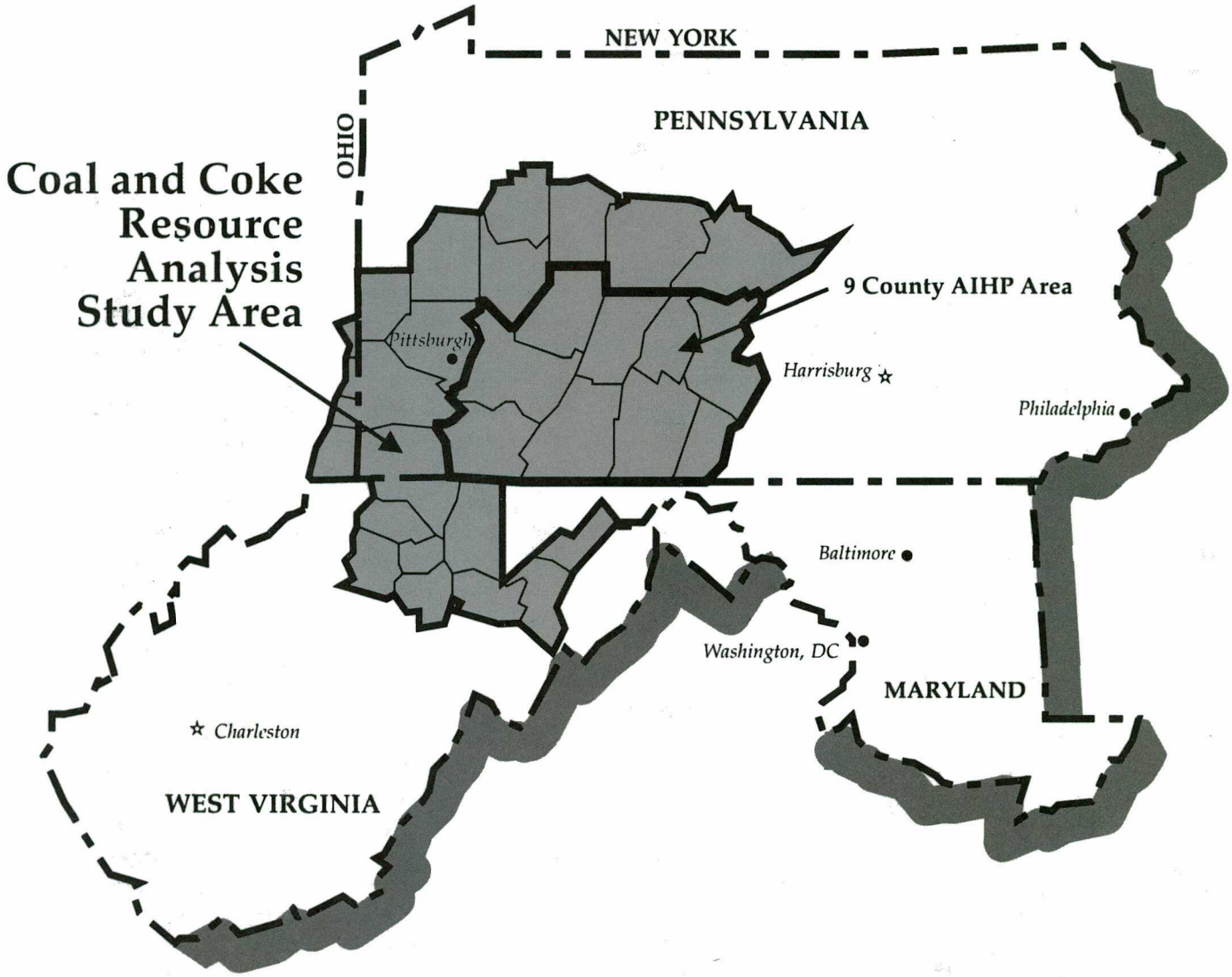
STUDY AREA

The study area for the resource analysis consists of western Pennsylvania and northern West Virginia, as shown on the Study Area map. Determination of the study area was based on several factors, including the location and extent of coalfields and mining activity in the region, the study area evaluated in the *Reconnaissance Survey of the Brownsville/ Monongahela Valley,* and the distribution and intensity of historic coke production activities. Although a smaller study area could be defined, the strategy adopted was to include a relatively large area for broad analysis at the outset, then narrow the focus to specific areas of emphasis.

REPORT CONTENT

This report consists of the historical overview and sections addressing interpretive stories and themes, geographic areas of emphasis, site evaluation criteria, and recommendations for further study. Included in the historical overview are sections about the formation of coal and its uses, the role of transportation, and technology and production. The relationship of coking operations to the coal and steel industries also is explored. Furthermore, community development, labor relations, and the business/corporate structure are examined. Finally, the importance and significance of the Connellsville coke region is discussed.

The "Interpretive Stories and Themes" section identifies the important interpretive elements of the coal and coke industry. The themes also reflect the interdependency and interrelationship of the industry and society. Ultimately, the stories and themes will be used as a guide for the site selection process and facilities/exhibit planning and design.



REGION

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STUDY AREA

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Key portions of the study area relative to development of the coal and coke industry are identified in "Geographic Areas of Emphasis." Identification of areas of emphasis is based on the extent and intensity of historic industrial activity in a geographic area and on the integrity of the existing resources. These areas may serve as focal points for future activities such as additional research or alternative site-selection.

The site evaluation criteria provide a framework for evaluating possible alternative sites. The criteria range from historical characteristics — such as relationship to stories and themes and resource integrity — to physical and environmental characteristics — such as site access, conflicting uses on adjacent land, and topography. During the upcoming site-specific portion of the study of alternatives, potential locations for interpretation or siting facilities will be assessed and rated according to these criteria.

In the final section, "Recommendations for Further Study," areas where additional research is needed are identified and future efforts for the study of alternatives are summarized.

ACKNOWLEDGEMENTS

Team members would like to thank all those interested partners who provided assistance to this project through suggestions, advice, and support.

Special thanks are extended to Bobby Salitrik, Project Archivist, Patch/Work Voices project, at Penn State University, Fayette Campus, Uniontown, Pennsylvania, for her generous contribution of photographs for this project.

HISTORICAL OVERVIEW

INTRODUCTION

Vegetable gardens were an important source of fresh food for coal mining families. Here, family members pose in their garden in Phillips, Pennsylvania. Note also the outdoor bread oven at right.

In the "Historical Overview" section of this *Coal and Coke Resource Analysis,* the historic elements of the bituminous (soft) coal industry of western Pennsylvania and northern West Virginia will be discussed. As the study area map on page 5 shows, this report is concerned with the development of the coal industry in 18 counties of western Pennsylvania and 13 counties of northern West Virginia. The study area encompasses a region that was rapidly transformed from an agricultural area to an intensely developed industrial region. As the country's demand for coal increased, leading industrialists invested capital in markets at home and abroad. In turn, the coal industry in the study area expanded and contracted in response to market demands. Elements of the coal and coke story are an integral part of the story of America's quest for industrial superiority.

The significance of western Pennsylvania and northern West Virginia's coal and coke industries lies in their contribution to America's vast industrial development during the late 19th and early 20th centuries. Nationally, the coal industry provided fuel to drive the engines of production in the glass, iron and steel, and railroad industries across the nation. Within that national context, western Pennsylvania's coalfields consistently produced almost a quarter of the nation's coal. Of the approximately 147 million tons of bituminous coal produced in 1897, Pennsylvania's coalfields produced more than 55 million tons. West Virginia's contribution was

slightly more than 13 million tons. Together, the two states produced nearly half of the nation's soft coal for that year (Alder and Ruley 1899).

The story of the development of the coke industry in southwestern Pennsylvania's Connellsville Coke Region falls within the larger context of the coal industry and the growth of the iron and steel industry in Pittsburgh. The Pittsburgh seam produced a coking coal unsurpassed in quality, and it was the mining of this seam that led to the unique development of the area. Fayette and Westmoreland counties were the top two producers of coal in western Pennsylvania (see Appendix A for production tables) and the majority of that coal went into the coke ovens in the area and was then shipped on to iron furnaces in Pittsburgh. Because of its unique contribution to the nation's industrial development, a brief history of the Connellsville coke region is presented in a separate chapter of the overview.

Northern West Virginia's three coalfields did not approach the coal and coke production figures generated by western Pennsylvania. However, research done in those fields not only helps to illustrate the differences between the areas but also helps to identify the similarities and shared experiences of workers and mine owners across the artificial boundaries of state lines.

The historical overview presents the development of bituminous coal industry during the period from 1740 to 1945. Although material is presented that touches on earlier and later periods, the research team has decided to look more closely at the history of the development of coal mining and coke production from 1850 to 1945. During that time, the coal and coke industry underwent its most dramatic development, making a transition from small "country bank" operations with local markets to large corporate structures with national and international markets.

In addition, this period encompasses the rise and decline of intensive *beehive* coke production in the Connellsville coke region, the rise of company-owned coal towns, and the recruitment of eastern and southern European workers into the region. In this "Historical Overview," these and other subjects will be addressed under the broader categories of transportation, technology and production, the rise of corporations, labor relations and organization, communities, and Connellsville.

The primary goal of the "Historical Overview" is to synthesize material already presented by other authors on the subject of the bituminous coal industry. This section is not intended as primary research, nor is it an exhaustive study of the history of bituminous coal mining in the region. The "Historical Overview" is intended to form a basis for future planning decisions within the NPS planning process.

COAL

INTRODUCTION

It is impossible to tell the story of industrial expansion in the United States in the 19th century without telling the story of coal. Coal fueled glass, iron, and steel industries; it powered grist mills, railroads, subway systems, steam engines, and steamships. The discovery and development of the bituminous coalfields attracted thousands of immigrant laborers and fostered the growth of coal *patch* communities. Some large investors profited from the extractive industry while smaller operators lost out in the cycles of intense competition within the industry. Between 1740 and 1945, coal was the catalyst that triggered the transformation of western Pennsylvania and northern West Virginia from an agriculture-based economy to an industrial economy.

FORMATION OF COAL

The original coal reserves in the bituminous (soft) coalfields of the United States were estimated at 1.7 trillion tons, with the major portion found in the hills of Appalachia from Pennsylvania, Ohio, and Illinois southward into Alabama. The study area for this project, the coalfields and mining districts of western Pennsylvania and northern West Virginia, are found within this eastern Appalachian region (Diciccio 1992, 1–4).

Coal is decomposed organic matter, pressed and heated over millions of years by the earth's process of plant growth, death, and decay. The ever-changing surface of the earth created layers of decaying plant material, which, in the presence of moisture and bacteria, formed the world's peat bogs. Peat, still used as heating fuel in England, Scotland, and Ireland, is the first step in the formation of coal. Under proper geological conditions, peat will decompose to become coal. The "coalification" process begins as increasing layers of mud and sediment keep air from reaching the peat. Increasing pressure from the thickening layers of debris combines with heat to drive off moisture and volatile materials. At the same time, methane gas is released and the basic carbon, oxygen, and hydrogen makeup of peat is altered. Carbonaceous deposits of coal are left in its place (Diciccio 1992, 1–4).

CHARACTERISTICS OF COAL

The layers of coal formed as a result of millions of years of the earth's cycles of birth, death, and renewal can be identified and labeled. In the laboratory, coal is burned in the absence of oxygen, and moisture and volatile matter are driven off. The percentage of fixed carbon remaining determines the *rank* of the coal. The ranks of coal in the United States are anthracite, semianthracite, semibituminous, bituminous, subbituminous (black lignite), and lignite (brown or woody lignite) (Diciccio 1992, 2; Cuff et al. 1989). The highest-ranked coal is anthracite. The bituminous fields of western Pennsylvania and northern West Virginia are ranked below anthracite.

Pennsylvania has four anthracite coalfields that are located in a concentrated area under the Wilkes-Barre/Scranton/Pottsville region of northeastern Pennsylvania (Long 1989, 4; DiCiccio 1992, 7). However, anthracite (hard or stone) coal is not found in the coalfields of northern West Virginia. In contrast, bituminous coal is found in a number of fields in the western half of Pennsylvania, including fields in the northern part of the state (DiCiccio 1992, 8). The locations of bituminous coals related to this study are indicated on the Bituminous Coal Mining Areas map. That map also shows the areas of the bituminous fields where coal was being mined during the study period.

Ranking of coal is intertwined with its volatile material content, heat value, and fixed carbon. Volatile matter in coal is the compounds, other than moisture, that are driven

off when coal burns. Generally, some ranks of bituminous coal and all anthracite coal have correspondingly high heat values and low volatile content. The notable exception is those bituminous coals that are low in volatiles and actually have a higher heat value than anthracite coal.

Anthracite, or hard coal, is almost pure carbon, with a low percentage of volatiles. This combination of a lack of volatile material and high fixed carbon content is what makes anthracite a "smokeless" coal and gives it its high rank. The bituminous, or soft, coal found in western Pennsylvania covers the spectrum from high to low percentage of volatiles and from 65% to 80% fixed carbon content. Although the coals of western Pennsylvania do not approach the almost 90% fixed carbon content of the anthracite fields, the Pittsburgh coal seam in Fayette county produced the region's highest quality coal. From this coal, coke was produced that was almost pure carbon. Coke from the Connellsville coke region was world renowned for its metallurgical uses in the iron and steel industries.

As important in determining the quality of coal are its other characteristic components, sulfur and ash. Sulfur, released in smoke when coal is burned, is now known to be an air pollutant and one cause of acid rain. Ash is the inorganic matter of coal. A high ash residue remaining after coal is burned indicates poor quality coal. The anthracite fields of eastern Pennsylvania have very low sulfur and ash content. However, bituminous coals in Washington, Fayette, and Cambria counties and parts of Somerset County actually have a lower ash content than anthracite, and their sulfur content is 1% or less (Diciccio 1992, 4).

USES OF COAL

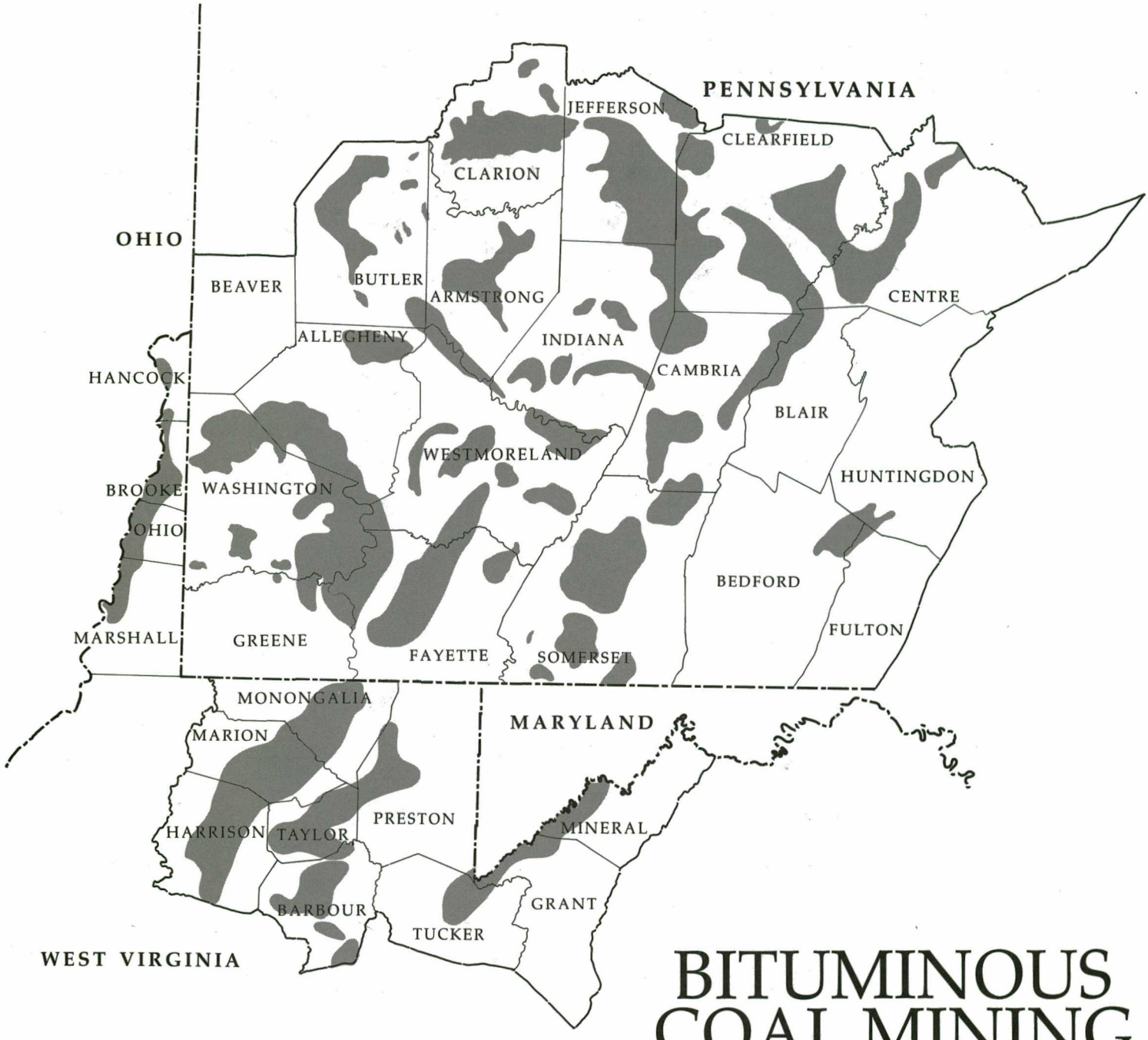
The importance of coal lies in its uses. Once coal is brought out of the mines and readied for shipment, markets must be available to receive it. As has been mentioned, the bituminous coalfields of western Pennsylvania and northern West Virginia played an integral part in America's rapid industrialization. The question, then, is, what is the relationship between coal and industrial expansion of the late 19th and early 20th centuries?

In 1760, early customers for the region's coal were local blacksmiths, mill operators, and residents. They bought coal from farmers who mined it from surface outcroppings on their property. These markets slowly expanded until shipping points were located along the Monongahela River. From those points, coal was shipped to Pittsburgh and westward. By 1785, Clearfield and Centre counties in eastern Pennsylvania were shipping coal to Philadelphia and New York. These early patterns of local use, coupled with shipments of coal east and west, set the pattern for coal usage that is still apparent today.

Between 1760 and 1860 the coal industry expanded slowly but steadily. Demand for coal increased as industries expanded. Pittsburgh's use of coal in its glass factories, iron furnaces, and woolen mills stimulated the demand for coal. By 1800 the widespread use of coal in factories and homes had gained Pittsburgh the designation "the smoky city", a name it retained for a century or more (Binder 1974, 21). In the 1830s, the salt works of western Pennsylvania consumed thousands of bushels of bituminous coal in steam pumps and under salt pans to aid evaporation.

The railroads were vitally important users of coal. The increasing cost of wood that accompanied the decline of eastern forests forced the railroad industry, like the iron industry, to look for alternative fuels. Slowly, the railroad's great steam engines began using coal. The primary difficulty in burning coal in steam engines lay in the firebox, which needed to be reinforced to keep the coal fire from burning through it. Once that problem was solved, the railroad industry became a major consumer of coal.

In addition to its consumption of coal, the railroad industry transported coal and coke to points east and west, extended tracks into isolated coalfields, and became the major



BITUMINOUS COAL MINING AREAS

Coal and Coke Resource Analysis

Composite adapted from a map of Pennsylvania and a map of West Virginia, copyright 1924, Keystone Consolidated Publishing Company, Pittsburgh, PA

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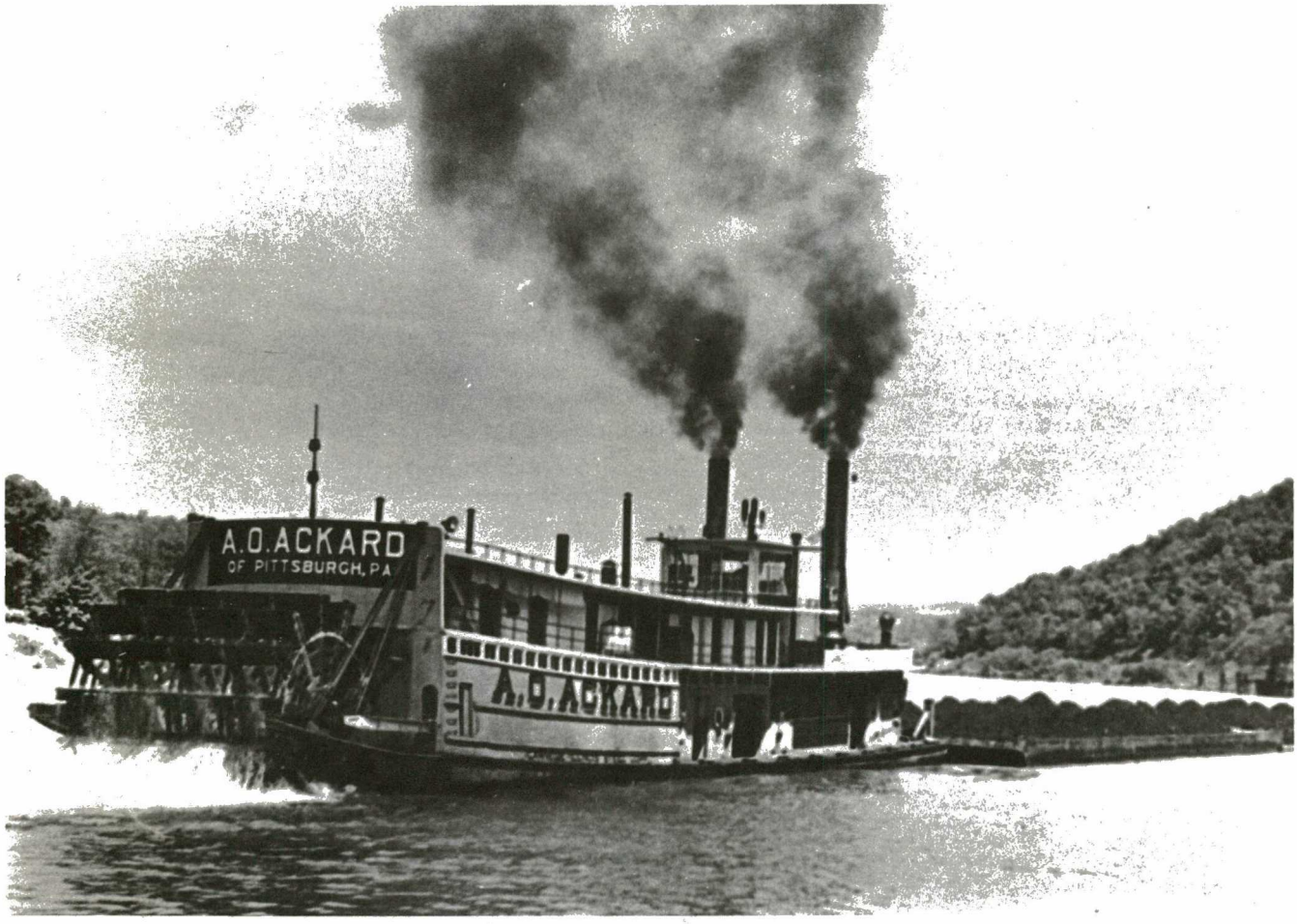
transporter of coal out of the region. The railroads were the key to delivering coal to market. Those markets ranged from iron and steel plants in the Pittsburgh area to businesses and homes across the country.

