

A HISTORY OF A COAL MINING IN NORTH DAKOTA 1873 - 1982

by
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INTRODUCTION

The geologic stratas of North Dakota hold a valuable natural resource in the form of lignite. This dark-brown, low-grade coal is softer than bituminous coal. Fifteen billion tons of mineable lignite lie beneath the soil of western North Dakota. The commercial mining of lignite began near the small town of Sims in Morton County in the early 1870s. Though small quantities were extracted and used in the beginning, today lignite is the major fuel source for several large electrical generating stations that produce over twenty billion kilowatt hours per year. Moreover, the use of lignite in the energy field will continue to grow as the construction of the first coal gasification plant for the production of synthetic natural gas nears completion at Beulah.

There are four stages in the history of the coal mining industry in North Dakota. They are: the birth of the coal industry, 1873-1900; the rise of the commercial mining firms, 1900-1920; the technological shift from underground mining to strip or surface retrieval, 1920-1941; and the emergence of lignite as the major catalyst in the production of electrical energy, 1941 to the present. This study concentrates primarily on the principal mining enterprises and on the problems associated with the growth of the lignite industry from 1873 to 1941.

Early settlement in Dakota Territory coincided with the discovery of vast deposits of lignite coal. As a means to attract westward migration, lignite was promoted by land developers and territorial officials as a low-cost and abundant source of heat. The mining of the soft coal for commercial profit thus began, and though there were successful ventures as well as failures, by the turn of the century coal mining had become an established industry in North Dakota.

From 1900 to 1920 the industry grew to maturity. Underground mines expanded in size and number. Coal towns made their debut. It was a colorful era, characterized by a labor strike and debates over the railroad tariff on lignite shipments. Progressive state legislation established a code of regulations for a safe recovery of the coal. Research into the chemistry of lignite revealed a countless number of by-products; a new worth far beyond its traditional value as a heat source.

During the 1920s the steam shovel made surface mining profitable and popular. It revolutionized the mining industry in North Dakota. Although the Great Depression of the 1930s forced some reverses upon the industry; the Depression also caused the financing of extensive coal research programs by the federal government. Together, the steam shovel and the Great Depression occasioned clear and rather quick changes within the industry. Within this period, however, came a more gradual force of change. Competitor fuels in the form of oil and natural gas began to make inroads into the lignite consumption market during the 1930s. Accordingly, the coal industry began to search for a new market.

From the advent of World War II until the early 1960s, the coal industry experienced a period of uncertainty. The demand for coal as a heat source was diminishing as the use of oil and natural gas rose. Furthermore, the industrial and research sectors were in disagreement over the future course of coal development. Some believed that lignite's future was in the production of electrical energy, while others suggested that its by-products would provide an ample market. By the early 1970s, however, the nation and the state began to realize that supplies of oil and natural gas were limited. A shortage of these fuels would lead to an energy crisis. The subsequent building of large-scale electrical generating stations, and the mammoth amount of lignite required by these plants, led to a new prosperity for North Dakota mining firms. This development also launched a great debate in the North Dakota Legislature over the impending impact on the economy, society, and the environment. The outcome of this controversy was a series of laws regulating energy development in the state. The long-term effects of these laws constitute an unwritten chapter in the history of lignite mining in North Dakota.

CHAPTER I

THE FLEDGLING INDUSTRY, 1873-1900

In the spring of 1901, Clement A. Lounsberry¹, editor of The Record, a widely read magazine, declared to the people of North Dakota that "vast fields of lignite coal were stored up under the clay and loam of the North Dakota soil. . ." and with supreme confidence he proclaimed that ". . . it would be no exaggeration to say that there is enough of it to warm the entire population of the United States for ten thousand years."² Although a dramatic statement by Lounsberry, it was indicative of the exuberant attitude prevalent among coal mine operators, land developers, literary men, and state boosters.

The period 1873 to 1900 was the initial stage in the development of the lignite industry in western North Dakota. In this treeless region, the soft coal soon became a commercial enterprise for those who ventured into the business of coal mining. It represented a marketable commodity as a cheap and abundant fuel for the indigenous population. The era witnessed the opening of numerous coal mines, many highly successful and others grand failures. Generally the mines were located along the three main railroads that entered the Missouri Plateau region or near the rivers that could be used for transportation. Many of the mines were developed for local use and were known as wagon mines, while others were opened for commercial production. Ownership of the mining firms often rested with one individual, although the larger enterprises were under the control of several men, including railroad executives, eastern North Dakota businessmen, and out-of-state interests.

The lignite coal industry had, as its point of origin, the land grant issued to the Northern Pacific Railroad by the United States Congress while the nation was in the midst of civil war. On July 2, 1864 Congress passed an act authorizing the Northern Pacific Railroad Company to construct a continuous bed of rails from Lake Superior to Puget Sound. The 38th Congress also granted to the company immense portions of the public domain to aid construction of the railroad.³ The total area of this grant exceeded 39,000,000 acres,⁴ of which 10,700,289 acres were located in the northern half of Dakota Territory.⁵ Specifically, the grant entitled the railroad to alternate sections of land for forty miles on each side of the tracks within the territories, and alternate sections for twenty miles on each side whenever it passed through a state. In the event that lands granted to the railroad were already occupied, the railway had the right to select additional lands referred to as lien lands. This often increased the grant to fifty miles on each side of the track within the territories. The Northern Pacific used their right to lien lands in the Dakota Territory.⁶

Section three of the act contained another stipulation. All mineral lands were to be excluded from the appropriation and in return they would receive unoccupied and unappropriated lands. This reservation on minerals, however, did not include coal lands, for Congress provided further ". . . that the word 'mineral' . . . shall not be held to include iron or coal. . ."⁷ As a result, much of North Dakota's lignite came under the control of the Northern Pacific Railroad.

As the Northern Pacific and other railroads penetrated the western part of the territory, their foremost objective was to generate traffic through promotion and settlement of the land. With vast land holdings, the Northern Pacific launched an intensive publicity campaign. The railroad published hundreds of articles, pamphlets, brochures, and books describing the exceptional qualities of northern Dakota, including its rich soil, "moderate climate," and its extensive deposits of lignite coal. In a picturesque book entitled The Great Northwest, An Official Guide to the Northern Pacific Railroad, 1890-91, the railway described the geological formations in western North Dakota and spoke of the "vast beds of lignite coal which abundantly meet the need of the country for fuel."⁸

In another piece of booster literature, the Northern Pacific reported on the James River Valley country. Aside from information on farm conditions and soil reports, the pamphlet covered the subject of fuel.

As there are no large bodies of timber in North Dakota, and no beds of the anthracite and bituminous coal found in the East, it is supposed by many that this country is entirely destitute of fuel, and that its only means of supply is by purchasing in the East at the most exorbitant

rates. This is an error. Beds of LIGNITE coal are found in this locality in almost inexhaustible quantities. This coal is entirely free from sulfur, stone and other foreign elements. It burns up as clean as wood, without waste, and without clinkers or cinders.⁹

Promotional activities of this nature were not launched solely by the railroads. The territorial government was also instrumental in attracting settlers to this novel land. Like the Northern Pacific Railroad, both the Territorial Department of Agriculture and Labor and the Department of Immigration and Statistics published detailed descriptions of North Dakota and cited lignite as one of its major "resources and advantages."¹⁰

The newspapers also played an influential role in settlement. They, like the railroads and state commissioners, extolled the advantages of the coal. One article, filled with colorful adjectives, spoke of the future state and of McLean County as that "heaven-favored territory."

The inexhaustible beds of lignite coal, which underlies so much of this locality, are of untold value to the settler. It makes excellent fuel, and can be supplied at a remarkable low cost. This coal is being largely used in lieu of wood, and for both heating and cooking purposes it meets every requirement. . . These immense deposits of lignite stretch far away on every side, and their value to the country can never be estimated.¹¹

The literature published and circulated by the governmental officials, the railroads, and the newspapers lured thousands of Americans and Europeans to the northern prairie, and the resulting influx became known as the "Great Dakota Boom." People emigrated from the British Isles, Germany, Russia, Norway, and from other European countries. Many immigrants came individually, while others joined large colonization groups. Several villages and towns in western North Dakota, such as New Salem, Glen Ullin, Richardton, Gladstone, and Dickinson, were the result of colonization projects.¹² By 1900 the population of western North Dakota, including the counties of Ward, Williams, Billings, Stark, Morton, Oliver, Mercer, McLean, and Burleigh exceeded 39,000 inhabitants.¹³

Before the onset of the "Great Dakota Boom," however, the early founders of the sprawling village of Bismarck began development of the soft coal and their ventures into the mining business met with limited success. In the fall of 1873, Dennis Hannifin, known as the squatter governor of the territory, discovered several veins of lignite west of Bismarck near Sims. Hannifin, along with another early pioneer and miner, John S. Warn, claimed the veins and organized a company. The novice coal miners traveled westward to their claim under military escort provided by Lieutenant Colonel George A. Custer, commanding officer of Fort Abraham Lincoln.¹⁴

During the ensuing months at "Fort Hannifin" . . . more properly the cave in which they were entrenched," the miners survived several attacks by hostile Sioux Indians. Eventually, Hannifin and Warn abandoned the workings and the mine remained undeveloped until 1882 when the Northern Pacific Coal Company purchased the site.¹⁵

Many of the earliest attempts at mining lignite coal were failures, but a substantial number of mines opened throughout the 1880s and 1890s were successful. Communities such as Dickinson, Lehigh, Sims, and Hebron along the tracks of the Northern Pacific became important mining centers. Along the line of the Minneapolis, St. Paul and Sault Ste. Marie (Soo Line), Minot, Burlington, Davis, and Kenmare developed their deposits and soon became well known. On the Great Northern line, men began excavating the lignite beds within the Williston area. Other mining towns in the years before 1900 were Coal Harbor (Coleharbor), Stanton, and Washburn along the Missouri River. Many of the mines before the turn of the century were one-man operations. Yet, there were others that employed as many as 300 miners.