Coal products varied from coke used as fuel for iron and steel production to coal gas used to light city streets. The so-called smokeless coals of Clearfield, Centre, Cambria, and Somerset counties went to heat homes in congested cities, where minimizing smoke was most important. Smokeless coal was also used in New York's subway system and as fuel for steamship liners crossing the Atlantic.

From its early use as fuel for blacksmith shops and grist mills to its later use as fuel for blast furnaces at iron and steel plants, coal has been a flexible, reliable, cheap source of industrial power. Intertwined with developments in transportation and in domestic and industrial life, coal is inextricably tied to the nation's growth and development.

TRANSPORTATION



Steamer and coal barge at the Palmer docks, May 1938. Coal traffic on the Monongahela River began early in the 19th century.

The development of bituminous coalfields in western Pennsylvania and northern West Virginia depended in part on technological advances in transportation. These improvements not only made it possible to haul coal and other products to urban markets but also eventually led to consumption of large quantities of coal. Despite the ultimate success of railroads in the 1850s, the geographical barriers of the Allegheny Mountains and the shallow rivers of the region posed formidable obstacles that impeded early attempts to gain reliable access to the area.

Several factors contributed to the difficulty of moving goods on local waterways. Shallow riverbeds characterized the Ohio, the Monongahela, and the Youghiogheny rivers (Enman 1962, 112; Binder 1974, 87). Summertime droughts exaggerated the shortage of water, which made river transport all but impossible. During winter, the rivers also contained floating ice, which posed an additional hazard to shipping. Finally, rapids just north of Connellsville on the Youghiogheny presented yet another risk to water transportation (Enman 1962, 112). All these factors limited trade outside the region. Because it was not possible to move products out of the region,

western Pennsylvania remained an area of predominantly local trade. Coal consumption followed this pattern. As late as 1838, residents of the region used 70% of the locally mined coal (Diciccio 1992, 11–12).

However, despite these obstacles, local companies tried to expand trade beyond the Pittsburgh region. In winter when the rivers were free of ice, and during the spring rises, coal operators occasionally floated large flatboats filled with coal beyond Pittsburgh to Cincinnati and other markets along the Ohio and Mississippi rivers. Farmers also used similar boats to bring agricultural products to western markets. These boats, filled to the brim with coal, required high water to make the journey safely. Once a boat had reached its destination, the crew dismantled it and sold the timber (Diciccio 1988, 10; 1992, 17). Despite the few successful trips to bring Pennsylvania's bituminous coal to western locales, the hazardous conditions and unreliability of the river depths made the supply of coal uncertain at best. This unpredictability prevented development of a market for soft coal. Thus, without demand for the product, local coal mining operations remained small.

Alternatives for transportation of heavy, bulky goods from the Monongahela Valley region in the opposite direction — to eastern urban markets — continued to be impractical. The Allegheny Mountains impeded any natural water route from flowing directly to the eastern cities. Beginning in the early 1790s, Pennsylvania embarked on a series of private, public, and joint projects to build overland roads to the interior of the state. Construction of the Lancaster Turnpike was finished in 1817; this road linked Philadelphia with Pittsburgh. A year later, the Cumberland Road, or National Road, began serving northern Maryland and southwestern Pennsylvania. By 1852, the National Road stretched from Cumberland, Maryland, to Vandalia, Illinois.

While these main highways, along with a series of smaller linking roads, joined sections of the nation together and received heavy use, the projects mainly facilitated the movement of people and manufactured goods from east to west (NPS 1963, 15–18; NPS 1991c, ii–iii; Goodrich 1960, 62). Despite a reduction of almost one-third in freight rates from Pittsburgh to Philadelphia, the cost remained too high to move heavy items more than 150 miles (NPS 1963, 18). As a result, these road projects did not open up the eastern markets for products from southwestern Pennsylvania; rather, the regional focus only intensified as goods from Pittsburgh's surrounding communities funneled into the city through use of these new highways.

The success of the Lancaster Turnpike, the National Road, and other highway projects for eastern cities and states did not go unnoticed. Commercial rivalries developed among different urban centers in attempts to secure western trade routes. Baltimore benefited from the National Road as newly constructed roads linked Cumberland with Baltimore. Virginia also undertook westward road building. The completion of the Erie Canal in 1825 threatened to undermine Pennsylvania's role as facilitator of western trade. Philadelphia, in particular, feared that New York City would monopolize commerce into the Ohio Valley (Goodrich 1960, 63).

In response to the opening of the Erie Canal, the Pennsylvania legislature approved funding for a cross-state canal construction. The shorter distance to the west, along with milder winters, convinced some canal backers that a Pennsylvania waterway could compete with New York's successful Erie Canal (Goodrich 1960, 63–64). Project planners rejected the use of canals through the Allegheny Mountains; instead, they opted for railroad incline planes, known as the Allegheny Portage Railroad, to scale 33 miles of the Alleghenies.

In 1836, after eight years of construction at a cost of more than $10 million, the Pennsylvania Main Line opened from Philadelphia to Pittsburgh (NPS 1963, 28). Freight and passengers moved along by rail from Philadelphia to the Susquehanna. Once at the Susquehanna, goods and people transferred to the canal to travel 172 miles to Hollidaysburg.

There, workers secured the canal boats on top of rail cars as stationary engines slowly lifted and lowered merchandise and passengers over the Alleghenies. Finally, at Johnstown, the boats reentered a canal to travel the rest of the way to Pittsburgh (Goodrich 1960, 65).

Despite the impressive technological achievements of the Pennsylvania Main Line, the project was never a financial or commercial success. By 1844, the line handled only a fifth of the freight that the Erie Canal processed (NPS 1963, 65). The cumbersome transfers from railroad to canal, to railroad again, and back to canal proved time-consuming and expensive, and unlike the Erie Canal, the Pennsylvania Main Line was never able to transport bulky western goods such as agricultural products, timber, and coal.

Narrow locks and competition from Maryland and Virginia, along with high freight rates, continued to restrict the eastward movement of goods from southwestern Pennsylvania. In addition, the stationary engines used for the Allegheny Portage Railroad could not haul heavy canal boats filled with coal or agricultural goods (Binder 1974, 159). As a result, western products generally remained excluded from eastern markets. For example, coal shipments on the Main Line to Philadelphia from the Pittsburgh region never topped 30,000 tons per year between 1832 and 1880 (Diciccio 1992, 14–15). Yet locations closer to Philadelphia — Huntingdon, Bedford, Blair, and Centre counties — were able to transport coal and agricultural goods east. The Main Line, however, was never able to turn a profit. After the Pennsylvania Railroad reached Pittsburgh in 1852, competition from improved rail technology squeezed the Main Line even further. The canal/railroad soon became a secondary route.

Although transportation improvements linking the Pittsburgh region with Philadelphia did not facilitate the development of southwestern Pennsylvania, slackwater projects on the Monongahela and Youghiogheny rivers did spur trade with the west. In 1837, the Monongahela Navigation Company began construction of a series of locks and canals along the river from Brownsville to Pittsburgh. With completion of the project in 1844, a dependable and safe water route was available — no longer would flatboats filled with coal have to wait for the water to rise.

The slackwater improvements along the Monongahela River and, later, the Youghiogheny River in 1852 increased trade between Pittsburgh and the surrounding region. Trade also increased at locations along the Ohio and Mississippi rivers, including those as far south as New Orleans. Coal operations sprang up along the Monongahela and Youghiogheny rivers, and coal shipments not only increased dramatically but soon became the dominant item of trade. In 1845 operators shipped more than 4.5 million bushels of coal down the slackwater improvements. By 1855 the figure increased to more than 22.25 million bushels, with an increase five years later to 38 million bushels (Binder 1974, 157–158).

As noted earlier, the Pennsylvania Main Line did not deliver the western trade that backers had envisioned. Philadelphia continued to lose ground to New York City through the Erie Canal and to Baltimore, with its connections to the National Road. Baltimore boosters proposed construction of a railroad, the Baltimore and Ohio (B&O), from Baltimore to some point on the Ohio River to improve access to western trade (Binder 1974, 111). The proposed rail route would join Baltimore with Pittsburgh via Cumberland and Connellsville. After first approving permission for the project, the Pennsylvania legislature revoked approval of the Pittsburgh/Connellsville link — legislators feared the B&O would challenge Philadelphia's own interest.

In response to the B&O proposal, the state chartered the Pennsylvania Railroad to complete an all-rail link from Philadelphia to Pittsburgh (NPS 1991c, x–xi). Because of limited rail technology, construction costs, and potential freight markets from iron, iron products, and passenger traffic, the route for the Pennsylvania Railroad followed rivers in

valley flats (NPS 1992, Snow et al., 7–8; Enman 1962, 120).

The opening of the Pennsylvania Railroad in 1852 and subsequent construction of various connectors with the initial line dispersed development throughout southwestern Pennsylvania. Altoona, for example, became the site of the Pennsylvania Railroad repair complex (NPS 1990b, Wallace et al., 5). As a result of the success of the railroads, bituminous coal began to flow not only west to Pittsburgh and up into the Great Lakes region, but east to Philadelphia. In 1860, 206,636 tons of coal were transported from Westmoreland County to eastern markets (Diciccio 1992, 17).

The railroads and the coal and coke industries quickly developed a reciprocal relationship. The location of railroads initially determined the sites of coal and coke operations. However, by the 1870s, as coal and coke production expanded, railroads began to construct new lines especially for these enterprises (Enman 1962, 175, 139). The main lines

Initial development of elaborate transportation systems was gradual. Many small operations depended on horses and wagons for hauling coke. These teamsters may have been transporting coke to small local foundries.

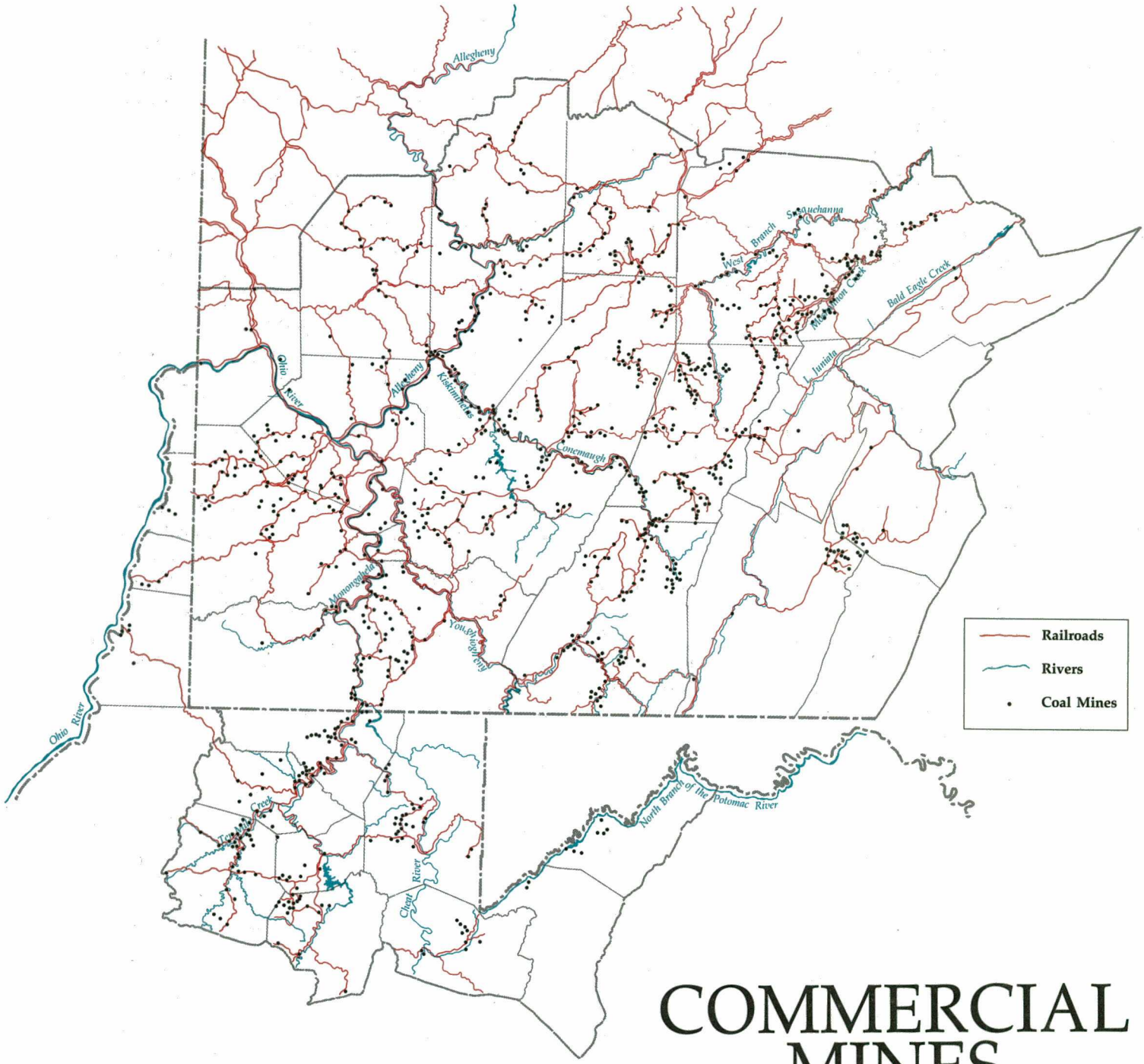
of the B&O and Pennsylvania railroads passed through or near the bituminous coalfields of western Pennsylvania and northern West Virginia. The major railroads built feeder and connector lines to reach the scattered coalfields and patch towns (see the Commercial Mines map).

The B&O and the Pennsylvania Railroad also leased or chartered a number of short line railroads to serve the coalfields. Among these were the Northwestern Railroad and the Cambria and Indiana Railroad in Indiana County, and the Pittsburgh and Connellsville Railroad in Fayette County. The B&O developed a major rail network in southwestern Pennsylvania by chartering locally incorporated railroads. Undoubtedly this was partly a response to resentment voiced by small communities and local companies over the Pennsylvania Railroad's regional hegemony.

Besides transporting more coal and coke, railroads affected the region in many other ways beyond the simple movement of goods. Parts of the United States were rapidly industrializing in the 1850s; this accelerated after the Civil War. Railroads, coal, and coke combined to industrialize western Pennsylvania and northern West Virginia. Later, in the 1880s, the industrialization attracted large numbers of eastern and southern Europeans, as well as blacks, to existing towns and new communities.

Industrialization helped in the transition from a rural society to an urban setting. Between 1870 and 1900, the proportion of urban residents in Westmoreland County increased from 10% to 32%; by 1930 the figure was 47% (NPS 1991c, ix). Railroads extended Pittsburgh's influence into neighboring areas, as both city dwellers and outlying residents now traveled frequently by train. Farmers easily shipped goods into Pittsburgh, and wealthy city residents established resorts in the countryside (NPS 1991c, xii).

Transportation improvements laid the foundation for the development of coal and coke areas. The canals, slackwater improvements, and railroads that penetrated the Alleghenies also brought immigrants into the region. Even failed transportation projects stimulated trade, although in an unintended direction. The important link between coal and coke and transportation continued into the next century.



COMMERCIAL MINES

Rail and River Locations

Coal and Coke Resource Analysis

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COAL TECHNOLOGY AND PRODUCTION

Underground Mining

Coal mining was an underground operation in the 19th and early 20th centuries. The mines were wrapped in eerie darkness, shut out from the light of day, and the men who worked underground faced the ever-present threat of roof falls and explosions. Theirs was a workplace unlike any other in the industrial world.

Types of Mines. The mines found in the bituminous coalfields were identified by their method of entry — drift, slope, tunnel, or shaft (figure 1). Of the four types of mines, the drift mine was by far the most common in the western Pennsylvania/northern West Virginia region. Drift mines outnumbered slope and shaft mines 10 to 1 in 1909. That year, according to the U.S. 13th Census, there were 55 shaft-entry mines and 76 slope-entry mines in Pennsylvania, compared to 758 drift-entry mines (Bur. Census 1909).

A drift mine, requiring little capital outlay to start, consisted of an opening driven directly into the coal from its surface outcropping. From the opening, the main mine tunnel ran directly into the mountain or hillside. Coal was removed from the mine in cars that ran along tracks generally laid level and above the water table.

The slope mine opening also was driven directly into the coal seam, but at an angle that followed the coal seam downhill. Slope mines required more mechanical equipment for hauling coal uphill out of the mine. In addition, water pumps were needed to keep the mines free of deep water.

Unlike the entry for a drift or slope mine, the entry for a tunnel mine was made by boring through the hillside at right angles to the coal seam. This, too, was a simple mine to operate and required little capital investment. The ease of access to the coal afforded by these mines allowed small companies to operate within the industry.

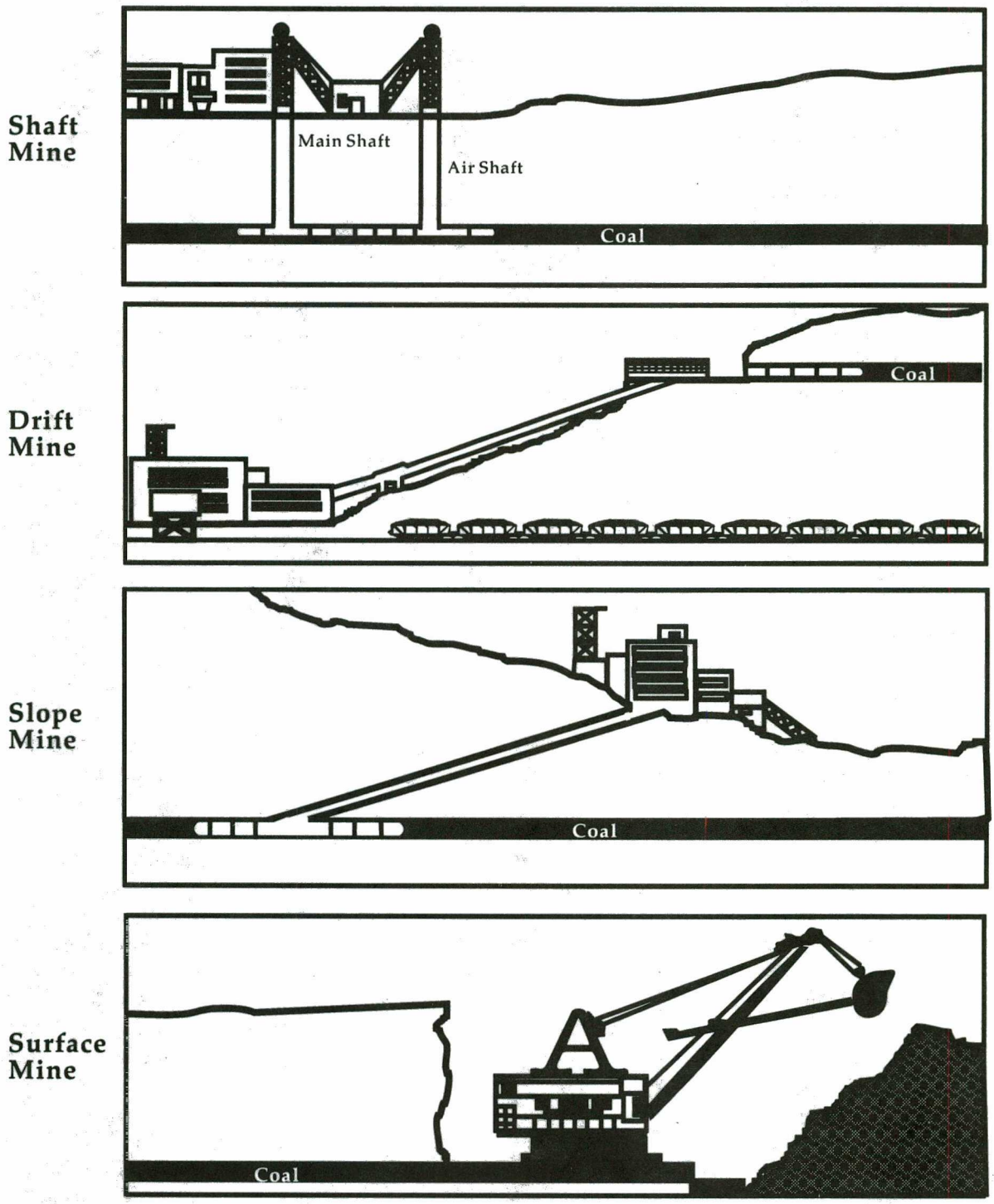
Shaft mines, on the other hand, required considerable initial investment and frequent maintenance. The mine comprised a shaft for reaching the coal seam, haulage equipment, and pumps to remove water. In addition, shaft mines required more complex ventilation shafts to facilitate the exchange of air.

In a shaft mine, a vertical tunnel (shaft) was dug for access to low-lying coal seams, often giving access to more than one seam. From the vertical shaft, miners dug horizontal entries into the coal. The main shaft, equipped with an elevator known as the cage, became the entry and exit for miners, tools, animals, and equipment. (Description of types of mines found in Diciccio 1992; Long 1989.)

Inside the Mines. Two methods of underground mining are described, room and pillar and longwall mining.