One of the first major mining concerns in western North Dakota was the Northern Pacific Coal Company, a division of the Northern Pacific Railroad. The Company operated mines at Sims and Little Missouri in the Dakota Territory.¹⁶ On July 5, 1879 Charles W. Thompson opened a mine near the site of Dennis Hannifin's earlier abortive effort.¹⁷ E. H. Bly had purchased it--perhaps from Hannifin--since the railroad purchased the mine from him in December of 1882 for \$20,000. The

Northern Pacific Coal Company in turn acquired the mine and 590 acres from the railroad for \$2,950 and reserved certain sections for the incorporation of the Sims townsite.¹⁸ The name of the operation was changed from Bly's Mine to the Baby Mine. The coal was located in five different veins; one was seven feet thick and the other four about three and one-half to four feet in thickness. In 1884 the average output of the mine was 100 tons daily.¹⁹ The railroad utilized one-half of the lignite and the coal company constructed a fuel yard in Bismarck to supply the locomotives. The remainder was either used by the people of Sims or shipped east to customers in Mandan and Bismarck.²⁰

The Northern Pacific Coal Company employed a large number of people at the Baby Mine. Many of the men were immigrants who either lacked capital for the purchase of farm land or were established homesteaders working in the mine during the winter months to supplement their income. August Weinreich, a settler who arrived in 1884, worked in the mine at Sims before he homesteaded. In 1885 Thomas Ekwortzell arrived at Sims and worked in the mine until he too homesteaded. Frederick Heager, Sr., another immigrant decided to work for the coal firm in order ". . . to earn enough money to buy oxen, and the needed machinery to work his land."²¹

The Northern Pacific Coal Company continued operations at Sims until 1887. In May of that year the company decided to close the Baby Mine. Hard coal in eastern Montana proved to be a more successful fuel for powering locomotives, reason enough in view of paralyzing losses at Sims to dictate closing of the mine. Over its five-year life-span the mine produced a substantial loss for the company, piling up a \$38,381.92 debt.²²

In the northern part of the coal region near Minot, L. M. Davis began excavations into a hillside layered with alternate bands of lignite, sand, and clay. The resulting activity became known as the Mouse River Lignite Coal Company, one of the largest mines in operation before 1900. In 1894, Davis, a civil engineering graduate of the Massachusetts Institute of Technology and Surveyor of Ward County, established a station and loading platform near the site of the excavations and named it Davis.²³ The mine was shortly thereafter incorporated into the Mouse River Lignite Coal Company owned in part by the officers of the Soo Railroad.²⁴

The Mouse River Lignite Coal Company's Davis Mine was the state's first mine ". . . to be worked on scientific principles."²⁵ Earle J. Babcock, North Dakota's first State Geologist, gave a description of its methodical operation in the first biennial report of the Geological Survey.

This mine is systematically worked and has a large output. Compressed air coal cutters are employed, a fan system provides good ventilation, and the coal is removed by cable cars which run to loading chutes delivering the coal directly into the railway cars.²⁶

Within a year the Mouse River Company had become a large producer of the brown coal; on February 15, 1895 seventeen cars waited alongside the mine to be filled with coal for eastern points.²⁷ By 1900 the mine was producing from 500 to 600 tons per day and employed a sizable force; anywhere from 60 to 100 miners at a rate of \$.60 for every ton removed from the mine.²⁸ Mouse River coal was shipped via the Soo and Great Northern lines to such points as Valley City, Hankinson, Fairmount, Larimore, Grand Forks, Fargo, and as far away as Glenwood, Minnesota.²⁹

Along the tracks of the Soo line near Kenmare lignite mining became a thriving enterprise for many people. One of the several coal firms established prior to 1900 was the Smith-Kenmare Dry Coal Company. William T. Smith and E. C. Tolley of Kenmare and L. B. Mattoon of Elgin, Iowa, owned the company. The mines were located above the Des Lacs Valley. The land owned by the company consisted of 640 acres with a yield of approximately 15,000 tons per acre. The vein was six feet thick and was rated superior to many other coal veins in the state.³⁰ Tunnels extended for about one mile and employment was as high as 300 men. Several samples of the lignite were analyzed by the State Geologist and one sample contained 40.59 percent volatile matter, 53.24 percent fixed carbon, and 6.17 percent ash.³¹ During the winter of 1900, the mines produced six to ten railroad carloads per day for shipment east and another forty tons for consumption in the local market area.³²

Another successful undertaking was the Lehigh Mine, four miles east of Dickinson. Before 1890, there was little mining activity on the western edge of the coal region. As one source stated, "it was not until J. F. Brodie spent two years in the Lehigh Mine near Dickinson and realized the vast possibilities for wealth which lay under the ground in the region, that real mining was carried on." Brodie, a mining engineer and a member of the Tenth North Dakota Legislative Session, came to Dickinson in 1892 and soon became interested in the native coal and its production possibilities. Brodie, together with A. P. Peake of Valley City and Alexander C. McGillivray of Dickinson, purchased the Lehigh Mine and began production.³³

The amount of lignite in the Lehigh vein was considerable and the operation was considered by some the most comprehensive in the state. Brodie submitted an article to The Record sketching the "Coal Industry" in the state; and he included two descriptive, yet somewhat biased, paragraphs on the Lehigh Mine.

The most extensive of the mines is located at Lehigh in Stark County, where a twenty-six-foot vein is worked and where the operator's [sic] claim to have beaten the world's record as to cheapness of the production. This mine is entered by a tunnel running into a high bluff, whose tablelands extend for a distance of twenty miles and contain three and a half billion tons.

The mines are worked on the stall and pillar system. An electric apparatus is used in undercutting the coal, which is blasted down with powder and loaded into small cars that run on a narrow gauge track from the mine to the railroad cars. From twenty to ninety men are employed, the larger output being in the winter season.³⁴

By 1895 the Lehigh Mine had become a substantial enterprise for Brodie, Peake, and McGillivray, an investment of about \$100,000. Many attributed the success of the Lehigh Mine to Brodie's ". . . tact, skill, and indomitable energy."³⁵ Yet, the real growth of the Lehigh Mine took place during the expansive years after 1900, when the firm would become the well known Consolidated Coal Company.³⁶

Another area to develop its lignite potential was Washburn in McLean County and the most famous mine was the Black Diamond. The Black Diamond Mine began on a small scale and like the Lehigh Mine, it did not reach its peak of production until after 1900. Opened in 1895 by John Satterlund, a member of the North Dakota House of Representatives, the mine was located six miles northwest of Washburn on the banks of a coulee which drained into the Missouri River. The seam measured approximately nine to ten feet thick, of which seven feet was mined and the remainder reserved for the roof and floor. A tunnel ran from the side of the bank into the vein for about 175 to 200 feet.³⁷

Satterlund's primary purpose in opening the mine was to supply the flour mill in Washburn with fuel. His lignite not only powered the mill but also furnished the townspeople with a needed heat source and it gained wide acceptance. A correspondent from the Bismarck Tribune described Satterlund's lignite as ". . . of superior quality, hard and black with very little foreign substance of any kind in it."³⁸

The total number of coal mines opened in the state prior to 1900 was significant. Available records indicate a total of 73 mines. (See table 1.) This figure is inconclusive, however, because some mines have escaped historical record. Many of the mines opened were commercial, yet a greater percentage were small operations known as wagon mines. Some of these wagon mines were worked by five or more men, while others were mere one-man undertakings. The wagon mines were closed during the summer months but offered employment to many throughout the fall and winter. The lignite taken from these mines was generally ". . . used for domestic purposes by the farmers and townspeople."³⁹

The homesteader often filed on land that contained sizeable seams of coal. Frequently they mined their lignite, hauled it by wagon to the nearest town and sold it for about \$2.00 per ton. In other instances, the homesteader simply dug the coal and waited for neighbors to come, loaded the fuel, and hauled it away themselves. The haul-it-yourself option reduced the cost to \$1.00 per wagon load. There were also situations in which farmers and ranchers built their homes directly over the mine and merely dug into the walls of their cellars for fuel, thereby, "obtaining an unlimited supply at no cost."⁴⁰

TABLE 1.--North Dakota Lignite Coal Mines, 1873-1900.

Title of Mine and/or Owners	Location	Title of Mine and/or Owners	Location
Mouse River Lignite Coal Company	Davis	Lehigh Coal Mine	Lehigh
Colton Coal Company	Burlington	John Brodie	Lehigh
La Des Lacs Coal Company	Burlington	Farrell Reilly	Lehigh
Smith-Kenmare Dry Coal Company	Kenmare	E. W. George	Taylor
Rouse Lignite Coal Company/ W. Augustine C. Rouse, D. A. Cannon, E. T. Tompkins	Kenmare	J. B. Bird	Belfield
S. E. Brindle	Williamsport	Gus Fingers	South Heart
Edick Mine	Livona	Ben Gating	South Heart
Black Diamond Mine/John Satterlund	Washburn	William Klinefelter	Dickinson
A. Fahlgren	Washburn	J. S. Letts	Gladstone
George L. Robinson	Coal Harbor	Michael Joachim	Richardton
William Lacy	Coal Harbor	R. S. Brookings	Richardton
A. Youngquist	Conkling	John Conlin	Antelope
Carl Johnson	Ingersoll	A. R. Stewart	Dickinson
Wadeson Mine/H. T. Wadeson	Sims	M. M. Vineyard	South Heart
Sims Coal Company	Sims	T. O'Connor	Crofte
North Dakota Coal & Power Company	Sims	Edward O'Brien	Crofte
Feland Mine/Theodore Feland	Sims	Charles Klemp	Crofte
Gillis Brothers	New Salem	Casino Coal Mine/Ida Lewis	Painted Woods
Standard Coal Company	New Salem	Ole Anderson	Slaughter
Frank J. Keibert	Glen Ullin	Crazyman's Coulee Coal Mine/ Otto Dahl	Williston
John Bleich	Sweet Briar	Blue Grass Mining Company	Blue Grass
Jacob Christina	Mandan	Plenty Mine	Stanton
William Alder	Mandan	Foote Mine	Minot
Wilbur Mine	Mandan	Taylor Mine/Frank D. Taylor	Williston
J. E. McCoull	Dickinson	A. P. Folsom	New England
Mose Lennaville	Dickinson	Pony Gulch Mine/Thomas Dodsworth	Sykeston
George Frye	Dickinson	George's Coal/Edward George	Hebron
		People's Kenmare Dry Coal Company	Kenmare

TABLE 1.--North Dakota Lignite Coal Mines, 1873-1900.--Continued

Title of Mine and/or Owners	Location	Title of Mine and/or Owners	Location
Brown and French Mine	Williston	Syndicate Coal Mine/E.D. Kelly	Minot
Dahl Mine	Williston	Pederson Mine/Michael Pederson	Carpio
Burton Mine	Sims	Reif Mine	Kenmare
Eckland Mine	Wilton	Paradis Mine/Frank Paradis, Sr.	Kenmare
Standring Mine	Coal Harbor	Angus McDonald	Minot
Washburn Coal Company	Washburn	Gassman Mine/Henry Gassman	Gassman
Northern Pacific Coal Company	Sims	Kenmare Diamond Coal Company	Kenmare
Slater Mine	White Earth	Gaerchel Mine	New Salem
Charles J. Dolan	Hazen	J. J. Sullivan	Minot

7 SOURCE: First Biennial Report of the Commissioner of Agriculture and Labor to the Governor of North Dakota, 1890 (Bismarck: Tribune, State Printers and Binders, 1890), pp. 37-44; Fourth Biennial Report of the Commissioner of Agriculture and Labor to the Governor of North Dakota, 1896 (Bismarck: Tribune, State Printers and Binders, 1896), pp. 76-77; Fifth Biennial Report of the Commissioner of Agriculture and Labor, 1898 (Bismarck: Tribune, State Printers and Binders, 1898), pp. 63-64; First Biennial Report of the Geological Survey of North Dakota, 1901 (Grand Forks: Herald, State Printers and Binders, 1901), pp. 59-70; First Annual Report of the Board of Railroad Commissioners to the Governor of North Dakota for the Year Ending November 30, 1890 (Bismarck: Tribune, State Printers and Binders, 1890), pp. 41-42; U.S. Department of the Interior, United States Geological Survey, Mineral Resources of the United States for the Calendar Year 1901 (Washington, D.C.: Government Printing Office, 1902), p. 408; Seventy-Five Years of Kenmare and the Gooseneck Area, 1897-1972 (n.p., 1972); Lutie Taylor Breeling, When The Trail Was New in Mountraille (Ross, North Dakota: By the Author, 1956), pp. 97-98; Marion Mark and Theodore Mark, Early Hebron: Fiftieth Anniversary, 1885-1935 (Hebron, North Dakota: By the Authors, 1935), p. 19; "Burlington Doings," Ward County Reporter and Minot Journal, 22 February 1895, p. 4; "Up the Des Lacs," Minot Mirror, 20 November 1896, p. 4; "Another Coal Mine," Minot Journal, 18 May 1894, p. 4; Clement A. Lounsberry, "About Portal and Bowbells," The Record (November 1896): 13.