Room and pillar mining — Once the coal was reached through the entry and the main artery running through the mine, miners dug "rooms" into the coal, leaving pillars between mined sections to support the mine roof. New rooms were opened as miners drove cross "streets" (called entries or headings) at right angles to the main artery. The rooms (also called chambers or breasts) were the workplaces of the mines, where coal was removed from the face of the seam, loaded into cars, and removed to the mine opening. It was important to keep the main arteries and headings as straight as possible to facilitate laying of track and to maintain sufficient ventilation to the rooms.

The rooms between pillars were about 24 feet wide; the intervening pillars were 20–100 feet wide. Engineers of the late 1800s complained that room and pillar mining was wasteful,



Adapted from Survey of Coal Mining Sites in Greene and Washington Counties, Pennsylvania, 1780-1945 by Carmen Diciccio, 1988.

Figure 1: Four Types of Bituminous Coal Mines

since so much of the minable coal was left behind as roof supports. However, continuous longwall mining, which eliminated the intervening pillars, was not used to any great extent in U.S. bituminous fields until after World War II (Long 1989, 24).

Longwall mining – Longwall mining is an integrated mechanical process. First the blades of a mechanical cutter remove large sections of the coal seam by moving back and forth across several hundred feet of the face of the seam. Once the coal is loosened from the face, it is carried away on a conveyor belt. At the same time, the roof is supported by movable steel props. (Unlike the room and pillar system, this method leaves no coal to support the roof.) The cutter, conveyor system, and roof supports advance as the operator moves deeper into the seam (Diciccio 1992, 22).

The technology for longwall mining was first used extensively in Europe around 1900. However, American operators were reluctant to invest in the expensive machinery. Another reason for the owners' reluctance apparently was associated with the large pool of workers available for work in the mines. The switch to longwall mining would have reduced the number of workers in mines. Since coal companies benefited financially, not only from miners' labor, but also from the income from rents on company houses and purchases at company stores, they were not anxious to make such drastic changes in their operations. It was not until after World War II, when the cost of labor increased dramatically and profits steadily decreased, that longwall mining became widespread in the industry (Long 1989, 24).

Surface Mining

Strip (surface) mining did not begin in the region's bituminous coalfields until the 1930s. Strip mining involves removal of coal from seams 50 to 100 feet below the surface. Huge ripping, drilling, and shovel machinery is used in strip mining methods known as "area" and "contour" mining; that is, mining in flat ground *areas* or following the seam over the *contours* of hilly terrain (Diciccio 1992, 23).

A greater percentage of the coal can be removed from a seam by strip mining methods than by underground methods — 80% to 100% of the coal can be removed by strip mining, compared to the 40% to 60% generally recovered by underground methods. Strip mining also has several other advantages over traditional underground methods: the speed at which coal can be removed (because strip mining is more efficient), lower operating costs (since a smaller labor force is required), and increased safety (Diciccio 1992, 24).

However, strip mining poses severe environmental problems to mined areas. It destroys the natural landscape and ecosystems of the mine area, disrupting water flow and wildlife habitat and creating potentially hazardous pits and ridges at the mined site. As a result of the degradation of the environment caused by strip mining, the federal government and some state legislatures have enacted reclamation laws that require strip mine operators to restore mined areas to their original landscapes (Diciccio 1992, 25).

The Work of Mining

The work of mining coal traditionally has been performed by skilled workers. Before recruitment of unskilled workers to the coalfields, and before the introduction of mechanical undercutting machines led to a more marked division of labor in the mines, skilled miners (also known as practical miners) were responsible for removing the coal from the face and getting it to the surface. Young boys learned mining techniques from their fathers or other skilled miners; thus, mining skills were passed from generation to generation.

Undercutting the coal was the first order of work. Until 1870, miners used picks to undercut the coal. Lying on his side, a miner made a 3–4 foot cut into the base of the seam,

wedging a section at a time to keep the wall from dropping as he moved along the face. Once undercutting was completed, some miners made vertical cuts into the face perpendicular to the undercut at the base. The next step in the process was to wedge the coal from the top of the face and drop it to the floor without shattering it.

Blasting coal from the face replaced the hand wedge method, although some experienced miners protested the introduction of blasting in the mines. This early technological advance in mining was seen as an intrusion upon the skill of traditional miners, even though properly done blasting required considerable skill (Long 1989, 126).

After the coal was mined, or removed from the face, the miner and/or his partner loaded it into a coal car for removal to the surface. There the coal was either placed directly into rail cars for shipment to market or processed at the tipple (coal-screening plant), where the coal was sorted by size, and slate and other debris were picked out of it. From the tipple, the coal was sent to rail cars for shipment.

The basic hand technology of coal mining persisted in the bituminous coalfields until late in the 19th century. The introduction of the mechanical undercutter and drilling machine in the 1870s facilitated a division of labor in the mines that undermined the work of the skilled miners. However, it was the larger operations that were most affected by early mechanization.

Large corporations first introduced mechanical undercutters, replacing the slow process of undercutting by hand. Work once done completely by skilled workers was divided into individual tasks performed by teams of men: teams with undercutters driven by compressed air doubled the output of the hand pick method; other teams used power drills to drill the deep holes needed for setting blasting powder. Then one man set blasts at night for the next day's work (Long 1989, 126).

The introduction of technology to the work of coal mining was driven by the rapid development of the coal industry. In part, the development was due to expansion of railroads into the coalfields. However, the increased demand for bituminous coal in the 1880s was linked more closely to the rapid industrialization taking place across the United States.

Demand for coal came from industrial centers like Pittsburgh, whose iron and steel industry grew at phenomenal rates at the end of the 19th century. New York City needed coal to power its subway systems, and coal was needed to fuel steamships crossing the Atlantic Ocean. As the demand for coal grew, coal companies were stimulated to combine the use of new technology with an increase in the number of workers in the mines. The reordering of work in the coalfields pushed many skilled miners out of their jobs, some into higher-paying supervisory positions, others to smaller operations, and still others out of the industry altogether (Long 1989, 127).

Production

During coal's reign as America's primary fuel, thousands of miners and laborers found jobs in the coalfields of western Pennsylvania and northern West Virginia. Production figures alone do not tell the whole story of bituminous coal mining. Only within the larger context of people and industry do the numbers begin to relate the significance of the coal and coke industries in the United States. The sheer increase in numbers of workers at the mines, in addition to the number of new mines opened between 1850 and 1880, led to a steady increase in production.

Between 1880 and 1920, Pennsylvania's coalfields were ranked first in the nation in production (see appendix A for production figures between 1881 and 1945). Railroads, subways, steam engines, and iron and steel industries across the country used Pennsylvania coal. In 1913, at its peak, Pennsylvania's coal production reached 172,965,659 net tons, leading other large producers in Ohio, Illi-

nois, and Indiana (Maize and Stible 1964, 55). It was not until 1927 that West Virginia first surpassed Pennsylvania in coal production. As Pennsylvania began its slow decline, West Virginia took the lead and held it after 1930.

After a resurgence of demand for coal and coke during World War II, U.S. industries continued to switch to oil and gas for fuel, and the demand for coal decreased. By 1960 oil and natural gas had surpassed coal as the primary energy sources in the nation. The sooty days of coal's dominance in the fuel industry have passed. Coal is still mined in western Pennsylvania and northern West Virginia, but at only a fraction of what was mined during the study period.

COKING TECHNOLOGY

Early Coke Activity

Technological innovations, alternative fuels, and the growth of new industries all influenced the speed at which a successful coking process developed in the United States. Competition from charcoal and anthracite coal slowed experimentation and the use of coked bituminous coal. However, some experimentation with bituminous coke continued, driven by the depletion of forests and a growing demand for iron products related to the railroad boom. Although the growth of Pennsylvania's iron industry had initially sparked interest in coking, it was only with the discovery of the Connellsville sector of the Pittsburgh seam and demands of the growing iron and steel industries that coking became the dominant industry in the region.

Ironworkers preferred wood charcoal for smelting. They used a rather simple process to transform wood to charcoal: they placed the woodpile around a central chimney on a packed earthen floor and covered it with noncombustible material. After igniting the pile, workers sealed off the chimney to prevent any oxygen from entering the mound. The process was completed in approximately 10 days (Enman 1962).

There were several reasons that charcoal was preferred for use in smelting before the 1840s and 1850s: familiarity with charcoal, a lack of knowledge about alternative fuels, and the seemingly limitless supply of trees all contributed. As a result of the need for vast expanses of forest, iron furnace operations were located near abundant fuel supplies and away from cities (Storey 1991).

Generally 1 acre of woodland provided a day's fuel, which in turn produced 2 tons of iron. Over a year, a typical rural furnace consumed 240 acres of forest, or 5,000–6,000 cords of wood (Diciccio 1992, 24-25). At this rate, a furnace quickly depleted nearby forests, necessitating transport of logs from greater distances. Access to woodlands became more expensive as the resource dwindled, and the greater distance also added to time and labor costs. Scarcity of labor in the newly settled region compounded labor expenses (NPS 1991a, Quivik, 24). Deforestation and the high cost of logging were two factors that encouraged experimentation with alternative fuels.

Foreign competition also stimulated research. During this period, the British were able to export iron products at a lower cost than goods manufactured in the United States. Because of their own wood shortage, the British had begun experimenting with coke production in the 16th and 17th centuries, and in 1711 Abraham Darby developed a successful coking process that could be used for smelting iron (NPS 1991a, Quivik, 8). More than a century later, James Neilson of Glasgow Gas Works applied hot-air blast to this smelting process. As Binder explained,

> The hot-air blast was one of the most significant discoveries in the iron industry, resulting in larger yields of pig iron with less fuel by causing more complete combustion of the latter and a union of a greater proportion of carbon to the metal (Binder 1974, 62).

The use of coke, as well as hot-air blast smelting, enabled the British to provide their iron goods at a lower cost despite the trans-Atlantic journey.

British competition, disappearing forests, and the scarcity of labor prompted several Pennsylvania organizations and institutions to volunteer financial incentives to accelerate the manufacturing of iron from mineral coal or coke. For example, the Franklin Institute in 1831 and 1832 offered prizes in the form of medals to iron manufacturers who successfully used anthracite or bituminous coal in the smelting process. Three years later, hoping to learn more about its different mineral deposits, the state of Pennsylvania allotted funds to survey the underground wealth (Binder 1974, 63). Finally, a group of business associates led by Nicholas Biddle offered $5,000 for a successful three-month employment of mineral fuel (Diciccio 1992, 26).

Various experiments eventually led to the use of raw anthracite coal for smelting, especially east of the Alleghenies. The high carbon composition and low gas content of anthracite made it ideal for smelting iron. Thus, by 1860 anthracite was used in more than 56% of smelted iron (Diciccio 1992, 26, 29). With the completion of transportation improvements linking eastern and western Pennsylvania during the mid-19th century, anthracite-smelted iron began to compete with the state's western charcoal-produced iron.

The challenge from anthracite-fueled iron spurred interest by western iron producers to find a more efficient and less expensive alternative to charcoal. The abundance of forests, along with a series of unsuccessful attempts to use both raw and coked bituminous coal, had perpetuated the use of charcoal. However, by the 1840s, experiments with different grades of bituminous coal revealed some progress.

By this time, workers produced a fair grade of coke, but results were inconsistent because of inferior coal containing large amounts of sulfur, coupled with inexperience with the coking process (Binder 1974, 80). As a result, coking remained a relatively small industry until the 1870s. Nationally, only four coke establishments existed in 1850; 10 years later the number had grown to just 21 (Diciccio 1992, 35).

In the 1840s workers began to extract coal from the Connellsville sector of the Pittsburgh seam in western Pennsylvania. The bituminous coal in this area had several qualities that made it ideal for coking. First, the Connellsville coal pulverized during mining and transportation; this saved the expense of crushing the coal before loading it into coke ovens. Second, the chemical composition of coal from this area was low ash, phosphorous, and sulfur, which left essentially pure carbon after coking. (NPS 1991a, Quivik, 4–5). For these reasons the Connellsville coal was excellent for coke production because it "was comparatively free from impurities and possessed a strong structure capable of bearing the heavy burden of the blast furnace charge" (Binder 1974, 81).

In 1860, the Clinton Furnace at Pittsburgh experimented with Connellsville coke. The owners were so pleased with the end product that they decided to secure a continuous supply of coke from the Connellsville region (Diciccio 1992, 36). This sparked the building of several beehive coke ovens in Fayette and Westmoreland Counties. As mentioned earlier, these early coke plants were adjacent to different rail lines such as the B&O, Southwest Pennsylvania, and Pittsburgh and Lake Erie (Diciccio 1992, 36).

Several factors contributed to the rapid growth of coking in the Connellsville area after 1860. The high quality of bituminous coal in the Connellsville sector of the Pittsburgh seam was a major determinant. Transportation improvements facilitated movement to Pittsburgh of coke from Fayette and Westmoreland counties and ore from the Lake Superior region. With high-quality nonphosphoric ore, combined with the new Bessemer process, Pittsburgh's steel industry grew rapidly (Krause 1992, 56). Steel manufacturers' need for fuel, especially coke, stimulated development of more coke plants in the Connellsville region.

Beehive Ovens

The successful 1860 experiment using Connellsville coke at the Clinton Furnace in Pittsburgh led to a boom of coal and coke development in the Connellsville region during the 1870s. This rapid growth rippled through communities, increasing population and affecting racial/ethnic compositions and local control over economies. It was during this period of industrial expansion that the establishment of company towns became the framework for community development. The advancement in coking technology fostered both community and industrial growth.

The technique for the coking process evolved from charcoal mounds to brick beehive-shaped ovens. At first, workers simply substituted coal for wood in a similar crude pile method, cooking the coal for only 8 days instead of the 10 needed for wood. This procedure required little capital outlay, but the end product was often inconsistent (Enman 1962, 87), so coke producers turned to brick ovens. Brick ovens had first been used by 17th century Germans in the distillation of wood to produce tar. Coke manufacturers altered these beehive-shaped ovens for their own needs (NPS 1991a, Quivik, 17–18).

Different experiments with beehive ovens began in the Connellsville region during the early 1830s (Diciccio 1992, 40). Beehive ovens produced a more consistent product in a shorter time — either 48 or 72 hours, depending on the size of the charge. By 1860, the success of the Clinton Furnace experiment, the use of Connellsville coal, and the consistency of the coke produced in beehives all combined to stimulate growth in the coke business in this area.

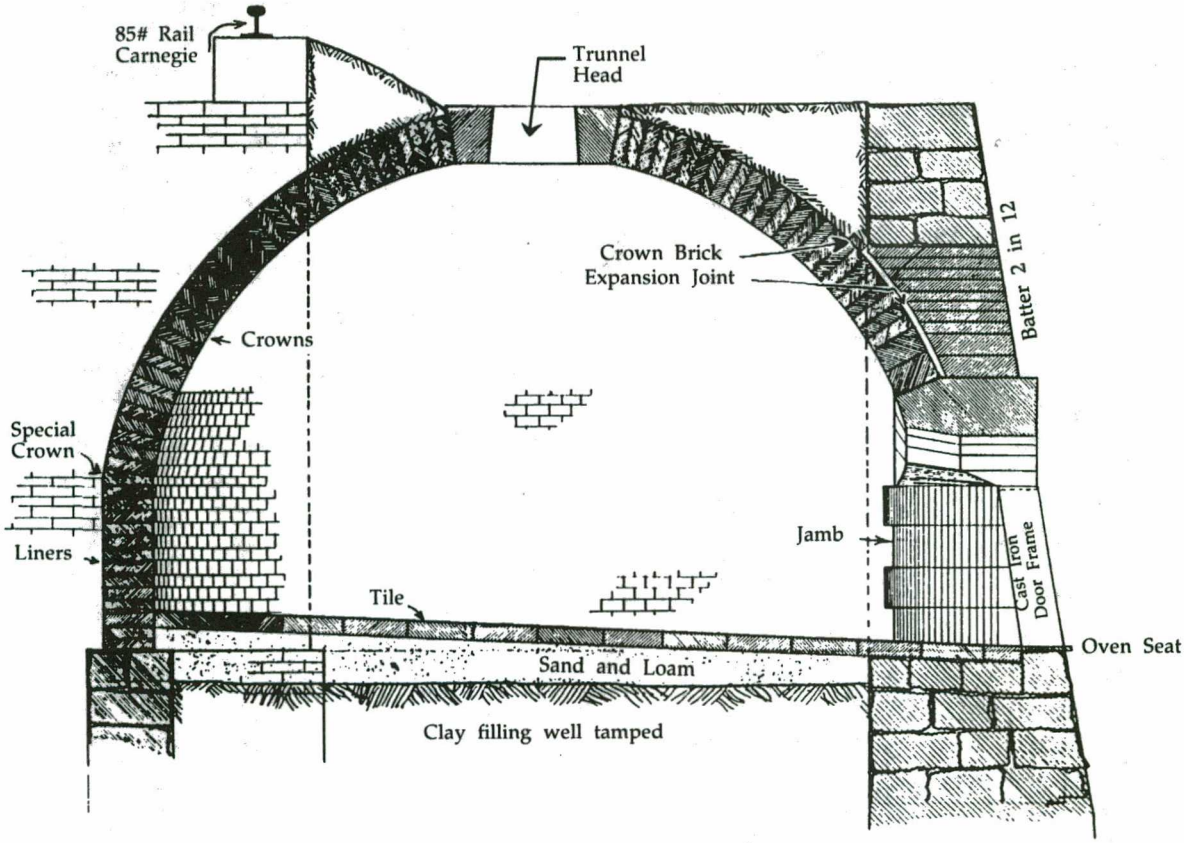
Although there was no industrywide standardization of beehive ovens, Henry Clay Frick (H. C. Frick), the largest single owner of coke plants, did standardize his operations. Construction crews used heat-resistant brick, tile, and masonry to build hemispherical beehive ovens (Diciccio 1992, 41). The height of the typical oven varied from 5 to 10 feet; floor diameter ranged from 10 to 13 feet. The trunnel (the opening at the top) measured about 1 foot in diameter. This opening facilitated the loading of coal and allowed smoke and gases to escape. Workers sealed the fronts of the ovens with brick and mortar during the coking process (Storey 1991, 17; Diciccio 1992, 41; NPS 1991a, Quivik, 18).

Beehive ovens were designed into coke plants according to either the *bank* or the *block* pattern (see figure 2). Bank ovens were located in hillsides along the valley bottoms. The hills provided insulation for each single line of bank ovens. Block ovens were built in two adjoining parallel, back-to-back rows of beehives along flat land (Enman 1962, 91).

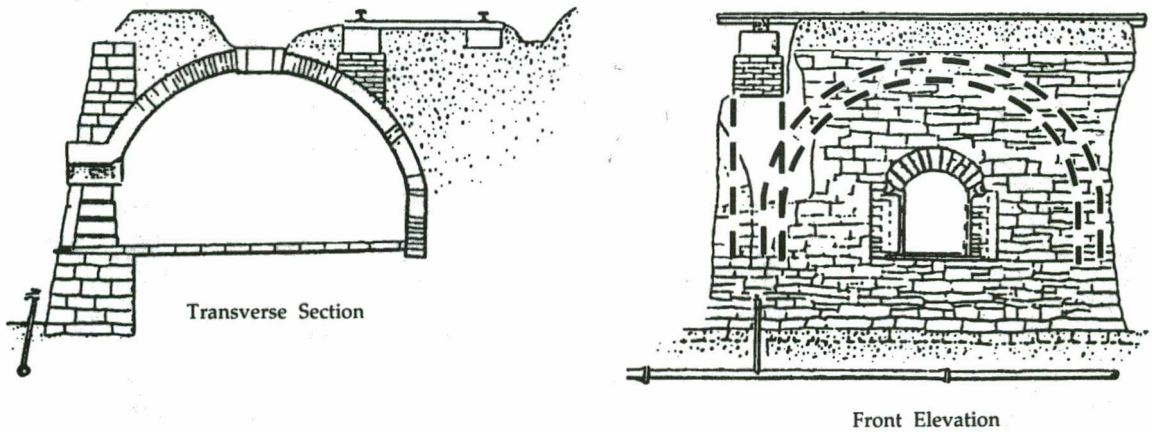
The same individual or company often owned coal and coke operations in the same immediate vicinity, so coke ovens were located close to the mine to reduce transportation cost. Both bank and block ovens were built in valley flats for essentially two reasons: the valley locations corresponded to the paths of railroads on which finished coke would be transported, and gravity contributed to movement of mined coal downhill from the pit mouth to the ovens (Enman 1962, 91).

W. J. Rainey introduced a third type of coke oven, the rectangular oven, at his Mount Braddock works in 1908. Rectangular ovens differed from the beehives in several ways: they were larger than beehive ovens, they had two doors (on opposite sides), and they were constructed in a single row removed from hills. While rectangular ovens were more expensive to build, coke companies saved money by using mechanical oven unloaders to cut labor costs. Rectangular ovens never surpassed beehives in the Connellsville area because many beehives existed before the introduction of rectangular ovens and because many already believed that the Connellsville sector of the Pittsburgh seam was running out of coal (Enman 1962, 93).

The size of beehive coking plants varied greatly. W. J. Rainey Company's Paul Works employed 70 people and contained 83 ovens,



Standard 12′-0" Diameter 7′-3" High Beehive Oven
Cross Section



Standard 12-Foot Bank Oven

Figure 2: Beehive Ovens

with 20 cokers and yardmen tending the operation. The company employed 44 men inside the mine; 6 more worked in support positions. At one of Frick's operations, Leisenring no. 1, a much larger facility, 500 ovens burned around the clock, occupying 132 cokers and yardmen, with 315 more employed as miners and support staff. Another Frick plant, Standard Shaft no. 2, operated 885 beehive ovens, with 340 cokers and yardmen working the ovens and 641 were miners and support staff (NPS 1991a, Quivik, 38–39).

Regardless of the size of the beehive coke plant, the tasks required for coking remained essentially the same. With the bottom few layers of the door bricked up, the lorries — steel rail cars that ran on top of the ovens — transported coal from the mine tipple to the ovens (Brestensky, Hovanec, and Skomra 1991, 31). The charger (lorry operator) filled the oven with 6½–7 tons of coal for a 48-hour burn or with 8 tons for a 72-hour weekend burn (Storey 1991, 17).

Next, the *leveler* used an 18-foot bar with a spoonlike attachment on one side and a crossbar on the other to level out the coal inside the oven. Good coke required a level start in order to have an even and consistent burn. Then levelers sealed the oven with the remaining ceramic bricks and mud, leaving a triangular opening near the top of the door for airflow (Brestensky, Hovanec, and Skomra 1991, 28). If the previous load had been emptied quickly and not overquenched, the heated roof of the oven spontaneously ignited the coal. To speed the process, the coke burner would place paper over the triangular opening to increase the oven temperature. Smoke and then flames poured out of the trunnel opening at the top of the oven.

In a coke oven, coal burns from the top down, leaving only carbon. After the coal had burned out and begun to cool, the water boy tore off the ceramic brick door and set sprinklers inside the ovens to cool the coke. The water boy had to pay special attention that the water did not cool the crown of the oven — a cooled crown would not ignite the next load. Finally, the scraper cleared out the coke and dumped the coke cart into a waiting rail car. Then the process would begin again (Brestensky, Hovanec, and Skomra 1991, 28–36).

The growth of coke production in the Connellsville region was extremely rapid. Coke production in Westmoreland County in 1870 was nonexistent; in 1880 it was the county's leading industry, employing 881 people (Henderson et al. 1990, 225–26). Between 1876 and 1877, 3,578 ovens were built in the Connellsville region (Davis 1951, 136). Coke was produced in other parts of the country during this period, but none came close to the production of Pennsylvania. By 1880, Pennsylvania coke production employed 80% of the nation's coke workers and produced a little more than 84% of the country's coke (Diciccio 1992, 43; Davis 1951, 137). At the turn of the century, Pennsylvania's beehive ovens still made more than 65% of United States coke; most of these operations were in the Connellsville region (Henderson et al. 1990, 213). Also see appendix B for production figures.

The expansion of coke production linked the Connellsville region to Pittsburgh's steel industry. The mill owners sought to ensure a steady supply of coke. As a result, many Connellsville coke plants became captive operations that funneled all their finished products to certain Pittsburgh steel mills. Other steel and iron producers operated their own coke plants in the Connellsville region (NPS 1991a, Quivik, 41). H. C. Frick, who entered the coke business in 1868, focused on the captive strategy. Frick initially owned 50 ovens in Fayette County, but by 1882 he had expanded his operations and controlled over a thousand ovens in Fayette and Westmoreland counties (Diciccio 1992, 45). By 1900, Frick, through his coke company, controlled not only 11,000 coke ovens and 40 mines in Westmoreland and Fayette counties but also more than half of the nation's coke production (NPS 1991c, xviii).

By-product Ovens

Ironically, the very elements that contributed to the industrial expansion of the Connellsville region eventually undermined its success. Variables that had initially triggered development — coking technology, the quality of the coal in the Connellsville sector of the Pittsburgh seam, and transportation — began to pull and push the coking business away from the Connellsville area.

Although these factors did not immediately combine to shut down the numerous beehive ovens, they did encourage a rapid decline of coking in the region by the second decade of the 20th century. During this transition period, the area, once the dominant producer and exporter of coke, became merely an insufficient supplier of raw coal (Enman 1962, 319). Because the region depended almost exclusively on coke production, the decline in coking ultimately delivered a harsh blow to the people of the Connellsville area.

Although beehive ovens dominated Fayette and Westmoreland counties by the late 1870s, advancements in coking technology continued. As in the evolution of beehive and rectangular ovens, Europeans led the development of a more advanced oven, by-product ovens. Many types of European coal, when cooked in beehive ovens, did not produce good quality coke, so Europeans began experiments with by-product ovens in the 1880s (NPS 1991a, Quivik, 45).

Like beehive ovens, by-product ovens rendered usable coke. But they differed from the beehive and rectangular ovens in an important manner: flues on by-product ovens collected gases that beehives allowed to escape into the atmosphere. Smoke emitted through the beehive trunnel contained a number of components, including ammonia and other gases, that could be further refined into oils, dyes, fertilizers, explosives, tars, and pitch. Some of these products could be resold to a growing chemical industry; others could be consumed in the ovens themselves.

By-product ovens captured the gas and reused it to heat the ovens from the outside. As a result of the gas burning, by-product ovens consumed no carbon in the coking process and produced more coke per ton of coal. By-product ovens converted a little more than 73% of the coal to coke; beehives produced about 69% (Diciccio 1992, 11–12). In addition, by-product ovens reduced the cooking time to 17–24 hours. The efficiency in coke production, along with income from the sale of various gases and goods, made by-product ovens economical and more profitable.

Despite the financial benefits of by-product ovens, for several reasons coke operators did not immediately convert from beehives to by-product ovens. First, the quality of coal found in the Connellsville region and in parts of England cooked extremely well in the existing beehive ovens (NPS 1991a, Quivik, 45), so there was no reason for producers to switch to the by-product ovens. Second, by the time U.S. industrialists began to construct the first by-product ovens in the early 1890s, thousands of beehive ovens had already been built.

By the turn of the century, the Connellsville region alone contained more than 20,000 beehive ovens, which were supplied by nearby mines (NPS 1991a, Quivik, 40). Although wasteful, the beehive ovens represented millions of dollars in investment; they could not simply be abandoned. By-product ovens cost five to seven times as much to build as beehive ovens: $300 paid for a beehive oven; by-product ovens could cost anywhere from $1,600 to $2,200 (Enman 1962, 308). This large difference in capital outlay also discouraged quick conversion to by-product ovens.

A final factor contributing to the delay in by-product use relates to the marketability of the goods collected during the by-product process. The chemical industry, which used many of the captured products, was only beginning to develop in the United States at the turn of the century. Before World War I, Germany and other European nations supplied

many of the by-product derived goods to the United States. The availability of these goods dampened "demand for by-product ovens in the United States" (NPS 1991a, Quivik, 45). The outbreak of World War I interrupted the flow of this trade and stimulated the growth of domestic by-product and chemical industries (Diciccio 1988, 27).

All these variables delayed the rapid and widespread adoption of by-product ovens; nevertheless, their introduction into western Pennsylvania occurred during the height of beehive dominance. In 1894, Dunbar Iron Company constructed the first by-product ovens in the Connellsville region. These 50 ovens supplied coke for iron production and heat and gas for a neighboring glass plant (Enman 1962, 305, 307). Less than a year later the Cambria Iron Works at Johnstown installed 60 by-product ovens for coke manufacturing (NPS 1991a, Quivik, 46).

Both by-product plants were a success, yet it would be several more years before production of by-products would eclipse beehive output. Late in the first decade of the new century, beehive production climaxed in the Connellsville region. The exact date of peak beehive production varies, depending on the source cited, although all agree that it was between 1906 and 1910 (Storey 1991, 15; Enman 1962, 325; NPS 1991a, Quivik, 49). At any rate, beehive production declined from 1910 onward, while by-product production increased. When H. C. Frick constructed a massive by-product plant in 1918 at Clairton, along the Monongahela River, it became obvious that the future clearly belonged to by-products. The Clairton plant consumed 10,500 tons of coal daily in its 640 by-product ovens (Diciccio 1992, 13).

In 1924, by-product production surpassed beehives. By this time one-third of the beehive ovens in the Connellsville region had closed. Eight years later, more than 13% of the coal mined in the area was exported, compared to 3% in 1910 (Enman 1962, 331). The Connellsville region was becoming simply a coal exporting area.

The closing of beehives and movement of raw coal out the Connellsville region represents the importance of the technological change brought on by the by-products. Unlike beehive ovens, which were resource-oriented, by-products were market-oriented (NPS 1991c, xx). Coke companies had originally located beehive ovens near coal mines to gain access to a specific coal seam. By-product ovens, on the other hand, required proximity not to a particular type of coal, but to steel mills and chemical industries that used the captured by-product goods. The by-product plants at Dunbar, Johnstown, Clairton, and later at Wheeling, West Virginia, all followed this market-oriented pattern. The result of this new orientation was that coking operations moved outside of mining areas like the Connellsville region to locations closer to steel and chemical industries such as Pittsburgh, Johnstown, and Wheeling.

Coal in the Connellsville sector of the Pittsburgh seam, which had initially attracted coking operations, now began to hasten the exodus from the region. By 1915, this section of the Pittsburgh seam was beginning to show signs of depletion (Enman 1962, 308). Knowledge of this exhaustion discouraged investment in coke ovens. The remaining coal began running out or became too difficult and expensive to extract. During the 1930s, floodwaters "ended deep mining in the Latrobe Syncline," and by the 1950s coal companies had exhausted most other sections of the Connellsville region (Storey 1991, 16; Enman 1962, 195).

The exhaustion of the Connellsville sector of the Pittsburgh seam did not affect the by-product coking process because technological advancements allowed the use of a lower-quality coal in the new coking procedure. The high-quality coke formerly produced only in the Connellsville region could now be produced by U.S. operators using coal from new areas. For example, harder and more sulfurous coal from the Pittsburgh seam in Greene County, along the Monongahela River, supplied the huge Clairton by-product plant (Enman 1962, 317–318). Barges with 1,000-ton

capacities carried the coal down the Monongahela to Clairton (Diciccio 1992, 14). The use of less costly water transportation further challenged the more expensive rail system used to transport Connellsville coke.

The success of by-product ovens resulted in an economic downturn for the beehive regions. By the 1930s, by-product ovens produced 90% of the nation's coke (Diciccio 1992, 14). In Tucker County, West Virginia, coke production came to a halt by 1931 (Salstrom 1992b, 41). However, limited beehive production continued in the Connellsville region until the late 1950s. Connellsville area operators were able to continue limited operations because beehive ovens were already built, skilled labor was available, and they had the flexibility to increase or decrease production quickly.

A locally specialized market kept some beehives in operation. During periods of increased steel demand, as in World War II and the Korean conflict, workers once again fired up idle beehive ovens (Enman 1962, 320–325, 332). However, these short periods did not give long-term relief to the dying beehive coking industry. In the 30 years between 1940 and 1970, Fayette County lost close to a fourth of its population as many residents went to other areas of the country in search of steady employment (Storey 1991, 26).

THE RISE OF CORPORATIONS IN THE COAL INDUSTRY

Baseball players from the Palmer Mine. Baseball games, which were encouraged by coal and coke companies, were the highlight of summer recreation for the whole community. Bands marched through the patches, drumming up support and enthusiasm for the games and drawing people to the field. Young boys organized their own leagues and dreamed of the opportunity to join "the first nine" — the "real pros" of the patch. These were the players that young players looked up to and idolized. (Dennis F. Brestensky, Evelyn A. Hovanec, and Albert N. Skomra, *Patch/Work Voices: The Culture and Lore of a Mining People* — Pittsburgh: University of Pittsburgh Press, 1991, 50.)

Between 1880 and 1920 the bituminous coal industry saw its greatest period of expansion as the demand for soft coal rose. Iron and steel, railroads, and others dependent on coal-fired boilers relied on coal to power their equipment. This period was marked by significant changes that rapidly transformed an agricultural area into an industry-dependent region. The changes unquestionably altered the region's natural landscape and had a profound effect on the lives of thousands of workers and their families.

The transformation of western Pennsylvania and northern West Virginia into an industrial region was due in part to the emergence of large corporate structures in the industry. Large corporations had the economic power to invest in equipment and labor in such quantity that smaller operators often were unable to compete in the marketplace. Along

with eliminating many of their competitors, large corporations affected the region in various ways during this period, including the following:

- a marked increase in the number of mine openings
- introduction of mechanical undercutters and drills
- increased division of labor in larger mines
- an influx of thousands of immigrant and migrant laborers
- construction of hundreds of coal patch communities
- activities of the United Mine Workers of America

EARLY DEVELOPMENT

Economic gain was the driving force behind the appearance of large corporations. After 1880, investors could make immense sums of money in the industry as coal markets expanded and transportation networks moved into once-isolated regions. Corporations backed by prominent financial investors bought out small mine operations and sought to maximize their investments by increasing production.

In northern West Virginia's coalfields, leading local families that had continuing interests in established businesses in the region controlled the coal industry. Diversified business interests allowed the development of a mixed economy and kept the region from being solely dependent upon coal (Workman 1992). In contrast, western Pennsylvania's corporate investors, often headquartered in large cities like Pittsburgh, Philadelphia, or New York, were more interested in extracting profits from the coalfields than in developing permanent businesses there.

By 1900, a growing number of owner associations and large corporations controlled significant sections of the region's coal lands. However, as Priscilla Long points out, the large corporations did not enjoy the degree of corporate control that was exercised by leaders in other industries, because "the resource was sufficiently scattered and the costs of entering the industry sufficiently low, at least at first, that the large companies could never entirely eliminate their smaller competitors" (Long 1989, 125).

Despite this observation, to say that independent operators continued to operate their mines in spite of the growing concentration of larger operations is not to imply that they were unaffected by corporate activities. Railroads and large companies exercised various levels of control over small operators, often using insidious methods that robbed them of customers and profits. For instance, by controlling the number of cars provided at a mine, railroads dictated the amount of coal a company could ship to market, directly affecting company profits. The practice of withholding coal cars indirectly eliminated customers for some companies, since customers could not depend on timely deliveries of coal from those mines.

Many consolidation efforts initiated in the coal industry resulted from attempts to control coal prices. Intense competition for markets led to chronic overproduction and a constant struggle to contain unregulated growth. In one such effort to control prices, operators of 140 southwestern Pennsylvania companies in 1899 merged their operations into two: the Pittsburgh Coal Company and the Monongahela River Coal and Coke Company (Long 1989, 120). Once formed, these companies became leading producers in the region. (The Pittsburgh Coal Company merged with Consolidation Coal in 1934 and created the largest bituminous coal company in the nation.) By 1910 the four leading bituminous coal producers in Pennsylvania were, in order, the following large corporate operations:

- H. C. Frick Coke Company
- Pittsburgh Coal Company
- Monongahela River Consolidation Coal and Coke Company
- Berwind-White Coal Mining Company

GROWTH OF THREE CORPORATIONS

This section contains discussion of three examples of corporate coal companies that were significant in the development of western Pennsylvania and northern West Virginia coalfields during the study period. Each company created its own place in the industry and played an important role in unchecked competition, creation of company towns, and labor struggles. In addition, each company realized enormous profits from its involvement in the industry.

The H. C. Frick Coke Company

After 1860, the Connellsville coke region of southwestern Pennsylvania became widely known for its high-quality metallurgical coking coal. By 1900 the H. C. Frick Coke Company dominated coal mining and coke production in the region.

H. C. Frick entered the coke region in 1871, invested in the Broad Ford and Mount Pleasant Railroad, bought 300 acres of coal land, and built 50 coke ovens. Frick continued operations during the 1873 financial panic, and with backing from Judge Thomas Mellon he was able to acquire small, ailing coke plants (Henderson et al. 1990, 252; DiCiccio 1992, 45). In 1882, Frick merged his coke operations with the Carnegie Steel Company.

The Frick/Carnegie agreement directly linked the Connellsville region with Pittsburgh capital as well as with national and international economies. As a result, the economy of southwestern Pennsylvania, especially in the Connellsville region, no longer was decentralized and locally focused. National and international economic trends now had an immediate effect on the region. During the economic depression of 1883 and the less severe recession of 1903, coke shutdowns caused the loss of jobs for hundreds of workers in this area.

Frick's association with Andrew Carnegie's iron and steel mills led to an industrial alliance that significantly affected both industries. Beyond the realization of enormous profits for both men from captive mines and coke works, corporate practices, especially a virulently anti-union attitude, emerged and endured well into the 20th century.

The Berwind-White Coal Mining Company

Especially well known for its Eureka smokeless coals and its development of western Pennsylvania's coalfields, the Berwind-White Coal Mining Company serves as one example of the evolution and growth of coal companies within the industry. This independent company was a top Pennsylvania coal producer in 1910. Unlike many of its competitors, the company refused to join owners' associations and consistently denied recognition of the United Mine Workers union.

Charles Berwind began what became a lifelong career in the coal industry at the age of 15. He worked for a Philadelphia coal merchant for several years, and by the time he was 30 in 1874, he had entered into a partnership and formed his first successful company, Berwind, White and Company. Charles ran the company until his death in 1890. His son, Edward, then became president and took over operations. Under Edward's direction, Berwind-White became one of the largest bituminous coal companies in the United States. Much of its renowned Eureka coal was widely used — from the New York City subway system to steamship companies working the trans-Atlantic trade (NPS 1989, Mulrooney, 51–52).

In 1874 Berwind, White and Company opened its first mine at Houtzdale, in Clearfield County. Other mine openings followed in Clearfield, Jefferson, and Centre counties. The company was incorporated as the Berwind-White Coal Mining Company in 1876. In addition, Berwind-White owned and operated storage bunkers along the East Coast and expanded its markets with the purchase of its own steamship line. Much of the coal in its trans-Atlantic trade was sold to France (NPS 1989, Mulrooney, 51).

Demand for Berwind-White steam and gas coal increased as the company built its reputation on a clean, high-quality product and prompt delivery. With the expansion of its markets and the exhaustion of some of the early mines, the company expanded its operations into Cambria and Somerset counties. Berwind-White opened 13 mines and built the town of Windber, which was established as the company's regional headquarters. Windber was advertised as a "model" coal company town, complete with miners' housing, company store, and central business district.

The company's control of workers' lives in Windber, as at its other mines, was considerable. Miners and their families were required to live in company-owned housing, shop at the company store, and refrain from union activity. Penalties for breaching company rules at times resulted in loss of a worker's job and eviction from company housing.

Like Consolidation Coal Company and the Westmoreland Coal Company, Berwind-White expanded its operations into southern West Virginia, and built Berwind, in McDowell County, which was a "model" town like Windber. In addition, Berwind-White owned and operated the New River and Pocahontas Consolidated Coal Company in the New River-Winding Gulf and Pocahontas coalfields. Berwind-White produced more than 4 million tons of coal from its Pennsylvania mines in 1910. By 1924 the company boasted a 2 million ton production capacity from its West Virginia mines alone (Keystone Coal Catalog 1924, 570).

Consolidation Coal Company

From its beginnings, Consolidation Coal Company (Consol) demonstrated the advantages of coal company mergers. Consol began as a merger of several small companies in the Georges Creek Region of Allegany County, Maryland, in 1864. Production figures were small for the first year (37,678 tons), but the company grew quickly, and by 1869 production exceeded 250,000 tons (Consol 1989, 3). In 1875, as Consol's production increased, directors of the Baltimore and Ohio Railroad acquired large blocks of Consolidation stock and gained control of the company.

For Consol, 1903 was a banner year for consolidating its coal interests. With the financial backing of the B&O, the company bought the Clarksburg Fuel Company in West Virginia and the Somerset Coal Company in Pennsylvania. In addition, Consol secured majority interest in the Fairmont Coal Company of northern West Virginia. The Watson-Fleming interests in the Fairmont coalfield had formed the Fairmont Coal Company early in 1901 in an effort to control coal prices and to diminish some of the intense competition in the region. Consolidation Coal Company purchased a majority of the Fairmont Coal Company after the death in 1902 of the patriarch of the Watson-Fleming group, James Otis Watson (Workman 1992, 22).

Consol became the second largest coal company in the world through its expansion program. Like Berwind-White, Consol operated mines in Somerset County, Pennsylvania, owned docking facilities on the East Coast, and purchased its own steamship line. In addition, as mentioned above, Consol expanded into West Virginia, and by 1911 had acquired thousands of acres of coal land in eastern Kentucky (Workman 1992, 25).

Consol continued its dominance in the soft coal industry until 1932, when uncontrolled competition within the industry, low coal prices brought on by the Great Depression, and renewed organizing efforts of United Mine Workers forced the company into re-

ceivership. The company was reorganized in 1934, then joined with the Pittsburgh Coal Company to become the Pittsburgh Consolidation Coal Company.

As Pittsburgh Consolidation, Consol weathered the worst of the depression years and, with the advent of World War II, increased production, and purchases of other companies began once again. This time Consol's expansion reached into the chemical industry of New Jersey. Later Consol expanded its efforts into Illinois and North Dakota, and in 1966 it merged with the Continental Oil Company (Conoco).

The history of Consolidation Coal Company is one of successful mergers, each consolidation effort coming at a time that led to the strengthening of the company and allowed it to continue mining efforts when smaller companies were unable to weather unsavory economic times.

Coal miners, lunch pails in hand, wait to enter the "cage" at the H. C. Frick Company's Collier Mine for the daily trip down into the mine.

THE UNITED MINE WORKERS OF AMERICA

The story of the men who worked in the coal mines and at the coke ovens is a story of the miners' struggle for an eight-hour day, fair wages (including a check weighman at the tipple), freedom from company control in housing and the company store, and the right to union representation. Invariably, the struggle between companies and the men they employed revolved around these issues.

After years of wage reductions and dishonest weights at the tipple, evictions from company housing, and payments due the company store, bituminous coal miners looked to the United Mine Workers of America (UMWA) to correct the injustices they suffered at the hands of unscrupulous and uncaring company owners and operators. The refusal of companies to recognize the UMWA as the

legitimate bargaining agent for the miners resulted in the violence and hardships that marked more than 50 years of labor struggle in the coalfields.

The UMWA was formed in 1890 from two rival organizations, the National Trades Assembly 135 (a unit of the General Assembly of the Knights of Labor, created in 1886) and the National Progressive Union (a splinter group of the National Federation of Miners and Mine Laborers, founded in 1885). Both groups had worked to organize coal miners and had met with a mixture of resistance, support, and mistrust from the miners. The Trades Assembly advocated an idealistic society of equality between labor and management and the abolishment of industrial capitalism. On the other hand, the Progressive Union had more practical approaches to labor's problems in the coalfields. Along with promoting citizenship as a means of political control, the Progressive Union called for the eight-hour day, a law requiring weighing before screening, payment every two weeks, abolition of company stores, and legislation to improve safety at the mines (Long 1989, 149).

After years of disagreement and defeats due to splits within the ranks of both organizations, the two groups met in January 1890, agreed to resolve their differences, and formed a new union, the United Mine Workers of America. The constitution written at the convention stated the group's aims and promoted the cause of unionization and education throughout the nation's coal industry:

> There is no fact more generally known, nor more widely believed, than that without coal there would not have been any such grand achievements, privileges and blessings as those which characterize the nineteenth century civilization, and believing, as we do, that those whose lot it is to daily toil in the recesses of the earth, mining and putting out this coal which makes these blessings possible, are entitled to a fair and equitable share of the same. Therefore, we have formed "The United Mine Workers" of America, for the purpose of the more readily securing the objects sought, by educating all mine workers in America to realize the necessity of unity of action and purpose, in demanding and securing, by lawful means, the just fruits of our toil. (Preamble, "Preamble and Constitution of the United Mine Workers of America," quoted in Evans 1918).