The methods of mining employed both before and after 1900 in North Dakota were of two general types: the room and pillar, or underground, and the open-pit or strip methods. The room and pillar method was used in both the shaft and the drift type mines. Both types of mines were essentially the same except for the course of entry.⁴¹ In a shaft mine, a tunnel was drilled in a vertical direction, either penetrating through the vein or parallel to it. Crosscuts or additional tunnels were driven at right angles from the shaft or main tunnel into the vein. In a drift mine, the entry was driven horizontally into the seam with crosscuts or galleries drilled, again at right angles.⁴² An average drift mine with the room and pillar process began as such.

The first opening into the mine is the main shaft, from six to twelve feet in width, in the form of a long hall stretching away into the mine. As the work progresses, timbers and scantlings are used to protect the miners from danger of the mine caving in from above. At regular distances excavations are made at right angles from the main shaft as far as it is desired to go and then the coal is taken out between these galleries starting from the point most distant from the main shaft and as the 'rooms' are finished the props are taken out and that portion of the mine which has been worked out is allowed to cave in and abandoned.⁴³

In a strip or open-pit mine the lignite was reached by removing the overburden or the topsoil, clay, and gravel. The overburden was removed through the use of either slip scrapers, frescoes, or hand shovels. After reaching the coal, dynamite was often used to break up the seam, picks and shovels to remove it.⁴⁴ John Hatzenbuehler, who homesteaded 20 miles south of Mandan, mined lignite on a neighbor's farm and used the strip method.

. . . We had to remove about ten feet of ground to get at the coal. We used scrapers pulled by horses for this purpose. The vein of coal was about a foot thick. We used long iron bars to pry up and break off the coal. By working hard all day, we averaged about a ton and a half each.⁴⁵

The amount of lignite produced by the infant industry in 1900 was substantial. The United States Geological Survey reported that the total production was 129,883 tons.⁴⁶ This figure, however, is too low, even for commercial production. Many of the seventy-three mines listed on the previous table were extracting and shipping coal in 1900. Furthermore, the Mouse River Lignite Coal Company had a production capacity of approximately 500 tons per day. If the mine was worked for 150 days, for example, their estimated production would have been 75,000 tons; over half the suggested total USGS level. As the production figure for just one mine, the total advanced by the USGS for 1900 appears incorrect. It is also unfortunate that a reliable statistic for lignite production for this time period does not exist.

While some men were busy mining the lignite, other men were busy promoting its utilization, particularly in the eastern part of the state. The editor of the Grand Forks Plaindealer stated on December 18, 1890 ". . . that the people of North Dakota paid out last year \$5,000,000 for coal. This is a big sum to spend for fuel and every effort made to develop our local mines should be encouraged. There is an abundance of coal, and it is good coal."⁴⁷ On March 9, 1891 the North Dakota Legislative Assembly passed a bill which provided for the use of lignite in state institutions. The act read as follows:

The various State Institutions of this State shall use for fuel native or lignite coal, and it shall be unlawful for any officers to purchase for use in said institutions any coal other than that taken from mines within the boundaries of this State; PROVIDED, That this section shall not be construed as prohibiting the use of wood for fuel at such institutions.⁴⁸

As a result, many institutions and businesses throughout the state used lignite coal. These included the Valley City Normal School; the North Dakota State Capitol and Penitentiary, both at Bismarck; the Agricultural College (North Dakota State University) at Fargo, and the North Dakota Hospital for the Insane at Jamestown. Business firms powered by lignite included the North Dakota Milling Association at

Mandan and Bismarck; the Dickinson Fire & Pressed Brick Company, and the Russell & Miller Milling Company at Jamestown and Valley City.⁴⁹

Sometimes, the coal that was extracted gave the inhabitants of the young state trouble, even though many considered it a valuable commodity. Often the coal refused to ignite and when it did, it either smoldered and died out or it gave off obnoxious gases. Clement Lounsberry, chief booster of the state's potential, knew of this problem and wrote an article in his Fargo monthly, The Record, suggesting the most advantageous type of stove for burning lignite and the proper way to build and maintain a constant fire. He stated:

The most desirable stove for lignite is one with a large fire pot, straight sides, large grate surface, and large doors. . . In building a fire with lignite coal use small chips and sharp pieces to start with, and add gradually larger pieces as the fire gains headway. Don't allow the fire to get too low before adding fresh fuel. If low, don't smother with large quantities, but add sparingly of fine coal.

Lounsberry's final comment on the matter was, "Don't get discouraged, for if you do not get good results it is because you do not understand the fuel."⁵⁰ Whether those pioneers understood the fuel or not, many of them thought of lignite as a "godsend."⁵¹ Others considered themselves "very fortunate" to have a bed of lignite coal running beneath their topsoil.⁵² Still others viewed the native coal as a marketable item that provided "a nice bit of money."⁵³

It has also been suggested that lignite was a determinant in the settlement of western North Dakota. Alvar W. Carlson, in his article "Lignite Coal as an Enabling Factor in the Settlement of Western North Dakota," stated that:

The availability of lignite as a fuel was probably as important as the availability of prairie sod as a building material in the establishment and sustenance of rural settlement in this region of the Great Plains. . . Without it, settlement certainly would have been more difficult and expensive.⁵⁴

Elwyn B. Robinson in his History of North Dakota suggested that "fuel was a greater problem than food" during settlement.⁵⁵ Lutie Taylor Breeling, a school teacher from Ross in Mountrail County, believed that "without it the Missouri Plateau could not have been settled."⁵⁶

During the period 1873 to 1900 the infant industry made significant strides. The railroads, government offices, and the newspapers participated in promotional activities. Once the homesteader arrived, lignite was one factor that enabled him to remain in this treeless region. It furnished a necessary, cheap, and abundant source of heat. It provided for profitable investment by those interested in its commercial production. Many of the mines opened were small one-man operations, yet many other mining firms were substantial business investments. Some of the attempts to mine the brown coal were profoundly unsuccessful. On the other hand, many more became flourishing enterprises. The industry had come a long way from the first fruitless efforts of Dennis Hannifin and John S. Warn. By 1900, the lignite mining industry had a secure foundation in the state of North Dakota.

FOOTNOTES--CHAPTER I

¹ Col. Clement A. Lounsberry was the editor of The Record, a publication of the North Dakota Historical Society at Fargo, North Dakota. Lounsberry was also known for his service during the Civil War where he rose to the rank of colonel at the age of twenty-two. He was also the editor of the Fargo Argus, and served on the staff of the Chicago Times and numerous St. Paul and Minneapolis, Minnesota dailies. The Colonel was also a correspondent for the New York Herald and provided that newspaper with a fourteen-column report on the Custer Massacre. See Compendium of History and Biography of North Dakota (Chicago: George A. Ogle and Company, 1900), pp. 1332-1336.

² Clement A. Lounsberry, "Lignite Coal," The Record (June, 1901): 40.

³ U.S. Statutes at Large, vol. 13, pt. 1 (December, 1863-December, 1865), "Lands to Aid in the Construction of a Railroad and Telegraph Line," 2 July 1864, p. 367.

⁴ Theodore Schwinden, "The Northern Pacific Land Grants in Congress," (M.A. thesis, Montana State University, 1950), p. 121.

⁵ Alva H. Benton, "Large Land Holdings in North Dakota," Journal of Land and Public Utility Economics 1(October 1925): 406.

⁶ Lewis F. Crawford, History of North Dakota (New York: American Historical Society, Inc., 1931), vol. 1, pp. 264-265.

⁷ U.S. Statutes at Large, vol. 13, pp. 367-368.

⁸ The Great Northwest, An Official Guide to the Northern Pacific Railroad, 1890-91 (St. Paul: W. C. Riley, 1890), p. 173.

⁹ The Upper James River Valley of North Dakota, Information to Those Seeking New Homes and Profitable Investments (Jamestown, D. T.: Jamestown Board of Trade, 1883), pp. 7-9, 14; Another good example of this type of literature is Western North Dakota: Being a Description of a Land of Great Promise and the Opportunities it Holds for Homeseekers (published by the Northern Pacific Railway, 1910).

¹⁰ P. F. McClure, Resources of Dakota, An Official Publication Compiled by the Commissioner of Immigration (Sioux Falls, Dakota: Argus-Leader Company Printers, 1887), pp. 159-160.

¹¹ "McLean County," Bismarck Tribune, March 24, 1884, p. 7.

¹² Harold E. Briggs, "The Great Dakota Boom, 1879 to 1886," North Dakota Historical Quarterly 4(January 1930): 88-89.

¹³ U.S. Department of Commerce, Bureau of the Census, Twelfth Census of the United States, 1900: Population, 1: 33-34, 775.

¹⁴ C. M. Hartwick, "Lignite Coal," The Record (November, 1895): 12; Clement A. Lounsberry, "The Coal Regions of North Dakota," The Record (November, 1896): 6; M. H. Jewell, First Annual Directory of Bismarck, D.T. (Bismarck: Tribune Presses, 1879); Edwin J. Taylor, History of the City of Bismarck, North Dakota, 1872-1972 (Bismarck: Bismarck Centennial Association, 1972), p. 23.

¹⁵ Ibid.

¹⁶ The operation at Little Missouri was rather short-lived. The lignite was unsatisfactory for use in locomotives and therefore it will not be discussed in this chapter. See "Report on the Northern Pacific Coal Company," p. 2.

- ¹⁷ Andreas' Historical Atlas of Dakota (Chicago: Lakeside Press, 1884), p. 194.
- ¹⁸ "Report on the Northern Pacific Coal Company" (Northern Pacific Railway Company Papers, Secretary's Branch Line Data File, Archives and Manuscripts Division of the Minnesota Historical Society, 1500 Mississippi Street, St. Paul, Minnesota), p. 2, hereafter referred to as "Report on the Northern Pacific Coal Company."
- ¹⁹ Andreas' Historical Atlas, p. 194.
- ²⁰ "Report on the Northern Pacific Coal Company," p. 2; Hartwick, "Lignite Coal," The Record, p. 12.
- ²¹ History Committee, New Salem Diamond Jubilee Anniversary, 1883-1958 (n.p., n.d.), pp. 83-86, 108-114.
- ²² "Report on the Northern Pacific Coal Company," p. 3.
- ²³ Compendium of North Dakota, p. 1195; Mary Anne Barnes Williams, Origins of North Dakota Place Names (Bismarck: Bismarck Tribune, 1966), p. 333.
- ²⁴ Clement A. Lounsberry, "North Dakota Coal," The Record (October, 1901): 8.
- ²⁵ *Ibid.*
- ²⁶ First Biennial Report of the Geological Survey of North Dakota, 1901 (Grand Forks: Herald, State Printers and Binders, 1901), p. 59.
- ²⁷ "Burlington Doings," Ward County Reporter and Minot Journal, February 15, 1895, p. 1.
- ²⁸ First Biennial Report of the Geological Survey, 1901, p. 59; "Mouse River Valley Coal Lands," Minot Optic, March 23, 1899, p. 4.
- ²⁹ Clement A. Lounsberry, "The Mouse River Lignite Coal Company," The Record (November, 1896): 13.
- ³⁰ Lounsberry, "North Dakota Coal," The Record, p. 8.
- ³¹ First Biennial Report of the Geological Survey, 1901, pp. 62-63.
- ³² Lounsberry, "North Dakota Coal," The Record, p. 8.
- ³³ William B. Hennessy, History of North Dakota (Bismarck, North Dakota: Bismarck Tribune, 1910), pp. 142-152.
- ³⁴ John F. Brodie, "The Coal Industry," The Record (July, 1899): 15.
- ³⁵ Clement A. Lounsberry, "The Lehigh Coal Mines," The Record (November, 1895): 8.
- ³⁶ Hennessy, History of North Dakota, p. 152.
- ³⁷ First Biennial Report of the Geological Survey, 1901, p. 70; Mary Anne Barnes Williams, Pioneer Days of Washburn, North Dakota and Vicinity, Book Two (Bismarck: Bismarck Printing Company, 1953), p. 3; Clement A. Lounsberry, History of North Dakota, 3 vols. (Chicago: S. J. Clarke, 1917), vol. 3, p. 784.
- ³⁸ Clement A. Lounsberry, "Satterlund's Coal Mine," The Record (February, 1896): 29.

³⁹C. B. Heinemeyer and Mrs. Ben Janssen, History of Mercer County, North Dakota, 1882 to 1960 (Hazen, North Dakota: Hazen Star, 1960), p. 44.

⁴⁰Hartwick, "Lignite Coal," The Record, pp. 12-13.

⁴¹Donald Achttien, "History of Lignite Mining," North Dakota Engineer 26(January 1951): 7.

⁴²George J. Young, Elements of Mining (New York: McGraw-Hill Book Company, 1923), pp. 444-447.

⁴³"About Mines and Manufactures," Grand Forks Herald, Silver Anniversary Edition, June 26, 1879-June 26, 1904, p. 46.

⁴⁴Alvar W. Carlson, "Lignite Coal as an Enabling Factor in the Settlement of Western North Dakota," Great Plains Journal 11(Spring 1972): 148-149.

⁴⁵Marion Plath Peterson, ed., Morton Prairie Roots (Dallas, Texas: Taylor Publishing Company, 1975), p. 743.

⁴⁶U.S. Department of the Interior, United States Geological Survey, Mineral Resources of the United States for the Calendar year 1901 (Washington, D.C.: Government Printing Office, 1902), p. 409.

⁴⁷"Use Dakota Coal," Grand Forks Plaindealer, December 18, 1890, p. 1.

⁴⁸Laws Passed at the Second Session of the Legislative Assembly of the State of North Dakota, 1891 (Bismarck: Tribune, Printers and Binders, 1891), p. 125.

⁴⁹Lounsberry, "The Coal Regions of North Dakota," The Record, p. 11; "North Dakota Lignite," The Northwest 11(January 1893): 18; Fifth Biennial Report of the Commissioner of Agriculture and Labor, 1898 (Bismarck: Tribune, State Printers and Binders, 1898), pp. 61-62; First Biennial Report of the Geological Survey, 1901, p. 65.

⁵⁰Lounsberry, "The Mouse River Lignite Coal Company," The Record, p. 13.

⁵¹Mrs. Dave Robinson, "Use of Coal in the Days BT," Trails and Smoke Signals, vol. 4, no. 4, 1970, Official Newsletter of the North Dakota Historical Society, Inc., p. 2; Prairie Tales (Bowman County, North Dakota: Rural Area Development Committee, 1965), p. 324.

⁵²Mrs. D. H. Dettman, Chairman, Beulah, North Dakota, Golden Anniversary, 1914-1964 (n.p., 1964), p. 133.

⁵³Clement A. Lounsberry, "Morton County Coal Fields," The Record (June, 1898): 243.

⁵⁴Carlson, "Lignite Coal as an Enabling Factor in the Settlement of Western North Dakota," Great Plains Journal, p. 145.

⁵⁵Elwyn B. Robinson, History of North Dakota (Lincoln: University of Nebraska Press, 1966), p. 160.

⁵⁶Lutie Taylor Breeling, When the Trail Was New in Mountrail (Ross, North Dakota: By the Author, 1956), p. 115.

CHAPTER II

THE BUSY YEARS, 1900-1920

The first score years of the twentieth century represented a busy time for the coal industry. It was an energetic period when many new coal towns came into existence and older established mining firms expanded production. It was a progressive era in terms of legislation relating to mine safety and child labor. It was also a troubled time that involved the rise of labor unions, the freight rate controversy, and the coal strike of 1919. Not only did the industry change and develop, but there were also experiments conducted to test the chemical composition of lignite and use of its by-products in other commercial fields. The period 1900-1920 was a dynamic era in the growth of lignite mining and it began when a general decided to build a railroad.

General William D. Washburn¹ began construction of the Bismarck, Washburn & Fort Buford Railroad north from Bismarck to Wilton in July, 1900, shortly after the discovery of lignite in northern Burleigh County. Seams averaging sixteen feet thick were located fifty feet below the surface near Wilton. Washburn soon began building what was to become a gigantic coal factory. The main shaft was sunk through the overburden and a tunnel was driven into the dense deposit. By the middle of September the mine was already producing fifty tons per day, ". . . an amount inadequate to the demand."²

During the next ten years, the Washburn Company grew to become the major producer of North Dakota's subsurface resource. Productivity in 1902 was 475 tons per day and by the winter of 1903 it reached 1,000 tons.³ In 1910 total output was 115,340 tons and sold at \$1.50 per ton. Not only did the production level increase during this ten-year span, but improvements in the mine provided better working conditions for the miners as well. Washburn installed Brest undercutting machines, a two-cage hoist, boxcar loaders, a sixteen-foot fan for better ventilation, and four electric pumps to drain water out of the tunnels and rooms.⁴

Washburn was concerned not only about technological improvements and production levels, but also about adequate housing for the miners and their families. The first step of the housing program was the construction of a large boarding house, known as the "Beanery," which accommodated seventy-five miners. Before long the Beanery became a gathering place for social events such as dances, card parties, school plays, and plain conversation.

The Beanery was not equipped to handle miners with families, so Washburn formulated plans for a larger complex of private dwellings. A village of approximately thirty yellow bungalows was erected in 1901. Known as Chapin, it included a school, the mine tipple, railroad loading platforms, offices, bath houses, and the mine manager's home.⁵

On August 2, 1912, Washburn died at the age of eighty-one and a new era in the history of the Washburn Lignite Coal Company began. Mine Superintendent Patrick J. Cahill instituted a new policy regarding the daily operating hours. In previous years the company used both day and night shifts during the winter season. By the fall of 1912, however, Cahill began working two shifts continually, keeping the mine in operation twenty hours a day. The superintendent also reorganized the production process, and it proved to be more efficient:

A force of men works at night with powder and cutting machines getting out enough coal to fill up all empty cars. When the day shift comes on duty there is enough lignite at the bottom of the shaft to begin hoisting at once. Coal is being brought to the surface just as fast as the cages can operate, continuously from 7 a.m. to 6 p.m. More coal can be put out than by two shifts. The average output is now 1500 tons a day.⁶

In 1915 the lignite in the Wilton Mine began to run out. The company decided to open another mine one and one-half miles east of Wilton. The new operation was referred to as simply Mine #2, and it was opened in 1916 complete with an office, a washroom, a powder house, storage facilities, a tipple, and four massive electrical generators.⁷ With the opening of Mine #2, the company enjoyed a period of general prosperity from 1915 to 1920. Mine #2 produced a vast amount of coal which was

shipped to various cities, towns, institutions, and businesses throughout North Dakota and Minnesota.

Wilton was a booming community by 1920. The town claimed several hotels, hardware stores, banks, livery stables, churches, a fire department, electric lights (powered by lignite coal), telephone service, and concrete sidewalks. The population was 1,026 and of that number about one-third or 325 were engaged in the production of lignite coal.⁸ The output of the Washburn Company in that year was 221,494 tons, valued at \$646,359.97.⁹ The site that Washburn platted as Wilton in 1899 had become a bona fide coal town within the first twenty years of the twentieth century.

Another coal town made its debut in the spring of 1907. Scranton, located in eastern Bowman County and named after the coal mining town in Pennsylvania, was "ushered into existence June 27th, 1907. . ." and named by the coal baron, John F. Brodie.¹⁰ The Dickinson Press carried an informative article on the opening of Mr. Brodie's town and the new Scranton Coal Mine.

The platting of Scranton, the new mining town between Hettinger and Bowman on the Pacific Coast extension of the Milwaukee [railroad], is significant. Col. A. P. Peake of Valley City, this state, and Representative J. F. Brodie of this city, were at Scranton the past week where they met E. D. Sewall, President, and H. B. Earling, general superintendent of the Milwaukee railroad and arranged for placing lots of the new town on the market. Messrs. Peake and Brodie, owners of the Consolidated Coal Co. mines at Dickinson and New Salem, have opened a 19 feet [sic] vein of coal on the Milwaukee at Scranton which is said to be the finest coal mining proposition in the state.¹¹

The Scranton Coal Mine was opened in early 1907. The underground slope style mine had a double entry system of retrieval. The nineteen-foot bed of coal was located thirty feet below the surface, and about 60 percent of the bed was excavated. A windmill was built to keep the mine dry and an air shaft supplied needed ventilation. A short railroad spur was built up to the mine entrance. Horse power carried the brown coal from the slope to the tipple. In 1910 the company hired thirty miners during the winter months and eight during the summer months. Generally, the employees were paid \$.50 for every ton loaded into the railroad cars. The average daily output was forty-seven tons and the average selling price at the mine head was \$1.25. The total production for 1910 was 8,584 tons, which grossed the owners of the Consolidated Coal Co. \$11,588.40.¹²

Between the years 1912 and 1916 the title to the Scranton Coal Mine transferred twice. In 1912 Brodie and Peake sold their investment to the newly organized Scranton Coal Company. The enterprise was incorporated under the laws of North Dakota, with a capitalization of \$50,000. From the time of its organization in 1912 until Charles A. Johnson, a South Dakotan, acquired ownership of the property in 1916, the Scranton Coal Company excavated 33,367 tons of lignite.¹³ The new proprietor renamed the operation the Johnson Fuel Company and enlarged the facility to include a lignite briquetting plant, which was built by German engineers, and also a power plant, which furnished Scranton with electricity. By 1920 the Johnson Fuel Company was producing over 13,000 tons of coal and had a monthly payroll of \$10,000.¹⁴

North Dakota Magazine, one of the state's leaders in unbridled boosterism, proclaimed that:

Scranton is destined, at no distant day, to be one of the cities of southwestern North Dakota. It is surrounded in all directions, as far as an antelope can run in an afternoon, by as fine and fertile country as the sun shines on, which is rapidly settling up and will soon be one vast country of homes and farms.¹⁵

Before long the young coal town not only had a number of homes and farms, but also hardware stores, a grocery and dry goods store, a barber shop, a lumber yard, an implement dealership, a harness shop, livery stables, banks, hotels, and a theatre "showing silent films." A brick yard, using native clay resources ". .