Since its start in 1890, the UMWA union has struggled to represent the miners of the nation. Throughout the study period, the union met with violent resistance from coal companies, suffered decline in its membership between 1925 and 1927 that almost destroyed the organization, and then realized an unprecedented recovery and gained new power under the New Deal of the 1930s.

COMPANY OPPOSITION TO UNIONS

Industrywide recognition of the UMWA was not automatic with the founding of the union. Pennsylvania operators resisted organization at their mines and blamed the nonunion coalfields in southern Appalachia for low coal prices and diminishing profits. Producers in the nonunion fields of the south had a lower wage scale than the Central Competitive Field (CCF) — Illinois, Indiana, Ohio, and western Pennsylvania — of the north. Low wages, coupled with preferential freight rates, gave southern operators an edge in the highly competitive and overproductive bituminous coal industry. Northern producers, although aware of the stability that an industrywide wage rate could bring, claimed that they could not compete with nonunion wage rates and tried to destroy the union.

Without the union, northern operators could also reduce miners' wages and remain competitive with the southern fields. Because wages represented up to 65% of the cost of coal mining, in times of low market prices, companies invariably reduced wages in order to maintain high profit margins. Workers, for their part, struggled to maintain what small gains they did receive through union negotiations. In 1898 miners established uniform wage rates with producers in the Central Competitive Field but failed to get the same from the expanding industry in West Virginia. The conflict between the northern and

southern producers resulted in hardships for miners in the north as they struggled to resist the operators' assaults on the union.

THE STRUGGLE CONTINUES

The period 1890–1920 saw tremendous growth in the coal industry. As Morton Baratz has observed,

> the volume of output increased fivefold. Employment tripled. The number of active mines more than tripled. Output per man-day rose from 2.5 to 4 tons. Coal mined by machine rose from 5% of total output to more than 60%, and the efficiency of cutting machines was steadily improved. (Baratz 1955, 46)

This growth brought intense competition between coal companies for markets, overproduction that resulted in fluctuating coal prices, periods of unemployment in the coalfields, wage reductions, and lockouts and strikes as operators and unions struggled for control.

On April 21, 1894, UMWA President John McBride called for a nationwide strike to deplete overstocking of Pennsylvania coal so as to raise coal prices and wages. Southwestern Pennsylvania's entry into the strike began at Oliver, a nonunion mine where the miners had not been paid for three months. The miners organized and called upon the UMWA and the American Federation of Labor for support (Brestensky 1991, 24). The strike was bitter and violent in Pennsylvania but ended without gains for the miners.

World War I moderated some of the problems of the coal industry as production boomed for the war effort. Miners agreed to a moratorium on strikes during the war (the Washington agreement) but found their negotiations for new contracts blocked by government decree and coal company efforts after the war ended. As demand for coal slackened and coal prices fell, operators closed some operations, laid off miners, and reduced wages in an effort to maintain profits.

A strike in 1919 involved thousands of angry miners, "According to the United States Bureau of Mines, 418,279 mine workers, representing 76.2% of all bituminous employees, tied up 71% of the country's coal-producing capacity" (Korson 1965, 396). Despite efforts of union leaders to call off the strike (they had been threatened with injunctions), miners refused to give up the strike. When agreement was reached between the workers and the companies, wage rates were set at the 1917 prewar level.

Coal prices continued to fall in 1920, and companies, desperate to cut economic losses, enforced wage cuts against contract agreements. Northern producers cited competition from nonunion fields as their justification for wage reductions. However, it must be remembered that demand for coal during this period was slowing because the use of alternative fuels was increasing.

In 1922 the miners fought back again. The UMWA called a strike for April 1. Once again more than 65% of bituminous workers joined the strike, including the nonunion workers of the Connellsville coke region and Somerset County. When companies tried reductions in various mining schedules, even anthracite workers joined the strike. That brought the total number of coal workers on strike to more than 618,000 (Korson 1965, 397).

During the 17 months of the strike, miners and their families were evicted from company housing; tent cities became the homes for thousands; and children died in the cold as the strike dragged on through winter. Operators hired strikebreakers (scabs), anyone willing to work for low wages, and appealed to the secretary of labor for an injunction to force the men back to work. However, those efforts failed, as seemingly nothing could get the determined miners and their families to give up their union demands (Cooper 1991).

In northern West Virginia's Fairmont field, the strike lasted five months, and as Workman noted, "many of the independent companies, especially the smaller ones, were able to

convince their employees to work at the 1917 scale. The Fairmont field remained virtually a closed-shop until 1924." (Workman 1992, 130). Conditions at this time in the Fairmont field appear to have been less antagonistic than those in neighboring Pennsylvania.

In August 1923, District 2's executive board officially ended the Somerset County strike. (District 2 included Clearfield, Centre, Jefferson, Cambria, Huntingdon, Bedford, Somerset, Blair, and Indiana counties.) UMWA president John L. Lewis orchestrated the agreement that returned the miners to the mines and restored 1917 wage rates. John Brophy, president of District 2, criticized Lewis for deserting thousands of new union members. Wage agreements between the union and coal companies excluded miners who had joined the union after the start of the strike. The miners gained nothing by their support of the union and felt betrayed and abandoned by Lewis's actions.

The strike of 1922 was not a successful strike, especially for nonunion workers in western Pennsylvania. John Brophy addressed his fellow miners and their families after the agreement was signed, saying that although "an opportunity had been missed, the like of which could not be expected again for years, the strike was an inspiring demonstration of the heights of self-sacrifice and devotion that ordinary people can attain for a noble cause" (John Brophy, as quoted in Cooper 1991, 17). Miners went back to work, many disillusioned and critical of the union and its perceived failures.

In 1924 Lewis again bargained with coal operators, this time claiming that the union would take "no backward step." At Jacksonville, Florida, he arranged an agreement with the operators of the Central Competitive Field that set the wage rate at $7.50 a day base wage for skilled workers (Johnson 1970, 118). The agreement was short-lived, however, as companies again felt they needed to cut prices to remain competitive with southern producers. Lewis refused to renegotiate the "Jacksonville agreement," and Pennsylvania's operators once again set out to destroy the union.

The Pittsburgh Coal Company, a union company for more than 30 years, changed management as Andrew and Richard Mellon assumed control of the company. The new antiunion managers closed their mines and reopened as nonunion in 1925, refusing to pay the Jacksonville rate (they paid $6 base). Other companies followed suit and started a prolonged, violent struggle that lasted until 1928. By then, Lewis and the UMWA miners were steadily losing ground. This was due in part to the power of the companies and in part to the general economic downturn of the nation's economy. Between 1928 and 1933, the UMWA and the miners reached the lowest point of their struggle. In Pennsylvania, few companies recognized the union, and no major operator associations signed agreements. (Johnson 1970, 118).

DEPRESSION AND THE NEW DEAL

The Great Depression brought an unexpected and still not completely explained resurgence of union membership and vitality. John L. Lewis, with renewed energy, set about to revitalize his organization. He appointed Philip Murray to head the Pennsylvania campaign. Murray was well liked by the miners, and because conditions were so difficult in the coalfields, they listened and supported him. Despite confrontations with the Pittsburgh Coal Company and others, Murray continued his organization efforts through the spring of 1933. Workers at commercial mines flocked to the union, and with the passage of the National Industrial Recovery Act, with its famous section 7a, the union received the support of the government in its organizing efforts (Johnson 1970, 121).

Section 7a of the National Industrial Recovery Act provided that employees

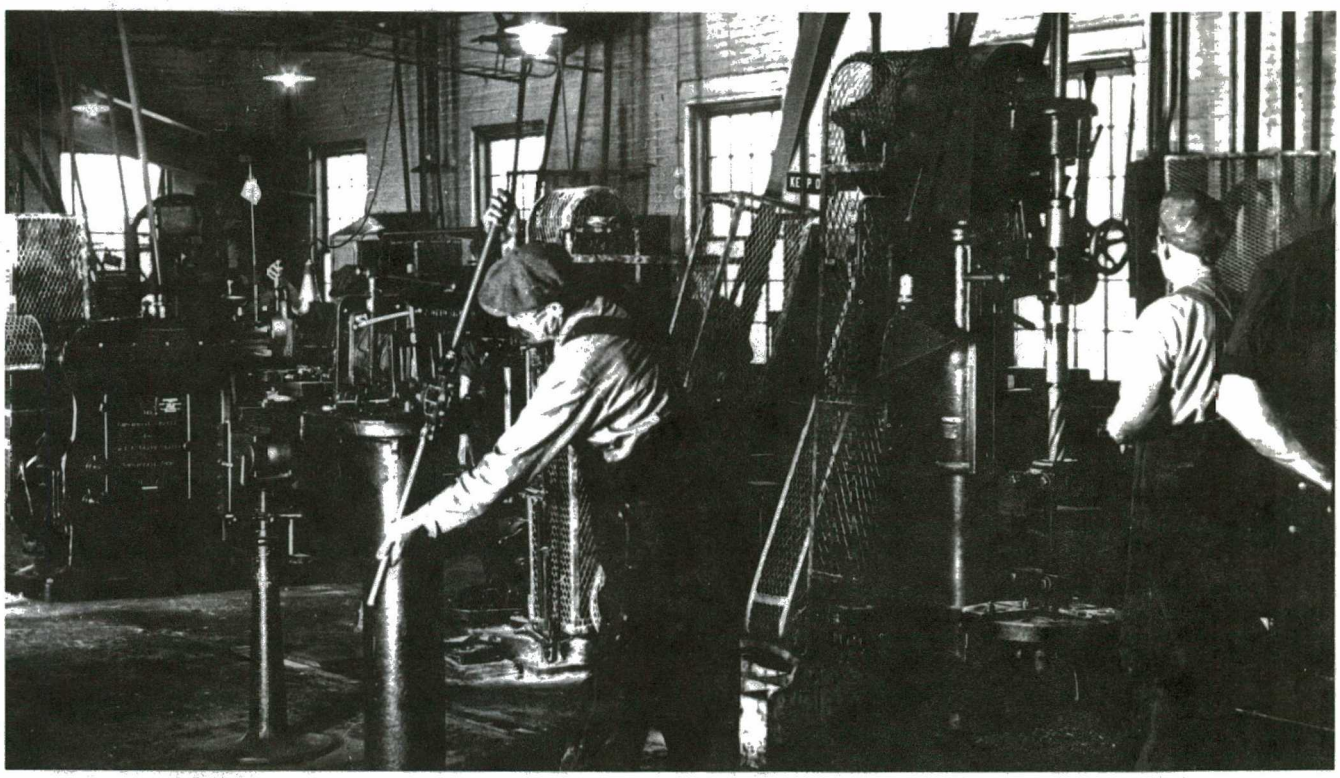
> shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other

> concerted activities for the purpose of collective bargaining or other mutual aid and protection (as quoted in Johnson 1966).

The act was the boost the union needed. By pressuring industries to draft codes of fair competition, the National Recovery Administration opened the way for UMWA to change old negotiating patterns from the Central Competitive Field to a new inclusive north-south field. The Appalachian wage agreement of September 21, 1933, "covered three hundred and forty thousand miners, provided for the eight-hour day and forty-hour week, the election of checkweighman (a crucial figure who checks the weight of cars coming from the mine and thus tries to insure honest payment for the miners) and pit committees, and the check-off for union dues" (Johnson 1966). In addition, the agreement abolished child labor in the mines and put in place policies for handling labor disputes. The agreement was signed and was in force from October 2, 1933, to March 31, 1934.

John L. Lewis and the UMWA miners had at last brought some semblance of order to the bituminous coalfields. Operators in general agreed that the new stability in the industry was long overdue, and most commercial mines agreed to recognize the right of miners to organize. However, as Johnson also points out, miners and coke workers in the Connellsville coke region worked for "captive" operations and were unable to benefit from the new union revival.

The captive mines and coke works of U.S. Steel led the opposition to unionization at their works. The H. C. Frick Coke Company countered UMWA efforts by establishing two company unions. The Workman's Brotherhood (supported by the Ku Klux Klan) and the Miners' Independent Brotherhood were run in large part by George Reynolds, a man determined to rid the nation of the "red menace". The H. C. Frick Coke Company and other operators of captive mines continued to thwart unionization efforts until World War



Buffington Machine Shop, c. 1940. Support industries were a vital part of coal and coke operations. Skilled machinists fabricated replacement parts for broken mine equipment.

II, when at last the captive mines were brought into the solid fold of the UMWA (Johnson 1970, 128).

SUMMARY

The history of the labor struggles in the bituminous coalfields of western Pennsylvania and northern West Virginia is the story of workers' attempts to control their working lives. The miners strove to increase wages to provide adequate food and clothing for their families, to secure the right to be represented in wage and policy negotiations by the UMWA, to make safety a priority in a dangerous industry, and to ensure equal treatment of all miners in the coalfields.

The history of the labor struggles in this area also is the story of the development of the coal industry, its competition, overproduction, and employment of thousands of workers. The key to understanding the complexities of the story lies in the interactions between coal companies and workers, between skilled and unskilled, native and foreign-born workers, between union and nonunion fields.

The development of the bituminous coalfields was dependent on the labor of thousands of miners and coke workers. Their work resulted in the expansion of industries around the world. The coal industry fueled America's industrial revolution and the workers in that industry were responsible for the many innovations and improvements in labor-management relations achieved during the long years of labor struggles.

Children from Standard pose for a picture at the community playground. Children from the patches made toys and used their rich imaginations to make up games like "caddy," "socky ball," "lay-low sheepy," or "hoops." (Dennis F. Brestensky, Evelyn A. Hovanec, and Albert N. Skomra, *Patch/Work Voices: The Culture and Lore of a Mining People* — Pittsburgh: University of Pittsburgh Press, 1991, 53-54.)

INTRODUCTION

The story of the rapid growth of the beehive coking and coal mining industries encompasses much more than technology. The importance of technology must be measured in relation to its impact on communities. The people in coal and coke towns encountered a range of experiences unique to the period and location of these industries.

Capitalists established company towns to have workers near the mines. From the companies' perspective, the purpose for these communities was exclusively the extraction of coal and its preparation for shipment out of the region. They placed short-term company profits ahead of long-term development of stable communities. As a consequence, coal and coke companies removed immense wealth from the region but "invested only grudgingly in local wages and infrastructure" (Demarest and Levy 1991, 104).

Once capitalists realized that coal was running out and that greater profits could be made elsewhere, they abandoned these company-created communities. Corporations

could simply move their capital investments, but residents of these towns remained behind to deal with a situation essentially fabricated by others.

In an attempt to maximize profits, capitalists strove to run the company towns efficiently. Low wages, the use of scrip, company stores, and company houses all increased a company's earnings while minimizing not only the earnings and savings of laborers and their families, but also their freedom. The companies tried to control residents' lives through private police, religious establishments, leases, and, ultimately, coercion.

Despite the extent of company influence, companies could not control every part of residents' lives. Areas such as social occasions, recreation, fraternal organizations, and daily gatherings essentially remained outside the reach of companies. The degree of company control varied from town to town, depending on a variety of factors, including location, when the town had been established, and ownership. The manner in which inhabitants dealt with this environment daily in the 19th and 20th centuries constitutes the foundation of the coal and coke story.

IMMIGRATION

Development of coal mining and coking facilities in western Pennsylvania and northern West Virginia beginning in the 1870s eventually altered population characteristics. Initially, the work force for coking operations consisted of local residents from nearby farms and towns. These workers of English, Welsh, Irish, Scottish-Irish, and German descent filled the labor needs of the early beehive plants. However, this arrangement did not last; as mentioned earlier, the rapid growth of the industry and the remote location of new coke operations quickly surpassed the local labor supply. As coking facilities became too big, too numerous, and too isolated for the rural populations of western Pennsylvania and northern West Virginia, capitalists began recruiting immigrant workers.

Other reasons capitalists encouraged immigration were to curtail labor organization and to reduce wages. As early as 1880, the *Keystone Courier* warned that "importation of foreign labor would certainly be detrimental to the interests of both operators and [native] miners" (Enman 1962, 201). Three years later, when western Pennsylvania miners struck in opposition to a pay reduction, coke operators tried to recruit Hungarians and northern black workers as replacements (Evans 1918, 111; Demarest 1992, 10). The initial recruits refused to break the strike, but eventually a company-sponsored group defeated the work stoppage. Most immigrants did not act as strikebreakers, but the constant flow of new arrivals into coking regions, encouraged by the companies, created a surplus of labor, which weakened attempts to organize workers (Long 1989, 127–129).

Immigration patterns changed in the latter half of the 19th century. Before 1880, most U.S. immigrants originated from northern and western Europe, but beginning in the 1870s, an increased number of southern and eastern Europeans arrived. Twenty years later, a majority of new arrivals were southern and eastern Europeans, and by the first decade of the 20th century they accounted for 70% of the immigration (Tindall 1988, 825–826).

The expanding coal and coke industry attracted many of the new immigrants, especially different ethnic groups classified then as "Hungarian." Before 1900 most of the workers were single men between the ages of 19 and 35 (Marchbin 1940, 163–165). Most of them intended to return to their homelands after a temporary stay in the United States. Some hoped to stay for years, eventually earning enough money to establish a farm or business back in Europe. Others returned home annually (Beik 1989, 125–126).

For a variety of reasons, including the outbreak of World War I, approximately two-thirds of these immigrants decided to remain in the United States (Beik 1989, 126). By 1921, "nativism" led to the restriction of southern and eastern European immigration in favor of

northern and western Europeans. Americans justified these limitations through "pseudo-scientific racism" and by linking the new foreigners with radical politics, especially communism (Tindall 1988, 1028–1029).

Immigrant laborers crossed the Atlantic for many reasons. A population boom and land shortage in Europe impeded many families' ability to produce enough food. In the decades following the 1848 emancipation of serfs, landownership became more concentrated. Compounding this situation were discriminatory policies by governments against various ethnic groups, including Slovaks, Galicians, and Jews (Beik 1989, 108–111).

Meanwhile, the Industrial Revolution began to pick up speed in the United States after the 1873 depression, and laborers were needed to work in factories, to dig coal, and to produce goods for the expanding economy. Immigration decreased when the booming economy contracted during depressions, as in 1894, only to rise again with economic expansion.

As related earlier, companies actively recruited immigrants. For example, the Berwind-White Coal Mining Company sent representatives to eastern port cities to recruit recently arrived workers (Beik 1989, 145). Farther south, in the Connellsville region, special passenger trains carried the influx of new arrivals (Enman 1962, 293). Someone was sent to meet the people who "came with tags on their coats" showing "their name and where they were going" (Brestensky, Hovanec, and Skomra 1991, 5).

Residents of the Connellsville region considered southern and eastern Europeans a threat to their way of life. Protestants of German, English, Welsh, and Scottish-Irish descent had dominated southwestern Pennsylvania. The majority of the recent immigrants were of the Roman Catholic faith, and Protestants feared that Catholicism would undermine democracy and that local priests would exert too much control over parishioners. One Protestant reformer asserted that the Catholic Church "could do almost anything with these people" (Maclean 1909, 350).

Suspicion of newcomers went beyond religious differences; it included racial hostilities. Americans of northern and western European descent viewed southern and eastern Europeans as an inferior group. It was not uncommon for residents to believe that immigrants "brought over to this country the manners and customs of a lower civilization" (Maclean 1909, 247). The *Punxsutawney Spirit* clearly reflected this prejudice when it gave more coverage to a dog's injuries than to the death of an immigrant (NPS 1987, Snyder, 11–12).

Local workers contributed to bigotry by blaming new arrivals for "degrading American labor" (Sheppard 1947, 47). Racial tensions ran so high during the mid-1890s that Hungarian and Slovak communities in the Connellsville region made plans for a mass exodus to Canada and later to Arkansas (Sheppard 1947, 59). These plans never materialized, but the extreme actions that were contemplated illustrate the extent of hostilities between northern and western European descendants and southern and eastern European immigrants.

Antagonism went beyond general animosity between residents and new arrivals. Immigrants brought with them their own ethnic and religious prejudices, which had created division among the emigrating populations for generations. Yet because Americans generally lumped these diverse groups together with inaccurate or racially derogatory terms, cultural, linguistic, religious, and geographic differences often went undetected. For example, the census classification of "Hungarian" encompassed not only Hungarians, but Slovenians, Germans, Croatians, and Slovaks, to name just a few (Marchbin 1940, 163). As a result, the ethnic composition of a community was often much more diverse than perceived by Americans (Beik 1989, 76–86).

Differences also could exist within a particular ethnic group. Many immigrants were associated with a specific geographic area; for example, Italians identified themselves as not

just Italian, but as being from northern Italy or from Sicily (Beik 1989, 94–95).

Ethnic groups could be separated by religion, as well: Roman Catholicism, Judaism, Protestantism, and Orthodoxy all distinguished a person into an even tighter community. For example, there were Protestant and Catholic churches for Hungarians, which were separate from those of other ethnic groups like German or Irish Catholics or Slovak Protestants. Priests from the homeland continued to minister to and teach the immigrants in their own languages and cultures (Marchbin 1940, 170-171).

Divisions materialized between different ethnic groups and within each group in living arrangements in company towns. New arrivals initiated some of this ethnic and racial segregation; living near someone who came from the same region or spoke the same language provided some comfort and strength in a strange environment (Enman 1962, 202). However, coal and coke companies exploited and perpetuated divisions to maintain a divided work force. Depending on the size of the town and the makeup of the work force, the hierarchy of company housing followed the prejudices described above: workers of northern and western European descent were given the best housing, followed by southern and eastern Europeans, who lived in better conditions than blacks. Mexican immigrants occupied the most dilapidated housing (Korson 1965, 32; Mulrooney 1991, 33; Demarest and Levy 1991, 105).

COMPANY TOWNS

Coal and coke companies constructed entire towns, especially after about 1880, to house the work force necessary to extract and coke the coal. These towns consisted of homes for workers and company superintendents, a company store, mining and coking operations, and often churches. This arrangement enabled companies to control workers and their families as well as to make a profit from rents and from goods purchased at the company store. Since many company towns lay outside of any local political jurisdiction, companies were able to run them without interference.