.was [also] built up near the mine with a large kiln to burn the brick, using lignite for fuel."¹⁶

While the barons of the Consolidated Coal Company were diligently harvesting the soft coal in Scranton, a physician was platting a new town in Mercer County. Beulah, as it came to be known, had a curious origin.

Early in 1911, settlers on either side of the Knife River Valley watched the building of a large, commodious house and a two-story business structure with a mixture of bewilderment and amusement. It just didn't add up--why would Dr. [Norman E.] Vrendenburg of Hebron build, what looked like the beginning of a new trading store, here in the middle of the prairies? This particular spot was inaccessible from the south, for there were no bridges spanning the Knife River. Farrington was situated a mile to the east and was right on the bank of the best river crossing--the south farmers would go no further to do their trading. The north farmers had adequate trading facilities in Kasmer, Kronthal, Expansion and Mannhaven, so they wouldn't be doing their trading here.

When the doctor was finished he named his new town, Troy. He never moved into his house or started a business. No one seems to know why or what prompted him to erect these buildings. . .¹⁷

Before long, Vrendenburg sold the townsite to the Tuttle Land Company. It was then resurveyed and the name was changed to Beulah.¹⁸

Lignite mining was not responsible for the creation of Beulah, but it did contribute to its growth and development. For the first few years of its history, Beulah ". . . did not forge ahead like the other towns," but with ". . . the discovery of good coal veins and the development of coal mining, Beulah soon became the largest town in the county."¹⁹

In 1917 Madison M. Mounts, L. C. Pettibone, Edmund A. Hughes, and C. B. Little organized the Beulah Coal and Mining Company. Mounts located a site for the main shaft and sunk it fifty-six feet into a bed fourteen feet thick. The shaft had two sections, one with a stairway for access and the other with a steam hoist for transporting the lignite to the surface. Two to three feet of coal served as the roof and props made of tamarack were placed in the rooms for support. An air shaft and a steam-driven fan provided ventilation. Excess water was removed by a steam pump and two electrically driven pumps. The company built several buildings including an office, a tippie, a power plant, a hotel, a powder magazine, a bunk house, and a blacksmith shop.²⁰ In less than three years after its organization, the young mining company produced over 76,000 tons of lignite. Thirteen miners were employed along with thirty-nine other workers who were associated with the Beulah Company on various production levels.²¹

By 1920 Beulah was not an agricultural community; it was a coal mining town. The lignite industry stimulated the economy of the incorporated village of 552 inhabitants.²² The larger business, the Beulah Coal and Mining Company, with a profit of over \$130,000 in 1920, was a most influential factor in the town's welfare and development.²³ When Beulah's first wooden buildings were erected in early 1911, many considered Vrendenburg's efforts a folly. Nine years later Beulah was quite the contrary. As time passed, Beulah would become very well known for its lignite production. The Beulah Coal and Mining Company would be reorganized as the Knife River Coal Mining Company and it would become the largest underground mine in the United States.

The lignite industry was responsible for the platting of numerous other town-sites in western North Dakota. By 1920, Hanks, in Williams County, was a typical mining town with five coal companies excavating its subterranean wealth.²⁴ Noonan, in eastern Divide County, became a recognized mining area. In 1920, the small town had six coal companies with a combined productivity of over 45,000 tons. Other communities engaged in the mining of coal were Velva, Haynes, Medora, Bowman, Columbus, Coalbank, Underwood, Garrison, Hazen, Hebron, Center, Zenith, Glen Ullin, and New Salem.²⁵

In addition to the fledgling coal towns of the early twentieth century, the well-seasoned coal districts continued to quarry lignite at a constant rate. From 1910 to 1920 in the Minot-Burlington area, twenty-one coal firms carried on the

harvest. Some were older, established businesses such as the Davis and Colton mining companies. Others were newer operations like the Hunewell, Hard Luck, Burlington City, and Cherry Vale companies. Kenmare maintained its position as a major coal district with eighteen mines in operation throughout the period, and Williston also remained as a commercial mining center. In 1910, Williston had seven mines and by 1920, fifteen coal firms extracted roughly 61,000 tons, over three-fourths of the total output for Williams County. In the Dickinson-Lehigh district, the production level continued to be high, although there was a decrease in the number of mines. In 1920, the two remaining coal firms, the Pittsburgh and Binek coal companies, mined 38,965 tons.²⁶

Besides wagon mines and commercial firms, cooperative mines were created and provided investors with fuel at a reduced price. The Farmer's Coal Association of Haynes in Adams County opened a mine about three miles north of Haynes in 1908. The coal bed was twelve to thirteen feet thick and produced about 1,000 tons annually. The company was incorporated in 1914 under the laws of North Dakota and capitalized at \$18,000. The farmers invested \$3,000 in surface equipment and \$250 in tracks and cars. The mine operated for the benefit of its stockholders and coal was sold to them at \$1.35 per ton, \$.40 cheaper than the selling price of a neighboring firm, the Haynes Coal Company.²⁷

The state of South Dakota ventured into the business of mining North Dakota lignite. The Clermont Coal Company, also located in Haynes, was sold to the South Dakota Coal Commission in 1920. Originally the mine was opened by A. W. Peterson in 1908 on a section of school land leased to him by the state. In the spring of 1912, the lease expired and Peterson moved the operation to an adjoining section of land where the coal was sixteen feet thick. The Clermont Coal Company bought the workings and built a tippel with two stationary screens for sorting the coal and storage bins with a combined capacity of twenty tons.²⁸ The mine remained under the ownership of local businessmen until early 1920 when it was purchased by the South Dakota Coal Commission. In a short time the commission made significant improvements at the mine and extracted over 8,000 tons in 1920. The coal was shipped south over the Chicago, Milwaukee, and St. Paul Railroad and was used to heat the institutions of North Dakota's sister state.²⁹ For several years, South Dakota institutions were warmed by North Dakota lignite.

The United States Reclamation Service mined coal near Williston for use in a project for irrigating thousands of acres of farmland in the valley of the Little Muddy Creek and the bottom lands of the Missouri River. The Reclamation Service opened the Government Mine four and one-half miles northeast of the city on the west bank of the Little Muddy Creek in 1907. The mine was a drift type with a double entry, room and pillar system of mining. The coal bed was about ten and one-half feet thick at a depth of 150 feet. In 1910 the mine produced about 4,500 tons. Ten miners were hired during the summer season and the operation shut down throughout the winter months.³⁰

The lignite from the Government Mine supplied the Williston and Buford-Trenton Irrigation Projects. After investigations of the nearby coal fields conducted by the United States Geological Survey, the engineers of the Reclamation Service decided that lignite would generate the necessary electrical power.³¹ Once the coal had been removed, it was hauled from the mine by mules and dumped into the tippel, which had five concrete bins, each with a capacity of 100 tons. Once in the storage bins, the lignite was fed into a crusher and then transported by a chain carrier into the boiler room of the main power plant only a few hundred yards from the mine.³² There, the coal was fired, electricity was generated, and eventually Missouri River water was pumped to the surrounding farmlands, where three crops of alfalfa were harvested annually instead of one.³³

After the turn of the century, the number of coal mines in the state increased at a continuous rate. Table 2 indicates the number of mines, the productivity, and the dollar value of the coal mined between 1910 and 1920. The figures in table 2 are not totally accurate. For example, the figures for 1910 and 1912 are low because the mines were not inspected during the early years and although information request forms were sent to owners and operators, many failed to complete them. The production level for 1913 was low because of moderate weather throughout the winter months. The decrease in the number of mines during 1919 and 1920 can be attributed to the fact that many mines were consolidated during that time period.³⁴

TABLE 2.--North Dakota Coal Mine Statistics 1910-1920.

Year	Number of Mines	Productivity (tons)	Value
1910	84	416,580	\$ 596,692.75
1911	100	486,842	699,471.55
1912	82	501,827	795,329.85
1913	109	431,054	719,050.26
1914	128	569,869	920,689.77
1915	137	586,116	921,835.49
1916	140	680,101	1,166,211.61
1917	196	885,473	1,709,039.48
1918	No Report	No Report	No Report
1919	156	783,694	No Report
1920	136	878,969	2,166,168.96

SOURCE: Fifth Biennial Report of the State Engineer to the Governor of North Dakota for the Years 1910-1912 (n.p., n.d.), pp. 59, 94; Sixth Biennial Report of the State Engineer to the Governor of North Dakota for the Years 1913-1914 (Devils Lake: Journal Publishing Company, State Printers, 1914), pp. 51, 110; Seventh Biennial Report of the State Engineer to the Governor of North Dakota for the Biennial Period Ending June 30, 1916 (Fargo: Walker Bros. & Hardy, State Printers, 1916), pp. 63-64, 117; Eighth Biennial Report of the State Engineer to the Governor of North Dakota for the Biennial Period Ending June 30, 1918 (Bismarck: Tribune Printing Company, 1918), pp. 51-52, 121; First Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1919 (n.p., n.d.), p. 14; Second Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1920 (Bismarck: Tribune, State Printers, 1920), pp. 6-7.

Throughout the entire 1900-1920 era, the number of coal mines multiplied at a somewhat constant rate.³⁵ This factor soon prompted the Legislative Assembly of the state to provide for the regulation of coal mines and the recording of statistical information relative to the mining industry. During the 1907 Legislative Session, Representative John F. Brodie introduced House Bill No. 263, known as the Coal Mine Statistics Act. Section one of the document called for the licensing of coal mine operators.

The operator of each and every coal mine operated in the state of North Dakota, and selling coal to the general public, shall annually, on or before the tenth day of July, . . . procure a license. . . for which he shall pay a fee of five dollars.

Brodie's bill also provided for the keeping of records on every operating mine. The Commissioner of Agriculture and Labor was responsible for collecting the data, which included information on the name of the mine, the owner and operator, the wage scale, the production level, and other pertinent facts.³⁶

During the same legislative session, a bill was introduced in the House which provided for the inspection of coal mines. The State Engineer was appointed as the ex officio coal mine inspector for the state. His duties required him to make a thorough inspection of every operating mine. He was also required to submit a detailed report on mining conditions to the Governor. The State Engineer's report was similar to that of the Commissioner of Agriculture and Labor, with the exception of detail and the fact that the State Engineer's foremost responsibility was to examine the conditions of the mines with particular reference to the safety of the employees. The Coal Mine Inspection Act became law on March 14, 1907.³⁷

Twelve years later, another essential piece of legislation became law. In 1919 the progressive political forces in the state investigated the coal mining industry and their report indicated that ". . .the coal mines of North Dakota are now being run and operated in a manner that is dangerous to the life and safety of the miners of the State of North Dakota. . ." ³⁸ Conditions in the mines were often dangerous; ventilation was poor, escapement exits were non-existent, props were inadequate. Stagnant water in the main airways, rooms, and entries became a problem as well as the lack of safety devices and the carelessness of the employees. These factors created a serious situation which demanded emergency legislation. The result was the North Dakota State Coal Mining Code. ³⁹

The document, containing ninety-two sections, was most significant for its creation of the office of the State Coal Mine Inspector. As outlined in section two, the Governor was empowered to appoint the inspector with the advice and consent of the Senate. Candidates for the office had to meet certain requirements including five years experience with coal mining and a competent knowledge of the different types of mining, ventilation systems, and explosive and noxious gases. The inspector's duties and rights were quite comprehensive.

The State Coal Mine Inspector shall have the right and it is hereby made his duty, to enter, inspect and examine any coal mine or any shaft, drift or slope in the process of sinking for the purpose of mining coal in this State, and the workings and the machinery belonging thereto, at all reasonable times, either by day or night. He shall also have the right and it is his duty to make inquiry into the condition of such mine, workings, machinery, scales, ventilation, drainage, method of lighting or using lights, and into all methods and things connected with or relating to as well as to make suggestions providing for the health and safety of persons employed in or about the same, and especially to make inquiry whether or not the provisions of the laws providing for the regulation of the coal mines, or other Acts which may hereinafter be enacted governing coal mines, have been complied with. It shall also be the duty of the said Coal Mine Inspector to carefully examine all the coal mines in operation in this State annually, and all mines having an annual output of 1,200 tons or more at least, every six months, and oftener if necessary to see that every precaution is taken to insure the safety of all the working men that may be engaged in such coal mine. ⁴⁰

The North Dakota Coal Mining Code was truly progressive in two areas: maximum hours of labor and the employment of children. When numerous other industries throughout the nation were setting minimum daily working hours at ten or above, the North Dakota code set the maximum hours for coal miners at eight, except in emergency situations in which life or property was in imminent danger. ⁴¹ The state mining code also limited the use of child labor, and in the year 1919, the employment of children--and often very young children--for excessive hours, was a well known fact in the United States. ⁴² Section eighty-six of the code declared:

Any person, company, firm. . .engaged in the mining industry in this state. . .who shall knowingly employ or permit to be employed any child under the age of sixteen years to render or perform any service or labor in any underground workings or mine, shall be guilty of a misdemeanor and. . .punishable by a fine of not less than One Hundred (\$100.00) Dollars or more than Five Hundred (\$500.00) Dollars. ⁴³

The coal mining code was a relatively uncomplicated solution to the problem of unsafe mining conditions, but when the state's legislators met the freight rate controversy over transporting lignite by rail, they encountered a maze of problems that refused any solution, let alone an uncomplicated one. In 1903 the legislature attempted to adjust the rate schedule established in 1897. Under Chapter 146 of the laws of 1903, the legislature enacted a maximum coal rate much lower for long distance hauls than the schedule set in 1897. Furthermore, the legislature approved joint rates, which meant that if coal was shipped over two or more connecting lines that rate could not be higher than if the freight traveled the same distance over one line. With the new schedule and joint rates, communities in the eastern part of

TABLE 3.--Maximum Freight Rates under Chapter 146, Laws of North Dakota Effective March 10, 1903.

Miles	Rate (per ton)
0-5	\$.30
5-15	.40
15-25	.50
25-40	.60
40-60	.70
60-100	.75
100-150	.80
150-200	.90
200-250	1.00
250-300	1.10
300-350	1.20
350-400	1.25
400-450	1.30
450-500	1.35

SOURCE: Laws Passed at the Eighth Session of the Legislative Assembly of the State of North Dakota, 1903 (Grand Forks: Herald, State Printers and Binders, 1903), p. 197.

the state received coal at a much lower price. Residents in Grand Forks saved \$.92 per ton on lignite from Kenmare with the new rates.⁴⁴ (See table 3.)

The major railroads in the state, however, declared the new rates unreasonable and confiscatory and refused to comply with the new schedule.⁴⁵ Several investigations and meetings followed with results indicating that the Chapter 146 rates, in comparison to those in other mid-western states, were markedly lower, particularly those rates for distances over sixty miles. The Board of Railroad Commissioners met with Governor John Burke and together they agreed that no legal action be taken to enforce the unreasonable rates. In their annual report for 1904, the railroad commissioners urged a repeal of Chapter 146.⁴⁶ The Senate concurred with the commissioners and passed a resolution against the enforcement of the rate schedule during the 1905 Legislative Session.⁴⁷

In 1907 the legislature attempted once again to enact a maximum tariff under Chapter 51, Laws of North Dakota. The railroads once again revived the old charges of unreasonableness and confiscation and refused to comply. In August, 1907, the Attorney General applied to the North Dakota Supreme Court for an injunction to restrain the shippers from charging the higher rates. They, in turn, voiced their objections to the new schedule. Eventually, the case went before the North Dakota Supreme Court and on April 16, 1909, the court declared that:

. . .the law was presumptively valid and the burden of proving that the rates prescribed were clearly unreasonable, was upon the carriers; and that the proper test as to whether the rates were reasonable, was whether the carrier would be enabled from its total freight receipts on all its intrastate traffic to earn a sum, above operating expenses reasonably necessary for such traffic, sufficient to yield a fair and reasonable profit on its investment--that the legislature might reduce the freight on a particular article, provided the carrier was enabled to earn a fair profit upon its entire intrastate business.⁴⁸

The railroads could not agree with the state court's decision and appealed their case to the United States Supreme Court. The federal judgment, however, was quite inconclusive for it did not ". . .settle any question of fact." Yet, the high court did concur with the state court's decision to rehear the case if the shippers could

"...prove more clearly the confiscatory character of the rates."⁴⁹ Accordingly, the railroads applied the rates under Chapter 51 for a trial period ending June 30, 1911. Two months later, the case was heard by the North Dakota Supreme Court. The state tribunal, after extensive investigations, found that the Great Northern Railway Company had made a reasonable profit from its lignite shipments. The Northern Pacific Railway Company, on the other hand, had made only a marginal profit from its lignite traffic and the court ruled the rates as non-compensatory. The Minneapolis, St. Paul and Sault Ste. Marie Railway Company (Soo Railroad), had suffered a net loss of from \$9,000 to \$12,000 during the trial period, and the rates were again declared non-compensatory. Nevertheless, the state court ruled that even though the rates were not compensatory for the Northern Pacific and the Soo Railroads, the revenue from other commodities shipped over those lines provided a reasonable profit and, therefore, the rate schedule under Chapter 51 was upheld.⁵⁰

The Northern Pacific and Soo Railways were not content with the state court's ruling and reappealed their case to the United States Supreme Court. On March 8, 1915, the court reversed the state court's decision. The coal rate law of 1907 was declared unconstitutional because it did not provide for a reasonable profit from the lignite traffic. The court further ruled that "...each commodity must stand upon its own bottom, and a carrier may not be compelled to transport any commodity at less than cost, or without substantial compensation in addition to cost."⁵¹

Shortly after the Supreme Court's decision, the two railroads filed tariffs with the Board of Commissioners which restored the schedule in effect prior to the passage of the 1907 statute. During subsequent conferences with the aid of rate experts, the commissioners discovered, however, that the old rates were significantly higher on coal carried over two or more connecting lines than on the joint rate schedule under Chapter 51. The board also concluded that the railroads lost the majority of their earnings on the longer hauls. Therefore, the board enacted a schedule which increased the rates on long hauls and implemented the joint rate clause. The coal operators protested the new schedule on the basis that it "...would operate to confine each mine to its immediate locality in the sale and distribution of its product and would not permit free competition at points which should be competitive."⁵²

The commissioners together with the rate experts and the legislature established a new coal tariff without the joint rate clause. (See table 4.) As an alternative, the board sanctioned a combined or joint rate as 80 percent of the through rate (i.e., 1-line haul--100 miles=\$.80 per ton or 2-line haul--50 + 50 miles at \$.60 each= \$1.20 x .80= \$.96).⁵³ The new freight rate schedule was enforced by the commission; the first one to be carried out since 1907. Surprisingly, the rates established in September of 1915 by the commissioners, the rate experts, and the legislature were satisfactory to all interested parties--the railroads, the coal operators, and the people.⁵⁴

Another controversial issue erupted in November of 1919 when soft-coal miners throughout the United States went out on strike. North Dakota miners were no exception, but their participation in this chapter of labor history was markedly different from that of the rest of the nation. Miners in North Dakota were not highly organized in 1919. Most coal mines were scattered throughout the western part of the state making it "...quite difficult to organize and maintain unions."⁵⁵ Still, there were several unions in existence at the time of the strike. North Dakota locals under District No. 27 of the United Mine Workers of America were located in Lehigh, Burlington, Kenmare, Williston, Wilton, Beulah, Medora, New Salem, and Noonan.⁵⁶ Approximately 1,500 miners belonged to the union and produced almost 70 percent of the state's annual lignite output.⁵⁷ Therefore, if the miners refused to work, the state would likely face a fuel shortage.

The coal strike of 1919 was the outcome of unpleasant economic conditions. As part of the World War I effort, soft-coal miners in the United States signed a contract, known as the Washington Agreement, on October 6, 1917 which froze wages for the duration of the war or until March 31, 1920. Economic conditions, however, undermined the Washington Agreement. In November of 1918, the average work week was about forty hours, but as the war drew to a close, the demand for coal declined at an accelerating rate. By the winter of 1919, miners were working only twenty-four hours a week.⁵⁸ Their earnings diminished as the cost of living rose.

In an attempt to alter the situation, the United Mine Workers met for their biennial convention in September, 1919. The wage-scale committee adopted a slate of

TABLE 4.--Maximum Freight Rates for the Carriage of
Lignite Coal Effective September 4, 1915.