Much of the literature on coal and coke company towns focuses on isolated communities removed from neighboring towns or larger urban centers. However, as Workman points out, many company towns in West Virginia's Fairmont Coal Field were not so isolated. Workman explains that some company towns were near existing communities. He goes on to argue that, because of the diverse economic structure of northern West Virginia, job opportunities in those areas were more varied than in isolated company towns. The coal and coke industries never dominated the area to the extent that they did the Connellsville region. Location near another town and available employment unrelated to coal and coke deflated a company's ability to control residents, according to Workman (1992, 64–71).

The concept that a company's influence may have been dampened by diverse economies along with a location near an existing town needs to be explored further. Workman has only scratched the surface with his research; a more in-depth analysis is needed. Most company towns in southwestern Pennsylvania were in isolated settings; nevertheless, a number of coal and coke communities were near Connellsville and Uniontown. Thus, the effect of urban service centers in Pennsylvania needs to be investigated. Because there is a wealth of information about isolated company towns and little about towns near other towns, this section is essentially a discussion of remote coal and coke communities.

Company towns differed from each other to some degree depending on geography, but generally they were characterized by a few basic patterns. Companies built towns as close as possible to coal and coke operations. A town's location was determined by the size of the valley floor, which usually contained coke ovens, water to quench the ovens, and railroads to transport the coke. If the valley was too small, the town occupied a hillside or

hilltop just above the mining and coking operations (Enman 1962, 234–251).

Since towns were constructed to facilitate extraction and coking of coal, employees' homes, regardless of the period of construction, tended to be designed with little imagination. Initially, companies housed workers in multiple-unit dwellings resembling barracks. Single men or groups of families occupied these buildings, which often had no dividing walls. These structures provided no privacy for family members, and when more families began to come into the coking region after the turn of the century, the two-family dwelling became the dominant housing structure. These two-story buildings consisted of "four rooms to a side, two upstairs and two down" (Enman 1962, 225). The two upstairs rooms served as bedrooms; downstairs were a kitchen and a parlor. Tenants often housed boarders in the two bottom rooms.

Low-quality building materials and the bare necessities characterized the construction of workers' homes. The houses had no basements, foundations, or insulation, and often clapboards were absent (Maclean 1909, 334). The houses were terribly cold and drafty in winter — weatherboards or clapboards, when installed, furnished the only protection from the weather. Heat from fireplaces and kitchen stoves was unsuccessful at warding off the cold. One former patch resident described trying to scrub the kitchen floor and seeing the water freeze before she could wipe it away (Brestensky, Hovanec, and Skomra, 1991, 41).

Company houses were painted red or green on the outside, creating a monotonous environment. A rough layer of lath and plaster coated the interior walls (Mulrooney 1991, 32). Running water, indoor bathroom facilities, and electricity were all absent from workers' homes. Residents got water from faucets or hydrants, usually only three or four per town, located outside the homes (Maclean 1909, 334). Generally a double outhouse stood behind each two-family dwelling. At first, candles and kerosene provided the only lighting. Later, after the turn of century, companies sold excess electricity to residents with wired houses. The mines generated their own electricity and sold the surplus power to workers (Korson 1965, xii).

In addition to workers' houses, companies built homes for superintendents. These dwellings were of a better quality than workers' houses. Made from brick or stone rather than wood, the homes of company officials had larger kitchens, parlors, and bedrooms, closets, cellars, steam heat, and indoor plumbing, as well as a full bathroom. Superintendents' houses not only had more rooms, they also had larger yards (Mulrooney 1991, 32).

Located closest to the mines or coke operations, a prominent position, the higher-quality management homes reinforced the ethnic/racial divisions with class distinction. The proximity of a house to the mine reflected not only the person's ethnicity, but also the level of employment. Mexican immigrants and blacks who lived farthest from the mines and coke ovens not only occupied the worst housing but had the lowest-paid and most dangerous jobs; at the other end of town (and the economic scale), skilled Americans of northern and western European descent lived closest to the mine, in the best housing, with the highest-paid jobs (Enman 1962, 200).

Companies controlled where and in what type of housing a person lived, but the one thing that owners could not dictate was the way the wind blew. At one time or another, depending on the day's wind direction, dust and smoke produced from coking and mining encased every inhabitant, regardless of ethnicity or class. Coke ovens burned daily, year-round, "belching smoke and flames and soot." One resident of Watson, Pennsylvania, described how people "inhaled acrid fumes with every breath and tasted the gritty soot with every swallow" and "[t]heir homes, once a gaudy red, were a drab and dirty gray" (NPS 1987, Snyder, 11). Other statements support this seemingly exaggerated assertion (Sheppard 1947, 1; Massay 1970, 204). The dust and sooty smoke infiltrated homes and other

Leisenring No. 2 coke ovens and patch community, Connellsville Coke Region. Companies built workers' housing near coal and coke operations. The patches filled with smoke and cinders from the ovens, adding to already difficult living conditions.

buildings, leaving a thin film on rugs and wallpaper, inside bureau drawers, and in people's hair and food (Sheppard, 1947, 5; Smith 1986, 130). Ironically, location of management's houses near work areas placed them in a highly polluted position, yet its prestige and convenience outweighed the drawbacks (Enman 1962, 265–266).

Despite an environment of pollution and control, company towns offered some advantages for workers. As related earlier, immigrants often were able to live near people from similar backgrounds, and companies offered immediate employment and housing to newcomers who needed both. The proximity of the patches to the mines and coke ovens meant that laborers walked to work. This was especially important in winter, when miners emerged from the warm underground with wet clothing — if the walk home was too long, clothes would literally freeze on the miner (Brestensky, Hovanec, and Skomra 1991, 41). Fortunately, company housing was close enough to prevent this problem.

COMPANY ATTEMPTS TO CONTROL WORKERS

Company control penetrated residents' daily lives in a variety of ways and to varying degrees. As mentioned earlier, residents underwent a wide range of experiences in company towns, and not all the practices mentioned below pertained to every patch. Yet profits were the basis for company control. Restrictive rental contracts, company stores, the use of scrip, evictions, control of churches, and the Iron and Coal Police all reinforced the company's dominance over men, women, and children. Although their policies essentially

denied basic civil rights to some communities well into the 20th century, companies' attempts to control residents were never completely successful. Despite large amounts of money, time, and energy expended to restrain people, residents regularly managed to avoid company rule.

The use of company scrip, or company currency, was one of the earliest forms of control. Many companies printed and often coined their own currency, which was used to pay workers. Scrip generally could be redeemed only at the company store, although some other retail stores would cash scrip at a discount (Diciccio 1992, 51). This system forced workers to buy necessities at the company store, which charged higher prices than stores in town. H. C. Frick introduced the use of scrip, the "Frick Dollar," in western Pennsylvania during the panic of 1873 both to free up capital for his continued expansion and to increase profits at his store. Frick no longer had to tie up precious cash for payday — especially important during this period of contracted money supply. Thus scrip created a captive market for the company store (Henderson et al. 1990, 253; Korson 1965, 72).

Eventually companies discovered that the use of scrip was not necessary to create a monopoly for the company stores. Instead, harassment and coercion of workers to buy goods at the company store effectively accomplished the same result without the expense of printing or coining money. One such method linked daily job assignments to the amount of goods purchased at the company store. If a laborer or his wife bought everything from the company store, then the worker was assigned to a relatively easy job. Management assigned difficult and dangerous tasks to workers who went to town for goods, or even blacklisted them (Brestensky, Hovanec, and Skomra 1991, 47–48; Salstrom 1992b, 44). In some places, company spotters or even train conductors informed on residents who carried goods into company towns (Beik 1989, 390). This system of forced patronage angered workers and their families. One laborer recalled that "you owed your soul to it [the company store] because you had to spend all your earnings at the store or you would lose your job" (Brestensky, Hovanec, and Skomra 1991, 47).

In some communities, the company store could not maintain such a captive market. Workman suggests that in patches located near existing communities, coal and coke operators were unable to force residents to shop at the company store (Workman 1992, 69). At the turn of the century, trolley systems in both northern West Virginia and western Pennsylvania linked coal and coke communities with urban service centers. For example, a network of trolley lines gave residents access to stores and services in Connellsville. The impact of this transportation system has not been researched, but the convenience of trolleys must have lessened the hold of company stores.

Housing was another area in which companies exerted control over residents. As previously mentioned, companies determined where workers would live and in what kind of house. But the family did not escape the grasp of the company after moving in. Living in company housing was contingent on employment, and employers took advantage of this fact to minimize union influence. Management fired and blacklisted laborers for union activity or other reasons. Once unemployed, the worker and his family had to vacate the house "immediately" (Massay 1970, 199; Smith 1986, 145–146). During strikes, companies used this power to evict families and to house strikebreakers in the company housing.

Even on a daily basis workers experienced the company's influence in their homes on a very physical level. Rent consumed at least a quarter, and usually much more, of a worker's piecework pay, depending on pay scale, days worked, and amount produced (Sheppard 1947, 45–46). To meet expenses, many immigrants took in boarders, sometimes as many as 20 in a four-room unit (Enman 1962, 255). Companies made a practice of entering workers' homes night or day without warn-

ing. Officials of the company could even control the visitors to a miner's home (Korson 1965, 34). If the company did not approve of a guest, he or she was not allowed to enter the company town.

Enforcing the company's will in these matters were individual company police forces and the Coal and Iron Police. While technically the two groups were separate, in reality both forces consisted of armed thugs hired by coal and coke companies to protect their interests and not the rights of residents. The 1865 Railroad Act of Pennsylvania established the legal framework for the Coal and Iron Police. This legislation essentially allowed companies to bring in large numbers of highly armed men, shotguns, tear gas, and later machine guns to quell strikes and other disruptive group activities (Shalloo 1933, 59, 128). Meanwhile, company police forces managed day-to-day repression of residents.

Because company towns existed in unincorporated areas, both police forces operated basically unrestrained into the early 1930s. Their brutal actions clearly reflect this situation (Sheppard 1947, 110, 120). During a strike in the late 1920s, one mother testified that police had shot into a group of school children (Sheppard 1947, 113). Police abuse also extended to immigrants who "raised trouble," as the police would, according to one officer, "Ride in and scoop 'em up and beat the hell out of them" (Smith 1986, 144). Company police forces controlled access to company towns through a pass system that required a police-issued permit to enter or leave the town (Korson 1965, 37; Sheppard 1947, 109). Finally, since the police could enter a home at any time unannounced, many women were raped. These criminals went unpunished despite knowledge of their identity and actions (Cooper 1991, 14).

Company control even reached religious organizations. Through contributions in the form of land and money, coal and coke companies generally kept a firm hold on both Protestant and Catholic churches. When they gave land to churches, companies placed deed restrictions on the future use of the land. For example, the Berwind-White Coal Mining Company included a clause in the deed to St. Anthony's Roman Catholic Church that read, "It is expressly understood that the said lot #1055 is to be used for church purposes only." This clause and similar clauses allowed companies to prevent union or political meetings from being conducted on donated church property. Similar restrictions can be found in deeds for Presbyterian, Methodist, Episcopal, and other denominations. Direct financial contributions also strengthened the churches' support of company policies. As a result of donations, religious leaders praised company practices at various celebrations (Beik 1989, 230–239; NPS 1987, Snyder, 14).

Despite powerful company control, a few congregations and religious leaders resisted company influence. The Slovak Catholic Church in Windber avoided the restrictive deed by purchasing a site from an independent landowner (Beik 1989, 227). In Westmoreland County, the Rev. Michael Tusek of Our Lady of Sorrows was arrested for allegedly encouraging the men not to work. Father Tusek said he "wanted to make them [Westmoreland Coal Company] understand that by a donation to the church they do not and cannot buy the priest's body and soul" (Smith 1986, 151–152). As late as 1927 in Rossiter, Pennsylvania, a court issued an injunction against the Magyar Presbyterian Church for singing in the church during a strike (Korson 1965, 52). The examples above depict the extent to which owners controlled residents, despite some exceptions to the rule of company control of churches.

As a result of restrictions on basic individual rights, residents of coal and coke communities lived with the ever-present fear of poverty. Having little control over their communities, residents experienced two forms of hardship: periods of intense poverty and the constant threat of poverty. When emergencies occurred, families had few options to remedy the situation. Company policies could not possibly have prevented every type of pover-

ty; nevertheless, they intensified the consequences of poverty for individual families.

Disease produced some intense periods of economic hardship for workers' families. For example, influenza devastated the town of Wishaw, Pennsylvania, in Jefferson County in 1918 and 1919. The local school served as a makeshift hospital, and bodies were stacked in a barn until burial (NPS 1987, Snyder, 19–20). Of course coal and coke companies were not directly responsible for epidemics, but some of the conditions in company towns contributed to their frequency. For instance, the water supply in many company towns was reported to be "bad and typhoid fever not uncommon" (Maclean 1909, 335).

The coking region was not immune to international economic depressions, either. During the 1930s, some miners and families lived in abandoned coke ovens (Smith 1986, 138; Sheppard 1947, photos between pp. 110 and 111). With a few modifications, the light-deprived ovens provided at least some protection from the elements.

The inadequate shelter of coke ovens was a step up from the living conditions experienced by workers and their families during strikes, the final example of sudden intense poverty. Sadly, children were the ones most affected by strikes and company responses to them. When a company evicted striking workers, families lived in union-provided tents or in henhouses, cow sheds, and cellars of sympathetic farmers (Cooper 1991, 16). During strikes in Westmoreland County in 1911 and Somerset County in 1922, families lived in these inadequate shelters in winter. At the same time, meat and clothing became scarce (Cooper 1991, 12; Smith 1986, 165–166). A total of 120 babies died in a tent camp near Latrobe in 1911 from malnutrition and exposure (Smith 1986, 165–166).

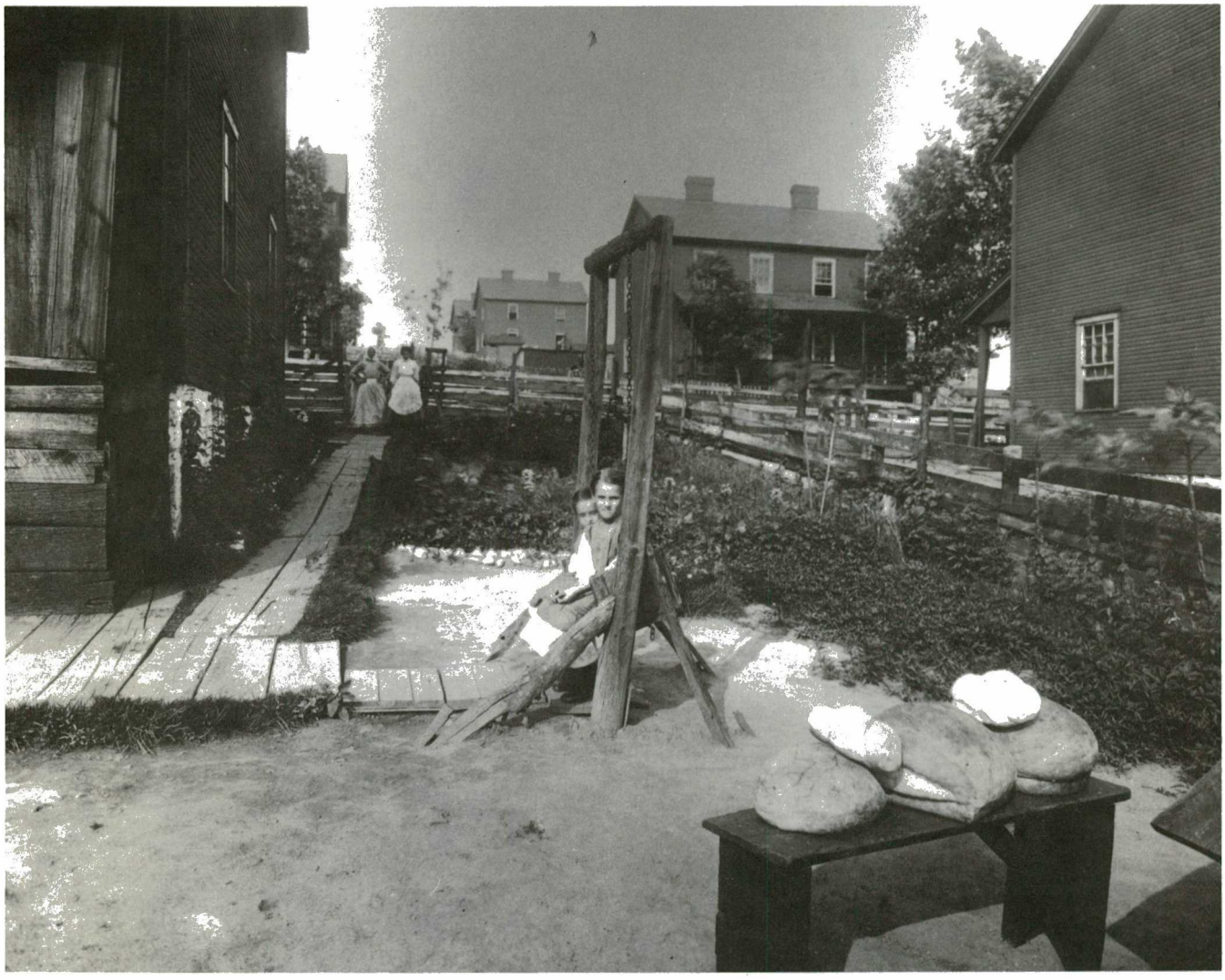
Discussion of poverty often is limited to occurrences such as those described, which affected large numbers of people. However, poverty and the threat of poverty existed daily, slowly chipping away at a family's fragile security. Low wages laid the foundation for families' economic vulnerability. In the 1920s a miner sometimes had "to work fifteen or sixteen hours, and only made a dollar" (Brestensky, Hovanec, and Skomra 1991, 8). Low wages prevented any substantial accumulation of family savings for emergencies.

An emergency that families most feared was the death or injury of the breadwinner. Since job opportunities for women were limited in patch communities, families relied heavily, although not completely, on wages earned by the males in the family. If this income was interrupted for any reason, the family quickly felt an economic squeeze. Before workmen's compensation was established, coal and coke companies did not reimburse laborers or their families for on-the-job injuries or death (Smith 1986, 127).

Coking and coal mining are dangerous occupations in which hundreds of workers have been killed and maimed since the late 19th century. From a nationwide work force of 18,570 in beehive coke ovens in 1916, 1,866 nonfatal injuries and 24 fatal accidents were reported. The majority of the accidents resulted from falls, falling objects, and use of haulage equipment (Bur. Mines 1959, 3, 15). In mining, roof cave-ins, gas and dust explosions, and transporting coal up to the tipple accounted for most accidents (NPS 1991a, Quivik, 53). Mining accidents often included many casualties; for example, 109 men were killed in the Mount Pleasant explosion at Mammoth Mine in 1891; more than 200 lives were lost in the 1907 disaster at Darr Mine at Jacobs Creek. But smaller accidents in which a few miners perished were more numerous and just as devastating to a victim's family (Bur. Mines n.d., 7–8). A nonfatal injury such as the loss of a limb or a spinal or head injury could end a miner's career.

FAMILY STRATEGIES

Families developed a series of strategies to cope with poverty and the authority of companies. Some of these responses were a direct



Along with performing routine household chores, women often took on additional work, as they took in boarders to supplement family incomes. Mothers passed domestic skills like gardening and bread-baking on to their daughters. Here mothers and daughters at Buffington, Pennsylvania, proudly show off their garden and some fresh-baked bread.

result of accidents, but families also employed any number of different techniques to keep the family afloat.

One of the most direct responses to the loss of a wage earner, or a way to increase the family income, was for children to go to work. Boys as young as 9 would enter the mines as wage workers in an attempt to supplement the family income. Coal cars often crushed these boys to death, and spraggers (boys who placed wood blocks to brake wagons) often lost fingers (Smith 1986, 115). Low wages also coerced boys into the mines. Alex Whoolery, a retired miner, recalled he had entered the mines because of his father's ailing health and the large family's need for more money (Brestensky, Hovanec, and Skomra 1991, 6).

Unmarried daughters also contributed to the family economy as wage earners. Some of these young women worked in factories in the larger towns such as Windber, Johnstown,

and Mount Pleasant. About 200 women labored in a glass factory in Mount Pleasant; a kindling factory in Windber employed 14 women (Maclean 1909, 342). Other unmarried women earned paychecks as domestic servants or housekeepers for local merchants, professionals, or company officials. Finally, because job opportunities for women were few in company towns, many young women left patch communities for eastern urban centers to seek employment as nannies or domestic servants (Beik 1989, 194–204).

Women also contributed to their families' economy through boardinghouse operations. For widows, running a boardinghouse was essentially the only viable method of economic survival. Since coal and coke companies banned women from working in coke plants in 1886, boarding remained the only substantial opportunity for women to make money. The contribution to the family income from boarders constituted upwards of 25% of the income of families with a male breadwinner (Beik, 1989 208–209). Taking in boarders greatly increased the workload of the female caretaker. Not only was she responsible for cooking, cleaning, and caring for the additional boarders, but she still had to care for her children and her husband, if he was living. Hauling water from pumps to wash clothes and dishes by hand, cooking, cleaning the house, mending clothes, feeding chickens and other animals, tending the garden, and caring for children filled a day that started before dawn and lasted late into the night (Hovanec 1991, 53). In some houses, miners rented beds in double shifts, one sleeping while another worked. In one boardinghouse, 18 boarders and 3 family members occupied a four-room unit (Smith 1986, 104–106).

As previously mentioned, women's contributions to the family economy extended beyond earned wages. The daily house chores kept the family afloat and functioning; they were just as important for the family's survival as earned wages. Women were in charge of buying goods for the family and stretched the meager wages to at least cover the family's needs.

Gardens played an indispensable role in the family economy, supplementing the diet with valuable vitamins and minerals in fresh fruit and vegetables without the need to go to the costly company store. Although companies gave permission to plant gardens on company property and encouraged gardening by awarding prizes, workers' families must be given credit for initiating the gardens. The immigrant population, which accounted for the majority of the workers, originated from rural areas in Europe (Beik 1989, 116). The huge gardens they planted in their new homes reflected the continuation of a European rural tradition.