Miles	Rate Per Ton Cents	Miles	Rate Per Ton Cents	Miles	Rate Per Ton Cents	Miles	Rate Per Ton Cents
10	40	85	74	160	92	270	114
15	42	90	76	165	93	280	116
20	45	95	78	170	94	290	118
25	47	100	80	175	95	300	120
30	50	105	81	180	96	310	122
35	52	110	82	185	97	320	124
40	55	115	83	190	98	330	126
45	57	120	84	195	99	340	128
50	60	125	85	200	100	350	130
55	62	130	86	210	102	360	132
60	64	135	87	220	104	370	134
65	66	140	88	230	106	380	136
70	68	145	89	240	108	390	138
75	70	150	90	250	110	400	140
80	72	155	91	260	112		

SOURCE: Twenty-Fifth and Twenty-Sixth Annual Reports of the Board of Railroad Commissioners to the Governor for the Biennial Period Ending June 30, 1916 (Fargo: Walker Bros. & Hardy, State Printers, 1916), p. 61.

demands consisting of a sixty percent increase in pay, a six-hour day and five-day week, and an end to the double shift system.⁵⁹ The UMW then met with the Bituminous Coal Operators Association and presented its demands. The association refused to accept the demands, claiming that they would cause a 153 percent increase in total wages, that the production level would be cut in half, and that the consumer would be forced to pay twice as much for the fuel. In addition, the operators stated that the war was not over as peace had not been formally established and therefore the contract was still binding.⁶⁰

Continued negotiations proved fruitless and the UMW issued a strike call for November 1. At midnight on October 31, the strike began and 394,000 unionized soft-coal miners left their jobs the first day.⁶¹ The coal miners in North Dakota, however, remained on the job as a result of the actions of Lynn J. Frazier, Governor of North Dakota, and Henry Drennan, UMW District 27 President. Frazier sent a telegram to John L. Lewis, President of the UMW, on October 30 proposing that the state's mines be kept open because lignite could not be stockpiled by reason of its rapid deterioration and a dangerous fuel shortage would result. Lewis wired Drennan, who in turn conferred with Frazier and other state officials.⁶² A final agreement was quickly reached; the miners would return to work during the strike, the operators were to pay a sixty percent increase in wages, which would be collected as a union assessment and sent to miners in Montana in order to finance their strike, no coal was to be shipped out of the state, and when a final settlement was made, the same contract would apply to North Dakota miners.⁶³ Shortly before midnight Drennan issued a statement delaying the strike.⁶⁴

The miners picked up their tools and went to work November 1 on schedule. According to the miners, they had, in fact, asked for an increase in wages, but they were satisfied with the eight-hour day established by the North Dakota Legislature only a few months earlier and they were also content with the six-day week.⁶⁵ The operators, on the other hand, refused to accept the Frazier-Drennan proposal and stated that the demands were excessive. They maintained that using the wage increase to aid striking miners violated a federal injunction, the increase would only

raise the price of coal, and a wage scale had not yet been adopted by the national organization. Therefore, the operators contended, the salary increase was not obligatory.⁶⁶ Continued negotiations proved futile and on November 7, Drennan delivered a strike order. The next morning the miners walked out.⁶⁷

Governor Frazier, after several unsuccessful meetings with operators, miners, and state officials, decided to institute martial law and took over the mines on November 12. His proclamation contained the following provisions:

1. The lignite mines were to be reopened at once under the supervision of the state militia.
2. The people of the state were to be supplied with coal immediately.
3. Any persons interfering with the mining operation or transportation of coal were to be placed under guard until they were considered as not dangerous to the public welfare.⁶⁸

Frazier also proposed to pay the operators a royalty of ten to twenty-five cents per ton, that the miners were to receive the existing wage scale, and that lignite was to be sold to the public at cost. The miners accepted the Governor's proposal and returned to work under the direction of the state militia.⁶⁹ The thirty-four mines that were placed under the control of the state were located in Burlington, Kenmare, Tasker, Foxholm, Noonan, Williston, Medora, Wilton, Avoca, and Zahl.⁷⁰

The operators of the Washburn Lignite Coal Company, however, protested the Governor's actions and refused to work for the state. The officers of the company petitioned District Judge William L. Nuessle for ". . . an injunction directing the governor to hand the Wilton mines back to the operators the following week."⁷¹ The court heard testimony from both parties. The attorney for the state argued that state law protected militiamen in the performance of their official duties and as subordinates of the Governor their actions could not be questioned. The Washburn officials, on the other hand, stated that there had been no breach of the peace and furthermore, ". . . had he (Governor Frazier) been warranted in declaring martial law for his seizure of private property, there was no warrant in law for his seizure of private property for commercial purposes." On November 19, Nuessle ordered Adjutant General Angus Fraser to return the Wilton mines to their legal owners by November 24.⁷²

Meanwhile, the owners of the Dakota Coal Mining Company of Tasker alleged that their mine was in operation when it was placed under state control. They began proceedings in the Federal District Court at Fargo for the return of their property. On November 24, the case was heard and the allegation of the mining company was sustained, although it was determined that the mine was not operated to capacity prior to the seizure. According to Federal District Judge Charles F. Amidon, the presiding justice, the central issue of the case was not the operating abilities of the Dakota Coal Mining Company, but ". . . whether or not all the people of the state could have secured coal and not been in danger of suffering and freezing to death if the Governor had not seized the lignite mines."⁷³ Amidon further declared that "there are three great rights in every strike. . . the right of the employer, the employee, and the public. . . the right of the public supercedes that of either employer or employee." With that conclusion, Judge Amidon handed down a decision in support of the Governor's action.⁷⁴

Governor Frazier's victory in the federal court was somewhat tarnished when a few days later the lignite operators accepted a temporary agreement with the UMW. On December 3 officers from District 27 of the union met with James Murphy, President of Local No. 3598 of Burlington and officials from the North Dakota Lignite Operators Association and together they agreed to a 14 percent increase in the wage scale as a temporary contract for settlement until a final agreement was reached by the national organization.⁷⁵ Gradually, the other mines settled on the 14 percent increase. The state militia was recalled from the mines, thus ending martial law, and by December 23, the miners were back at work under private management.⁷⁶

On the national scene, a final agreement was not reached until March 1920. Shortly after the settlement in North Dakota, President Woodrow Wilson asked members of the United States Bituminous Coal Commission to schedule hearings on the issues of the strike. Their objective was to review the problem, to reach an acceptable decision, particularly on the wage scale, and to submit their report to the President by March 10. In the report, the commissioners granted a 27 percent increase to the miners and suggested that the eight-hour day and six-day week remain the same.⁷⁷ President Wilson approved the report and sent it to the wage-

scale committee of the Bituminous Coal Operators Association and the UMW on March 29 for acceptance. The association and the union agreed to the conditions of the commission report, and the new contract went into effect on April 1.⁷⁸ The strike was over.

While lignite coal was the subject of controversy ranging from the prolonged freight rate battles to the episodes of the labor strike, it also served as the basis of intense research at the University of North Dakota in Grand Forks. Earle J. Babcock,⁷⁹ often referred to as the "Dean of North Dakota Lignite," conducted countless experiments on lignite which eventually led to briquetting and gasification of the coal. Babcock began investigations of the brown coal long before the turn of the century. He traveled throughout the coal region, describing the stratification of select mines and analyzing the fuel content. Babcock's enthusiasm and desire to promote the coal resources was acknowledged by the State Legislature in 1908 when the lawmakers appropriated \$30,000 for the construction of an experimental lignite station at Hebron, North Dakota, and for a lignite laboratory at the University's School of Mines.⁸⁰ By 1911 Babcock was devoting the majority of his time to coal research.

One of Babcock's numerous accomplishments was the briquetting of lignite. Early he saw the need and the advantage of producing briquets. Lignite was used extensively for domestic purposes and was generally supplied in large lumps that often slacked or pulverized. Coal at the mine head contained about 30 percent water, which reduced its heating efficiency. Briquets, on the other hand, were quite advantageous. As Babcock explained:

The briquets present many advantages over the original lignite or even over the other varieties of coal. They have nearly double the heating value of the original lignite, as usually placed upon the market, they do not disintegrate on standing or burning, can be stored without being affected by atmospheric conditions, and are uniform in size and convenient to handle.⁸¹

With the need and the advantage, the only remaining factor was feasibility. At the Hebron Mining Substation, Babcock built a briquetting plant. There, innumerable tests were carried on and a process for briquetting was developed:

In converting the raw lignite into the condensed briquets, the first step is . . . the removal . . . of water. The lignite is run thru a rotary drier which removes from 75 to 90 percent of the moisture.

After the coal has been sufficiently dried it is conveyed to the retort distillation chamber and the gas driven off. . . This process is usually completed in about four hours. At the end of this time the retort is discharged and the remaining coal residue quenched and crushed ready for the mixing with the binder. The coal and the binder are then warmed to the proper temperature and conveyed to the mixer where a very thro [sic] blending of coal residue and binder takes place.

When the mixing has been carried on for a sufficient length of time the material is discharged and conveyed directly to the briquet machine.

The material to be briquetted is fed between two rolls, the surfaces of which are covered with pillow shaped pockets, half of a pocket being on the under and half on the upper roll. The coal mixture is fed between the two rolls and pressed into the pockets, by which process firm dense briquets are made and as the rolls revolve the briquets are discharged to a belt conveyer by which they are carried to the storage bins and the briquetting process thus completed.⁸²

The briquetting machine was capable of producing two tons of briquets per hour, with each briquet weighing about two and one-half ounces.

Babcock also studied the heating power and the chemical composition of the briquets. He compared them to raw lignite and also to hard anthracite coal, and his conclusions favored the briquets. The results of one experiment undertaken in 1911 are found on table 5.

The gasification of lignite also intrigued Babcock. Both the Mining Substation and the School of Mines Laboratory housed gasification plants. At those two loca-

TABLE 5.--Chemical Analyses and Calorific Count of Lignite, 1911.

	Moisture	Volatile Matter	Fixed Carbon	Ash	B.T.U.s
Raw Lignite	35.01%	25.11%	34.67%	5.21%	7,500
Lignite Briquets	0 to 6%	2 to 8%	75 to 85%	10 to 14%	11,500-12,000
Anthracite Coal	3.68%	5.26%	80.51%	10.55%	12,000-13,000

SOURCE: Earle J. Babcock, "The Economic Utilization of Lignite Coal," The Quarterly Journal of the University of North Dakota 1(April 1911): 201-202.

tions, Babcock conducted research into the quantity and quality of the gases distilled from lignite. In the gasification process, 300 to 400 pounds of dried lignite were crushed and placed inside a retort. The retort was then heated to a temperature of between 1,200 and 1,400 degrees Fahrenheit and the gas was driven off. To purify the gas of any residue such as tar, pitch, ammonia, coke, and dust, it was sent through four filtering chambers including a tar extractor, a condenser, a scrubber, and a purifier. Once the gas had passed through these purification receptacles, it was sent to a storage tank where it was analyzed for its practicality and efficiency as a domestic fuel gas.⁸³ The results of an experiment conducted in 1911 are found in table 6. With such favorable results, Babcock believed that lignite gas could be used efficiently not only for lighting purposes, but also as a power source in gas engines and in the production of electricity. The residue ammonia sulfate would have a commercial value as a fertilizer, and tar would provide a more than adequate binder in the briquetting process.⁸⁴

Babcock's demonstration of the feasibility of briquetting and gasifying of lignite attracted the attention of outside interests. In 1913, lignite in the briquet form was tested as a marketable commodity and proven successful. The Northern Briquetting Company established the first commercial briquetting plant in the state at Minot. The three-story processing plant was constructed at a cost of \$150,000. The lignite used in the operation was shipped from the Davis Coal Mine. The plant was operated by five men and produced 100 tons of briquets per day.⁸⁵

With the successful operation of the Northern Briquetting Company, Babcock envisioned a grand future for the brown coal. In 1914 he stated:

There seems little doubt but that the briquetting and the production of gas from lignite will in the near future be put on a commercially satisfactory basis in the state. While this will prove of great value to all parts of our state, it will be especially important to those communities nearest the great lignite deposits in the western portion of the state, for in some of these the wastes can be converted into electricity which in turn can be sent to surrounding towns and villages, thus distributing power and light from numerous central power plants. Such an arrangement will not only be a great saving of our fuel resources but will also result in establishing many industries which can be developed by abundant and cheap electric power.⁸⁶

Babcock's extensive research, published works, and endless concern symbolized the 1900-1920 era. The first score years of the twentieth century were busy times for the coal industry. The rise of the coal towns suggested that lignite was becoming big business. Its use in irrigation projects, in producing electricity, and in firing the kilns in brick plants marked a widening horizon in its technological capabilities. In the laboratory, the chemical reduction of lignite into a countless

TABLE 6.--Gas and Residue Analysis of Lignite, 1911.