Support for families, both financial and recreational, also came from community members. Different fraternal societies serving various ethnic groups sprang up in the mining and coking region. Providing limited financial assistance during sickness and accidents, the fraternal societies attempted to offer some type of economic security to families in distress. In some communities these organizations quickly formed and disbanded because of a lack of members. Other larger and more stable groups established insurance polices for surviving relatives of workers who died. The Hungarian Cultural Association even went so far as to establish a library and brought Hungarian artists and lecturers to Pittsburgh (Marchbin 1940, 116, 174; Beik 1989, 130).

These fraternal organizations, which were often affiliated with religious institutions, sponsored dances and summer picnics. Attending these events were the young, old, single women and men, and couples. The organizers would charge a small entrance fee, usually 25 cents, to cover expenses. Part of those fees paid for liquor, which women, men, and children drank.

Protestant reformers were shocked that children and women consumed alcohol; women's drinking did not conform to American ideals of proper female behavior. Yet some of the drinking stemmed from traditions. After a death, a beer wagon parked outside the home

of the deceased while neighbors and friends drank and ate for three days until burial took place on the fourth day (Maclean 1909, 336–337; Brestensky, Hovanec, and Skomra 1991, 43). As one older resident of a patch community recalled, "They said you should cry when people come into the world and laugh when they go out" (Maclean 1909, 336–337; Brestensky, Hovanec, and Skomra 1991, 43). While reformers were worried about the cultural practices of immigrants from southern and eastern Europe, a United States Senate investigating committee reported that H. C. Frick encouraged prostitution and selling of drugs and liquor at the mines in Uniontown (Lewis 1991, 68, 73).

As in any other community, members of the patch communities gathered regularly to socialize. Children, with their seemingly unlimited imagination, would invent different games with hoops, sticks, cans, and balls made from socks. The games they played were similar to those played by other children outside the region, but playing on the ash dump near the coke ovens was unique to coal and coke communities. Children used cardboard boxes or tin to slide downhill on the dumps. In evening, the glow from the coke ovens illuminated the ash dump, producing a lighted play area (Brestensky, Hovanec, and Skomra 1991, 54).

Men assembled after work and on weekends. The company store, despite its control, also served as a meeting place for the community, especially men, who congregated on its porch to sit and talk (Brestensky, Hovanec, and Skomra 1991, 50). On weekends, a workman often would take a keg of beer home to drink with family and neighbors (Maclean 1909, 336). In summer, men also played baseball. Games between different patch communities became the "highlight of the week and the people walked for miles . . . to see their team," one former ballplayer recalled (Brestensky, Hovanec, and Skomra 1991, 50).

Women also gathered on a regular basis. They went to baseball games, picnics, circuses, and dances, and in summer they met on front porches with family and friends. When the winter chill set in, quilting or rug weaving brought women together. At the turn of the century, families began to go into urban centers like Uniontown and Connellsville on Saturdays on the extensive trolley system (Enman 1962, 292). During these outings, women could escape company town isolation by visiting with friends and family in the cities.

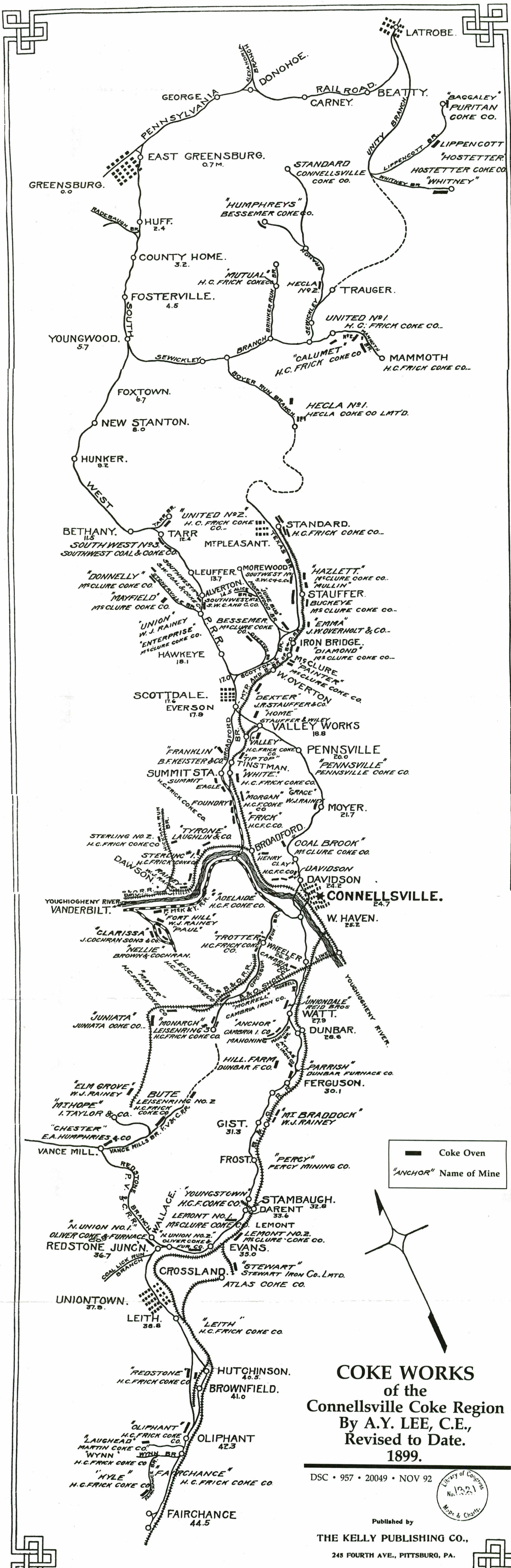
When the coal and coke industries started to decline, especially after World War I, patch communities began to change. Depletion of coal, changes in coking technology, and economic hard times chased out coal and coke companies, but the residents survived and remained behind in the company-created towns. Companies began selling homes to tenants during the 1930s depression, but few could buy them because of unemployment. In the early 1940s, the Frick company offered a few homes to residents, but the company preferred to sell entire towns to realtors or wealthy individuals, who then resold the marked-up homes to individual residents (Enman 1962, 394–398). The coal and coke story begins to fade after World War I, but the communities persisted, along with the legacy of the industries.

CONNELLSVILLE COKE REGION

The Connellsville coke region flourished as coke ovens burned around the clock. Operations like this one dotted the landscape, creating jobs for immigrant workers and making fuel for the nation's iron and steel mills. Here, a worker moves coke from the ovens to waiting rail cars.

The Pittsburgh coal seam, industrial expansion, transportation advances, immigration patterns, community development, and labor-management interaction all came together in a unique way in the Connellsville coke region of southwestern Pennsylvania. In 1843, James and Sample Cochran's success in selling Fayette County beehive coke to a Cincinnati market established the beehive coke industry and drew attention to a generally unknown, predominantly agricultural region. From those early beginnings, the 137-square-mile area became the most important coke-producing region in the nation (see Connellsville map).

Hundreds of mines opened as coal investors sought to enter the lucrative coal and coke market. Thousands of workers, most from eastern and southern Europe, moved to the region, secured jobs, raised families, and reshaped communities. The Connellsville coke region represents a significant part of Amer-



COKE WORKS
of the
Connellsville Coke Region
By A.Y. LEE, C.E.,
Revised to Date.
1899.

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ica's industrial expansion, social transformation, and working class development during the late 19th and early 20th centuries.

The portion of the Pittsburgh coal bed that supplied high-quality coal for the region's beehive coke ovens extended southwest to northeast through Fayette and Westmoreland counties (NPS 1990a, Heald, 12). As John Enman noted, the coal's low ash, phosphorous, and sulphur contents, coupled with the thickness of the seam and its accessibility, were advantageous to the development of the beehive coke industry, especially in Fayette County (Enman 1962, 48). Coal from the Pittsburgh seam was naturally soft and porous, and it did not transport well. Because of these characteristics, beehive ovens were built near the coal mines.

Once the coal was reduced to coke in the ovens, it was hard enough to be shipped to iron and steel mills for use in blast furnaces. The iron and steel industry in Pittsburgh grew steadily during the latter part of the 19th century as industrial capitalists like Andrew Carnegie invested heavily in steel mills. Steel was needed to meet the increased demand for iron and steel rails for railroad expansion, and structural steel was in demand for building the nation's infrastructure.

Connellsville coke met the steel industry's need for blast furnace fuel, and H. C. Frick, who had entered the coke industry in 1870, became the primary supplier for Carnegie's steel mills. Frick was the dominant producer in the Connellsville coke region. His holdings increased steadily, beginning with the financial panic of 1873, when he bought operations from competitors unable to survive economic conditions of the time. He invested heavily in the region, built company towns, operated more than 16,000 beehive ovens, and kept tight control over his work force.

In 1899, after years of association with Andrew Carnegie, Frick merged his coke business with Carnegie's steel holdings. With the merger, Frick's works left the open market and supplied coke only to Carnegie's mills. When United States Steel was formed in 1901, Frick's coke works became part of the corporation, but the coke operations retained the Frick name. Demand for steel around the nation ensured markets for both Carnegie's and Frick's products, and both men profited enormously from rapid industrialization.

Railroad growth and expansion went hand in hand with the development and growth of the coal and coke industry. Fayette County was initially bypassed when the Pennsylvania Railroad completed its expansion to Pittsburgh, but the county's reputation for high-quality coke production soon attracted rail traffic to carry its products to market. The increased demands from steel mills for Connellsville coke led the railroads into competition with each other to carry the lucrative coke trade (NPS 1990a, Heald, 13).

At the same time that trains were transporting Connellsville coke to Johnstown, Pittsburgh, and other steel-producing cities, a well-developed interurban trolley system transported people throughout the region. As mentioned earlier, by 1900 passengers could move freely from town to town by making a series of transfers along the line. This regional transportation network served to connect isolated patch communities and gave people access to the larger service cities like Uniontown, Brownsville, and Connellsville for shopping and recreation.

Communities in the Connellsville region varied from the patch communities at the mine and coke work sites to the larger towns situated along major rail lines and rivers. Towns like Uniontown and Brownsville had developed as trade centers for agricultural and manufactured goods (glass, pottery, and whiskey) long before the coke trade transformed the area. Uniontown, the county seat, was also busy accommodating travelers along the National Road. Meanwhile, Connellsville, on the shallow Youghiogheny River, had to wait for rail traffic transporting coke before it could begin to compete with Uniontown's trade. Brownsville, with its prime location on the Monongahela River, served as a central

point for river and stagecoach traffic early in the 1800s (Sheppard 1947, 32).

By the end of the financial panic of the early 1870s, the region was primed to expand its coke trade. H. C. Frick had weathered the economic crises nicely, thanks to the backing of the Mellons of Pittsburgh. When the railroads began reorganization efforts and rail orders increased at the Pittsburgh steel mills, Frick's newly acquired coke works went into full production. With railroads continuing their expansion and an assured market for coke in Pittsburgh, all that was lacking in 1880 was a large enough work force to meet production demands. Frick had plans to eliminate that problem as well.

Frick, like coal operators throughout the bituminous coal industry, recruited eastern and southern Europeans for his work force. Traditional labor migration patterns in Europe, as well as difficult political and economic times for peasants and artisans, led to the influx into the United States of thousands of workers and their families. Many of the immigrant groups found their way to the Connellsville coke region. Whether the workers were recruited by Frick employment agents or learned by word of mouth of work in the coal mines and coke works, the European work force increased steadily during the early 1880s (Sheppard 1947, 41).

The native population did not welcome the newcomers with open arms; rather, residents were alarmed at the sight of so many foreigners within their midst. Eastern and southern Europeans were not like the resident population of English, Welsh, and German descent; they did not speak English and they had strange customs and dress. Most importantly, the resident labor force perceived foreign workers as a threat to their own jobs. The foreigners worked for low wages, did whatever they were told, and worked at the worst jobs in the mines and at the ovens. They seemed willing to take any job, no matter how menial or degrading. American workers balked at working waist-deep in water in the mines, but the immigrant workers reportedly did not protest, but did the work anyway.

Much has been made of native workers' impressions of foreign workers and the conflicts that evolved between the groups. However, little research has been conducted concerning the thoughts and feelings of immigrant workers in their new surroundings. What motivated these first-generation immigrants to work so hard, at such low wages, under such trying conditions? How did they perceive the work done by native miners? What efforts did the immigrants make to cross the barriers between the groups? What role did their cultural background play in the day-to-day lives of these people? Much of the literature of the day tells only of the trouble caused by foreign workers. But how did the immigrants cope with the difficulties they encountered?

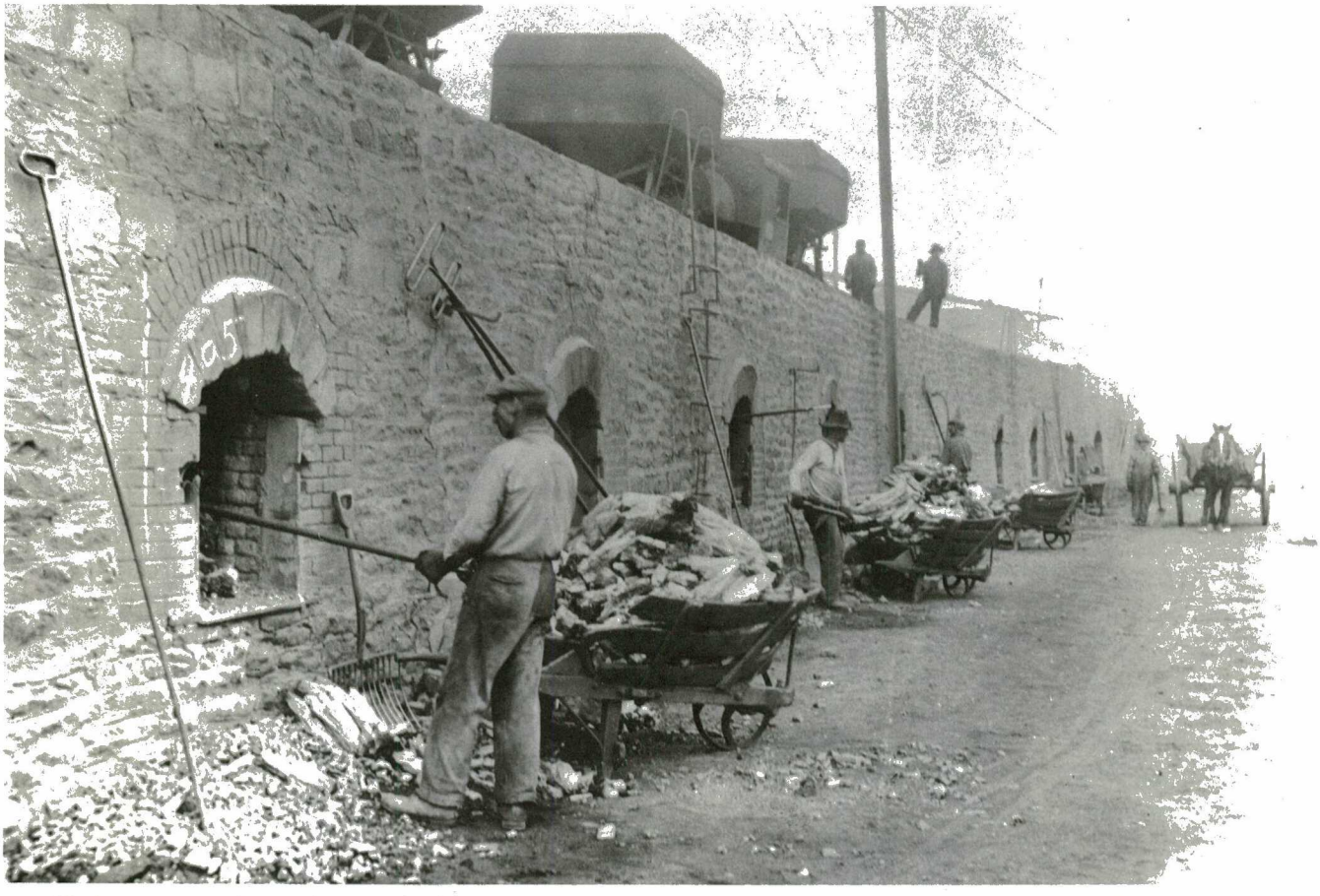
Tension between native and foreign workers was only part of the story of labor unrest in the Connellsville coke region. Labor-management relations were strained from the start. Labor struggles had begun as early as 1848 and 1859, as native workers struck for better wages and scales to replace the bushel measurement (Sheppard 1947, 43). However, labor relations deteriorated with the coming of foreign workers and ruthless antiunion attitudes of the operators. H. C. Frick demonstrated his antiunion tactics at Homestead during the famous strike of 1892. His dealings with workers in the coke region were no less severe. The H. C. Frick Coal and Coke Company and other captive mines of the steel mills were not represented by the UMWA until World War II.

The high point of beehive coke production for the Connellsville region came before World War I. As many as 40,000 ovens operated during the peak production period, but even with the demand for coke during the war, operators in the coke region realized that the beehive industry would not last much longer.

The Pittsburgh seam, heavily mined for many years, was rapidly being depleted. The advent of by-product ovens signaled another down-

turn for the industry. By-product ovens were built right at the steel mills, and coal was shipped directly to market rather than being processed locally. The once-busy industrial region slowly lost its markets; mines and coke works closed; people moved away in search of jobs; and the people left behind tried to cope with the losses.

Today, the Connellsville coke region is a mere shadow of its former industrial self. Only limited remains of mines and coke works exist to remind one of the vast industrial activity that went on there. Residents struggle to keep the few jobs that remain. Once again agriculture is prevalent in the area, and people search for new ways to revitalize their communities. Within those plans, people are also looking for ways to preserve the heritage of the coal and coke communities, realizing the important part the region played in the industrialization and development of the nation.



Workers remove finished coke from beehive ovens and load it into wooden wheelbarrows. Note the lorry cars on tracks above the ovens.

CONCLUSION

The coal and coke industries of western Pennsylvania and northern West Virginia played a crucial role in the industrial development of the United States during the last quarter of the 19th century and well into the 20th century. The combination of coal mining and coke operations, transportation systems, labor efforts, corporation development, and growth of communities all contributed to the nation's vast industrial expansion.

The Pittsburgh coal seam, especially the Connellsville sector, laid the foundation for coal and coke development in southwestern Pennsylvania. This area contained high-grade bituminous coal that was ideally suited for the production of coke. The low sulfur content of the coal produced essentially pure carbon, which served the needs of the growing iron and steel companies of the Pittsburgh area. Coke fueled the industries that sparked America's industrial revolution.

For years, limited technology curtailed the movement of heavy, bulky goods like coal and coke. Transportation advancements gave access to the natural wealth of the region, which in turn assured industrial markets of dependable shipments of coal and coke. With advancements in railroads and in slackwater improvements, coal and coke were shipped to established eastern markets and new markets opened in the west.

The changes in coking techniques also contributed to the rise and importance of coking. Since only high-quality coal produced good quality coke in beehive ovens, coking operations became concentrated in the Connellsville region, where the best coking coal of the Pittsburgh seam was found. With improvements in coke ovens, other grades of coal also produced good quality coke. By 1920 by-product ovens were built at iron and steel mill sites, allowing direct shipment of coal to the mills and the use of lower grade coals.

During this period of industrial growth, new forms of corporate structure emerged, along with new labor responses. Beginning with the growth of railroads in the mid-19th century, corporations commanded large concentrations of capital. This trend was evident in the coal industry as well. H. C. Frick, who dominated the Connellsville coke region, merged his operations with Andrew Carnegie's iron and steel corporation. The anti-labor policies of these capitalists triggered a series of important labor struggles that defined the direction of the United Mine Workers' activities.

The unique and rapid industrial expansion led coal companies to build coal patch towns to house their workers. Native workers, immigrants from southern and eastern Europe, and black workers filled these communities, altering both the labor movement and the local ethnic and racial mix.

Company control in the communities was paternal and authoritative. Workers obeyed company rules, shopped at the company store, and lived in company housing. Infractions of the rules often led to loss of a worker's job and eviction from company housing. Conflicts between workers and the company led to labor protests as well as to the development of varied family survival strategies.

Ultimately, the history of coal and coke is based on the interdependence of all topics presented in the "Historical Overview." The topics overlap, intermix, and combine at various points and at particular times to form the coal and coke story. The labor struggle involved developments in coal mining and coking technology, transportation, community formation, and the rise of corporations. The rise of corporations, in turn, was dependent on the market demand for increased soft coal production. At the same time, companies could not have met that increased demand without an abundant, accessible labor force.

The history of the bituminous coal industry in western Pennsylvania and northern West Virginia is a story of complex relationships between resources and people, a story of regional growth and national industrialization.

PLANNING ELEMENTS

INTERPRETIVE STORIES AND THEMES

Lambert, Pennsylvania, July 4, 1924.

As indicated by the material presented in the "Historical Overview" section of this report, several themes emerge for telling the coal and coke story. These themes reflect the complex relationships that existed between the coal and coke industry and American society during the late 19th and early 20th centuries. The themes address significant national and international conditions, as well as occurrences specific to the coal and coke industry of western Pennsylvania and northern West Virginia. The regional and national significance of the many features of the industry is common throughout the themes. The themes that follow are not arranged in order of importance.

RESOURCES

The coal and coke story rests on the unique resources found in the region and the effects of gaining access to and using them. The high-quality coal of the Pittsburgh seam produced a metallurgical coke unsurpassed in the world. Uses of coal were dependent on the chemical composition of area seams, such as the "smokeless" coals of the eastern part of the region. The extraction of coal and the coking process polluted the air, contaminated water supplies, and left a legacy of environmental damage that communities continue to struggle with today. Finally, the political and

economic structures under which this environmental degradation occurred eventually led to greater awareness of the social and economic costs of pollution.

IMMIGRATION

The flow of immigrants into the area during the late 19th and early 20th centuries corresponds to national and international migration patterns. People from different parts of Europe came to the coalfields in search of work. The reactions of Anglo-Americans to new immigrants contributed to political, economic, and social debates throughout the nation.

COMMUNITY LIFE

Communities were the center of social, political, and cultural activities. The new arrivals altered communities and diversified local customs and beliefs. In many cases, companies built whole new towns to house the newcomers. Within existing and new communities, ethnic/racial, cultural, and class differences separated immigrant groups and Anglo-Americans. Immigrant families established fraternal organizations, engaged in recreational activities, and participated in public and private education programs.

LABOR

The struggle between workers and management permeates the history of the coal and coke industry. Poor working conditions and low wages in the mines and at the coke ovens triggered lockouts and strikes. Through the use of private police, companies tried to limit organizing activities. At the same time, workers repeatedly demanded their right to union representation. The interactions between skilled and nonskilled, immigrant and native workers is also a significant part of the coal and coke story.

TRANSPORTATION

Construction of highways, canals, railroads, and river improvements affected the movement of people as well as coal and coke. The Pennsylvania Railroad extended its rail service into western Pennsylvania's coalfields, connecting feeder lines from mines to the main trunks. The Baltimore and Ohio Railroad moved coal and coke out of northern West Virginia's fields, and a well-developed trolley system shuttled people throughout the Connellsville coke region. The complex network of transportation alternatives fostered the development of coalfields in the region and provided fuel to industrial cities around the nation.

INDUSTRIALIZATION

The nation's rapid industrial growth and resultant need for coal and coke transformed an agricultural area into an industrial region in a relatively short period. Coal and coke fueled iron and steel mills, steam engines, and power plants as America became the leading industrial nation in the world. An important part of this development was the rise of corporations, investment capital, and intense market competition. America's industrial leaders invested heavily in the coal and coke industry, recruited workers, built coal towns, and introduced the latest coal mining technology to the region.

TECHNOLOGY

Technological developments were significant in themselves, but they also shaped and reshaped the workplace and worker-management relations. Pick mining methods gave way to undercutting machines and mechanical drillers. These techniques were further revolutionized by longwall methods and continuous mining machines.

Technological developments affected underground mining methods and shaped the aboveground landscape as the tipple and various support buildings and structures were developed. Significant advancements also occurred within coke production. The ovens themselves varied from beehive to rectangular to by-product designs. A further development was the Covington coke machine, which removed coke from the ovens and loaded it into railroad cars. As with developments in the mines, these advances changed work methods and affected the number of workers required to perform diverse tasks.

GEOGRAPHIC AREAS OF EMPHASIS

On the basis of the readings and research conducted by the coal and coke project team, the following areas have been identified as geographic areas of emphasis (also see map: Geographic Areas of Emphasis). These areas contain significant stories related to the development of the region's bituminous coalfields.

MONONGAHELA VALLEY INDUSTRIAL CORRIDOR

The "Mon Valley" industrial corridor includes significant stories of early coal mining and industrial development in Allegheny County and the Monongahela River Valley from 1760 to 1945. Allegheny County was consistently one of the top three coal-producing counties in Pennsylvania.

The ties between the Connellsville coke region and Pittsburgh's iron and steel industry were significant within the framework of state, regional, and national industrial development.

Efforts are underway by the Steel Industry Heritage Corporation and other partners to interpret, protect, and manage significant iron and steel resources in the Mon Valley. Cultural resources considered for evaluation include steel mill sites, sites associated with labor-management struggles, and communities associated with industrialization.

CONNELLSVILLE COKE REGION

The Connellsville Coke Region is unquestionably the most important coke producing area of the region. The high-quality metallurgical coke produced between 1870 and 1945 was unrivaled in quality or quantity. The coke industry of Fayette and Westmoreland counties was directly linked and controlled by the iron and steel industry of Pittsburgh (especially U.S. Steel).

Company towns, support industries, and service cities grew with the development of coal mines and coke works in the area. A significant part of the story of the region is the story of the people who lived and worked there — native-born American families, immigrant workers from eastern and southern Europe, industrialists who invested heavily in the coal industry and created jobs, all workers who struggled for union representation in an attempt to improve working conditions and wages.

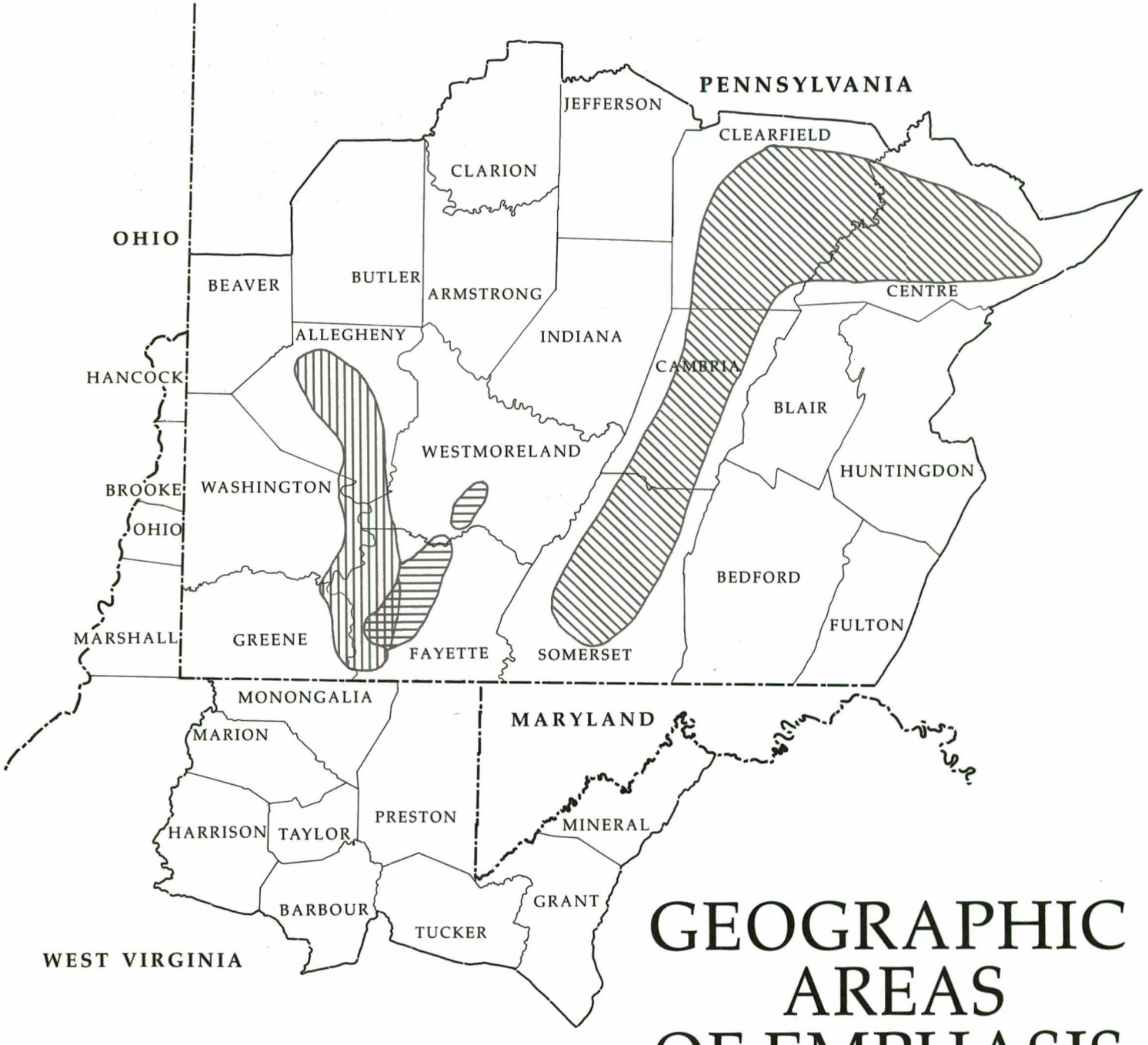
Fayette County was the leading coal producer in the study area; Westmoreland was second in production until it was surpassed in 1921 by Washington County. (As coal reserves were depleted, companies moved farther west to Washington and Greene counties. By that time the era of beehive coking was declining and companies began shipping coal directly to by-product ovens at the steel mills.)

The Connellsville coke region will be the focus for the site-specific portion of the study of alternatives that is underway at the National Park Service for the Southwestern Pennsylvania Heritage Preservation Commission.

SMOKELESS COALS

Coal companies found markets for "smokeless coals" in densely settled areas of eastern cities. Smokeless coals also were used for gas lighting and heating, as well as in subway systems and steamship liners.

Along with sharing many of the industry's common themes, the smokeless coals found in the eastern part of the region have made their own unique contribution to the development of the coal and coke story. As mines played out and new markets drove the demand for coal, coal companies expanded into new areas of the region. Coal was first shipped east from Clearfield County in 1785. Mines were opened throughout the county



GEOGRAPHIC AREAS OF EMPHASIS

Coal and Coke Resource Analysis

Monongahela Valley Industrial Corridor

Connellsville Coke Region

Smokeless Coals

Overlap Mon Valley/Connellsville

0 10 20 30 MILES

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and spread into Centre County as well. By the 1890s, coal companies were operating in Cambria and Somerset counties as well.

Another important aspect of the story of the coal industry in the smokeless coal region was the strike of 1922, especially in Somerset County. The union struggle profoundly affected union workers, but its effects were especially devastating to nonunion workers who had supported the strike. Its impacts were felt throughout the region, while national attention focused on the coal shortage created by the strike.

Within the America's Industrial Heritage Project, the Windber/Scalp Level area has been identified as a place where this part of the coal story can be told. Present plans call for a coal heritage center in the former Berwind-White (Wilmore Company) Coal Company office. In addition, the Southwestern Pennsylvania Heritage Preservation Commission is looking at long-range preservation efforts at Eureka Mine 40 in Scalp Level.

SITE EVALUATION CRITERIA

The following criteria will be used to evaluate coal and coke sites in the study area. The criteria will provide the framework to rate the historic significance of a site within the context of the coal and coke story as outlined in the "Historical Overview" section. Along with historical significance, the ability of a site to accommodate preservation or restoration, management, interpretive, and visitor needs also will be evaluated. These criteria will set the project parameters for the site-specific portion of the study of alternatives.

Primary and secondary evaluation criteria have been identified. Primary criteria are key to telling the coal and coke story and are essential to site development. Secondary criteria are important to understanding relationships of the coal and coke industry and to physical development of a facility. Although these conditions may require alternative development, management, or interpretive approaches, individually, they would not preclude the use of a site.

PRIMARY CRITERIA

Historical/Cultural Characteristics

Resource significance and integrity: Resource is of legitimate historical importance; resource is intact, or remaining features have not been modified to the extent of compromising its historical significance.

Significant within the context of broad themes: Site has a relationship or physical tie to regional/national industrial themes (immigration, transportation, steel, corporations).

Significant within the context of beehive coking operations: Site is significant as a beehive coking facility; site may also include rectangular or by-product ovens that help tell the story of beehive operations or other aspects of coke production.

Complete work site/company town: Site contains the many resources that depict the coal and coke story; that is, site contains not only ovens but coking equipment and other support buildings.

Physical Characteristics

Physical condition of resources: Resource is in a physical state that is (or can be made to be) representative of the time period; resource is (or can be made) structurally capable of accommodating visitors.

Availability of site for purchase: Landowner is willing to cooperate in land acquisition and development.

Accessibility to site: Site can be reached by automobiles, buses, motor coaches, or recreational vehicles.

Adjacent land use: Neighboring lands do not threaten the existing resources or character of the site (that is, large commercial developments).

Extent of resources: Resources are of significant size to adequately represent the magnitude and scale of coking operations.

Ability to accommodate interpretive and visitor needs: Site can physically accommodate rehabilitation of existing structures or possible construction of a visitor center, parking areas, interpretive exhibits.

SECONDARY CRITERIA

Historical/Cultural Characteristics

Significant owner/industrialist and people/community stories: Site represents authentic aspects of the business, immigration, labor, and/or community stories.

Physical Characteristics

Availability of visitor services: Visitor services are available within reasonable proximity of the site.

Impact on Community: Project would affect local circulation patterns and services.

Environmental Characteristics

Potential hazardous materials: Site has potential for containing hazardous materials.

Floodplain or wetland issues: All or a significant part of the site is within the 100-year floodplain.

Topographic and soil conditions: Conditions allow for development of adequate interpretative or visitor facilities (such as visitor center, parking).

Wildlife and vegetation issues: Site has significant potential for including species of special concern, or their habitats; vegetation condition presents a substantial obstacle to site development.

RECOMMENDATIONS FOR FURTHER STUDY

The aim of the "Historical Overview" section of this report has been to provide a historical context of the bituminous coal industry for the selection of coal and coke sites within the framework of a study of alternatives. On the basis of the research and writing that has been done for this report, the project team has identified areas in which further work needs to be done. Since the "Historical Overview" takes a broad look at the development of the coal and coke industries in the region, some areas were merely touched upon in the overview; others were recognized as beyond the scope of this project.

Educational institutions, historical societies, or others interested in the coal and coke story may want to conduct research on these topics. Where appropriate, these topics will be addressed in relation to the specific sites that will be evaluated within the study of alternatives; however, they also need to be addressed in the broader context of the entire industry. It is evident in the broad perspective taken in the Historical Overview that the history of the bituminous coal industry is a complex story that requires research in a multitude of areas. As more research is conducted, more questions arise, more details are uncovered, and the resulting picture gives a better insight into the coal industry and coal community life.

Listed below are areas that the project team believes are components of the coal and coke story that merit more detailed attention by interested parties.

Migration patterns between Pennsylvania and northern West Virginia — There is evidence that workers crossed the artificial boundaries of state lines looking for work in the coalfields. Was this migration simply an extension of patterns within the states? To what extent did these migration patterns affect the makeup of the labor force? How prevalent was the practice? Did workers migrate because of labor unrest; were they looking for higher wages; did they take their families with them? What effect did this mobility have on family life and communities?

Development of the coal industry within the context of the political climate of the region — What part did politics play in the uncontrolled competition of the coal industry? Much has been written about intervention by the national government during World War I, World War II, and the New Deal with respect to labor's gains and losses. However, little seems to be available concerning the political climate at the state level, particularly in western Pennsylvania.

Development of support industries within coal and coke communities or service cities — Machine shops, coal and rail car repair shops, and manufacturers offered jobs for skilled workers in the region. How did these industry-dependent businesses interact with the coal miners and coke workers? This aspect of the story of people in the industry has received little attention. Who were the workers? Were workers in support industries unionized; did they go on strike in support of coal miners and coke workers? Who were the owners of the support industries?

Women's labor within the context of the coal and coke industries — It is well known that women in coal and coke communities kept boarders and that daughters often worked as domestics to supplement the family income. Women also worked in retail stores, at company stores, at textile factories, and in coal company offices. More research needs to be done in the area of women's work outside the home during this study period. How did women view their work outside the home? How did their work serve to help the family during times of strikes; did they lose their jobs as well during strike periods? How often did women work outside the home? What ethnic groups allowed or

refused work for women outside the home? What pressures from American society outside the coal regions influenced work opportunities for women?

FUTURE PROJECT ACTIVITIES

Upon completion and approval of the resource analysis, the coal and coke project team will undertake the site-specific phase of the study of alternatives. This phase, scheduled to begin in November–December 1992, will involve identification and evaluation of alternatives for use, protection and management of coke resources and sites. The analysis will focus on resources in the Connellsville coke region in Pennsylvania's Fayette and Westmoreland counties. As with the resource analysis, the site-specific phase of the study of alternatives will be conducted under a partnership format, utilizing the expertise, ideals, and concepts of a number of individual partners.

The site evaluation criteria developed in the resource analysis will serve as the framework for identifying and comparing alternative project sites. In addition, two key NPS planning criteria will be assessed for each site: suitability and feasibility. Suitability refers to "adequacy of thematic representation." The project team will assess whether a similar resource already exists in the NPS system or is adequately protected outside the system. Feasibility refers to practical considerations, such as landownership, acquisition costs, site size, and access.

Once the site evaluations are completed, the team will prepare a report summarizing the analysis of alternatives. The report will include a resource description, analysis of the existing resources threats to the resources land use trends and plans, and public interest. The document will then present a description of alternatives for management, protection, and use and an analysis of the impacts of the proposed alternatives.

APPENDIXES / WORKS CITED

BITUMINOUS COAL PRODUCTION IN PENNSYLVANIA COUNTIES FOR SELECTED YEARS 1881–1945 (in tons per year)

County	1881	1891	1901	1911	1921	1931	1941	1945
Allegheny	3,029,000	6,216,428	11,248,921	17,816,705	11,089,705	14,313,614	16,115,371	17,551,873
Armstrong	245,000	299,945	1,686,075	3,760,460	3,386,591	2,796,574	4,742,526	6,442,928
Beaver	147,000	139,114	169,110	157,651	26,082	65,717	929,111	247,206
Bedford	130,000	413,537	476,985	454,740	296,484	357,301	474,292	732,797
Blair	190,000	218,955	294,015	288,092	215,643	247,834	183,932	128,407
Butler	51,000	160,273	325,451	941,625	878,569	651,091	1,046,486	1,255,504
Cambria	780,000	3,073,078	8,614,492	16,371,550	15,713,730	12,995,722	18,532,935	15,941,530
Centre	114,000	490,300	812,980	1,095,652	754,636	557,338	853,406	1,200,115
Clarion	565,000	739,058	376,429	924,171	1,233,346	1,103,168	2,131,335	3,188,576
Clearfield	1,853,000	6,706,016	5,232,054	7,575,994	5,631,752	3,002,139	4,113,081	6,371,229
Fayette	4,310,000	5,758,200	15,478,041	26,900,255	19,184,691	13,933,546	22,109,923	19,357,031
Greene	8,248[a]	53,714[b]	36,400[c]	75,760	2,412,522	3,711,042	6,296,026	8,628,754
Huntingdon	390,000	277,938	350,463	770,022	465,993	547,495	504,730	759,170
Indiana	52,000	539,628	815,659	8,555,610	6,192,613	6,626,280	8,308,035	8,531,846
Jefferson	420,000	3,600,052	6,034,656	5,356,338	2,639,997	1,981,360	1,927,066	2,058,848
Somerset	298,000	441,070	3,898,738	8,676,655	9,141,045	7,306,313	6,137,729	7,594,495
Washington	737,000	2,407,837	5,602,593	15,378,046	15,114,479	13,640,250	19,916,404	18,152,651
Westmoreland	3,553,000	7,605,868	16,199,709	23,734,630	17,999,981	11,243,386	10,875,964	11,009,275

SOURCE: Clyde H. Maize and George Stible, compilers, *Brief History of Pennsylvania Bituminous Coal* (Harrisburg, PA: Pennsylvania Department of Mines and Mineral Industries, 1964).

a. For 1885.

b. For 1889.

c. For 1902.

BITUMINOUS COAL PRODUCTION IN WEST VIRGINIA COUNTIES FOR SELECTED YEARS 1888–1945 (in tons per year)

County	1888	1891	1901	1911	1921	1931	1941	1945
Barbour	—	—	254,172	887,340	1,734,823	1,194,283	1,465,064	2,873,705
Brooke	19,161	38,079	73,812	681,057	1,762,936	1,257,120	2,024,669	1,906,129
Grant	—	—	—	248,037	271,837	52,130	60,057	27,868
Hancock	—	—	34,000	73,042	—	14,945	171,603	69,162
Harrison	126,594	126,860	1,219,361	4,450,945	5,877,253	3,784,507	5,177,439	12,744,276
Marion	284,116	809,305	2,995,499	4,575,001	5,622,325	1,257,120	10,373,915	9,613,771
Marshall	66,273	132,431	223,589	571,032	1,217,710	1,106,427	759,476	1,106,986
Mineral	524,852	697,835	575,425	688,866	411,206	203,734	186,252	240,874
Monongalia	—	51,632	84,660	520,037	4,826,800	5,461,670	9,731,347	10,131,077
Ohio	154,199	90,427	129,730	338,028	1,588,219	1,608,425	1,947 091	1,582,942
Preston	164,965	150,603	486,879	994,786	1,612,247	972,289	1,444,752	1,863,163
Taylor	74,412	93,913	429,210	710,597	850,344	1,013,774	572,711	1,057,269
Tucker	54,047	211,736	1,050,900	1,213,947	1,196,448	700,424	605,598	520,994

Production statistics compiled from West Virginia Department of Mines, *Annual Report*, 1946.

Total Annual Production of Bituminous Coal in the United States 1880–1897

Year	Tons	Year	Tons	Year	Tons
1880	42,831,758	1886	73,707,957	1892	126,856,567
1881	53,691,012	1887	87,887,360	1893	128,385,231
1882	68,164,533	1888	102,039,838	1894	119,488,372
1883	76,755,280	1889	95,684,543	1895	135,991,596
1884	82,578,204	1890	111,320,016	1896	138,906,526
1885	72,621,548	1891	117,901,237	1897	146,573,226

SOURCE: Compiled from statistics in Alder and Ruley 1899.

Top Five States in Bituminous Coal Production, 1896–1898 (tons)

State	1896	1897	1898
Pennsylvania	50,925,414	55,169,809	64,712,872
Illinois	19,786,626	20,072,758	18,599,299
West Virginia	13,369,964	13,110,529	16,010,249
Ohio	12,912,608	12,300,000	13,725,400
Alabama	5,743,697	5,893,771	6,162,516

Statistics, Top Five Coal-Producing States 1898

State	Production (tons)	Men Employed	Price at the Mine
Pennsylvania	64,712,872	88,791	$0.60
Illinois	18,599,299	35,600	$0.75
West Virginia	16,010,249	22,710	$0.60
Ohio	13,725,400	24,718	$0.75
Alabama	6,162,516	11,291	$0.85

APPENDIX B: COKE PRODUCTION

PENNSYLVANIA COKE PRODUCTION 1896–1898
(tons)

County	1896	1897	1898
Allegheny	250	4,500	525
Bradford	39,200	—	39,708
Blair	36,943	36,904	30,680
Cambria	165,435	263,474	265,282
Clearfield	157,756	191,040	173,108
Fayette	3,692,397	4,851,918	5,660,209
Indiana	22,798	16,330	15,712
Jefferson	407,865	445,013	619,731
Somerset	9,086	—	14,937
Washington	7,200	—	—
Westmoreland	2,073,291	2,723,636	3,351,525

WEST VIRGINIA COKE PRODUCTION 1896-1898
(tons)

County	1896	1897	1898
Barbour	—	—	1,350
Harrison	12,440	—	5,419
Monongalia	7,489	2,778	12,337
Preston	25,904	19,567	28,450
Tucker	155,795	159,842	229,261

COKE PRODUCTION, TOP FIVE STATES, 1896–1898
(tons)

State	1896	1897	1898
Pennsylvania	6,113,253	8,533,291	10,171,920
West Virginia	1,594,681	1,351,925	1,742,256
Alabama	1,689,407	1,395,252	1,246,554
Tennessee	332,746	350,275	394,545
Colorado	324,694	318,008	445,925

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