Sample Series	A	B	C
Carbon Monoxide	17.24%	18.70%	19.24%
Hydrogen	45.16	45.45	41.26
Ethane	0.14	1.02	0.39
Methane	15.59	14.42	16.31
Nitrogen	5.49	5.34	4.30
Oxygen	1.76	1.21	1.00
Carbon Dioxide	11.51	11.51	15.40
Tar (per ton)	20-30 lbs.		
Ammonia Sulphate (per ton)	14.5-15 lbs.		

SOURCE: Earle J. Babcock, "The Economic Utilization of Lignite Coal," The Quarterly Journal of the University of North Dakota 1(April 1911): 200-201.

number of by-products spelled the beginning of a promising future for those by-products in various other industries.

The era was a progressive one as well. The state government took influential steps in the licensing of coal mine operators. The creation of the State Coal Mine Inspector was a necessity and the inspector's duties and rights empowered him with a regulating influence over the mining industry. A liberal legislature also established a coal mining code for the state which was progressive in the areas of safe mining conditions, child labor, and daily working hours.

Somewhat problematical is another aspect of the 1900-1920 period. Shipping lignite was an old problem with new, unanswered questions. In 1916, after long years of controversy, the United States Supreme Court handed down a decision which limited the power of the state in rate making. The court's decision provided a balance of power between the opposing factions and lessened the likelihood of controversy in the future. Miners out on strike were another problem during the early winter months of 1919. Although labor was not highly organized at that time, its growing force was felt by those without fuel in the eastern part of the state. The institution of martial law by the Governor was a demonstration of the state's power, and the early acceptance of a new contract by North Dakota miners demonstrated the lack of substantial union power as well as the supremacy of compromise. The 1900-1920 era can indeed be characterized as eventful in the history of North Dakota coal mining.

FOOTNOTES--CHAPTER II

¹ General William Drew Washburn was known in both the industrial and political worlds. He was involved with the organization of the Crosby-Washburn and the Pillsbury-Washburn flouring mills in Minnesota. Lumbering and railroad enterprises measured among his business interests. Politically, Washburn was prominent nationally as well as in the state of Minnesota. He served as surveyor-general in that state from 1861 to 1865 and as a member of the House of Representatives in 1869 and in 1871. He also served as United States Senator from Minnesota from 1889 to 1895. See "W. D. Washburn Passed Beyond," Bismarck Tribune, July 30, 1912, p. 1, 5.

² Frances Wold, "The Washburn Lignite Coal Company: A History of Mining at Wilton, North Dakota," North Dakota History 43(Fall, 1976): 4-6.

³ Ibid., p. 8.

⁴ Fourth Biennial Report of the State Engineer to the Governor of North Dakota for the Years 1909-1910 (Bismarck: Tribune, State Printers and Binders, 1910), pp. 71, 76, 87; Second Biennial Report of the Geological Survey of North Dakota, 1902 (Bismarck: M. H. Jewell, State Printer, 1902), p. 62.

⁵ Wold, "The Washburn Lignite Coal Company," p. 6.

⁶ Ibid., p. 12.

⁷ Ibid.

⁸ J. F. Wathey, "The County of McLean," North Dakota Magazine 3(September 1908): 49; U.S. Department of Commerce, Bureau of the Census, Fourteenth Census of the United States, 1920: Population, v. 1, 271; Second Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1920 (Bismarck: Tribune, State Printers, 1920), p. 11.

⁹ State Mine Inspector's Report, 1920, p. 11.

¹⁰ "Thriving Coal Towns of North Dakota," North Dakota Magazine 3(January 1909): 27; Mary Anne Barnes Williams, Origins of North Dakota Place Names (Bismarck: Bismarck Tribune, 1966), p. 43.

¹¹ "Coal and Clay," Dickinson Press, 16 November 1907, p. 1.

¹² State Engineer's Report, 1910, pp. 70, 76, 84.

¹³ Sixth Biennial Report of the State Engineer to the Governor of North Dakota for the Years 1913-1914 (Devils Lake: Journal Publishing Company, State Printers, 1914), p. 123; Seventh Biennial Report of the State Engineer to the Governor of North Dakota for the Biennial Period Ending June 30, 1916 (Fargo: Walker Bros. & Hardy, State Printers, 1916), p. 110; Eighth Biennial Report of the State Engineer to the Governor of North Dakota for the Biennial Period Ending June 30, 1918 (Bismarck: Tribune Printing Co., 1918), p. 134.

¹⁴ Prairie Tales (Bowman County, North Dakota: Rural Area Development Committee, 1965), p. 192; State Mine Inspector's Report, 1920, p. 11.

¹⁵ "Thriving Towns," North Dakota Magazine, p. 27.

¹⁶ Prairie Tales, pp. 191-192.

¹⁷ Mrs. D. H. Dettman, Chairman, Beulah North Dakota Golden Anniversary, 1914-1964 (n.p., 1964), p. 4.

¹⁸ Ibid.

¹⁹ C. B. Heinemeyer, Historical Data of Mercer County, North Dakota (Hazen: Hazen Star, 1932), p. 51.

²⁰ C. B. Heinemeyer and Mrs. Ben Janssen, History of Mercer County, North Dakota, 1882 to 1960 (Hazen: Hazen Star, 1960), p. 42; Beulah Golden Anniversary, p. 138; State Engineer's Report, 1918, pp. 102, 149.

²¹ State Mine Inspector's Report, 1920, pp. 9, 12.

²² Fourteenth Census of the United States, 1920, p. 270.

²³ State Mine Inspector's Report, 1920, p. 12.

²⁴ Ibid., p. 13.

²⁵ Ibid., pp. 7-8, 11.

²⁶ State Engineer's Report, 1910, pp. 61-62; Fifth Biennial Report of the State Engineer to the Governor of North Dakota for the Years 1910-1912 (n.p., n.d.), p. 65; State Engineer's Report, 1914, pp. 59-60; State Engineer's Report, 1916, p. 71; State Engineer's Report, 1918, pp. 60-61; First Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1919 (n.p., n.d.), pp. 8-9; State Mine Inspector's Report, 1920, pp. 8, 12.

²⁷ Sixth Biennial Report of the Geological Survey of North Dakota, 1912 (n.p., 1912), p. 79; State Engineer's Report, 1914, pp. 106, 121.

²⁸ State Geological Survey, 1912, p. 79; State Engineer's Report, 1914, p. 121; State Engineer's Report, 1916, p. 125.

²⁹ State Mine Inspector's Report, 1920, pp. 6, 11, 13, 18.

³⁰ State Engineer's Report, 1910, pp. 74, 78; State Engineer's Report, 1918, p. 173; State Engineer's Report, 1914, p. 148.

³¹ "The Williston and Buford-Trenton Irrigation Projects," North Dakota Magazine 2(August 1907): 1, 4.

³² State Engineer's Report, 1914, p. 148; State Engineer's Report, 1918, p. 173.

³³ "The Williston and Buford-Trenton Projects," North Dakota Magazine, p. 7.

³⁴ State Engineer's Report, 1912, pp. 59, 94; State Engineer's Report, 1914, pp. 51, 110; State Engineer's Report, 1916, pp. 63, 64, 117; State Engineer's Report, 1918, pp. 51-52, 121; State Mine Inspector's Report, 1920, pp. 6-7.

³⁵ The figures for the years 1900-1909 are highly inaccurate and unreliable. For example, the Commissioner of Agriculture and Labor stated in the 1908 report that "the reports have not been complete because the operators have not kept records covering all the data required." See Tenth Biennial Report of the Commissioner of Agriculture and Labor to the Governor of North Dakota for the Term Ending June 30, 1908 (Bismarck: Tribune, Printers and Binders, 1908), p. 11.

³⁶ Laws Passed at the Tenth Session of the Legislative Assembly of the State of North Dakota, 1907 (Bismarck: Tribune, State Printers and Binders, 1907), pp. 72-73.

³⁷ Ibid., pp. 77-78.

³⁸ Laws Passed at the Sixteenth Session of the Legislative Assembly of the State of North Dakota, 1919 (Bismarck: Tribune, State Printers and Binders, 1919), p. 312.

³⁹ Ibid.

- ⁴⁰ Ibid., pp. 284-286.
- ⁴¹ Ibid., p. 311.
- ⁴² National Industrial Conference Board, The Employment of Young Persons in the United States (New York: National Industrial Conference Board, 1925), pp. 23, 28; See also Raymond G. Fuller, The Meaning of Child Labor (Chicago: A. C. McClurg & Co., 1922), pp. 37-41.
- ⁴³ Laws Sixteenth Session, 1919, p. 311.
- ⁴⁴ Laws Passed at the Eighth Session of the Legislative Assembly of the State of North Dakota, 1903 (Grand Forks: Herald, State Printers and Binders, 1903), pp. 194, 197.
- ⁴⁵ Fourteenth Annual Report of the Board of Railroad Commissioners to the Governor of North Dakota for the Year Ending November 1, 1903 (Bismarck: Tribune, State Printers and Binders, 1904), pp. xvi-xvii.
- ⁴⁶ Fifteenth Annual Report of the Board of Railroad Commissioners to the Governor of North Dakota for the Year Ending November 1, 1904 (Bismarck: Tribune, State Printers and Binders, 1904), pp. viii, xii-xiii.
- ⁴⁷ Sixteenth Annual Report of the Board of Railroad Commissioners to the Governor of North Dakota for the Year Ending November 1, 1905 (Bismarck: Tribune, State Printers and Binders, 1906), pp. 7-8.
- ⁴⁸ Twenty-First and Twenty-Second Annual Reports of the Board of Railroad Commissioners to the Governor of North Dakota for the Biennial Period Ending November 30, 1912 (Bismarck: Tribune, State Printers and Binders, 1912), pp. 65-66; Laws Tenth Session, 1907, pp. 73-77.
- ⁴⁹ Railroad Commissioners' Report, 1912, p. 66.
- ⁵⁰ Twenty-Fifth and Twenty-Sixth Annual Reports of the Board of Railroad Commissioners to the Governor of North Dakota for the Biennial Period Ending June 30, 1916 (Fargo: Walker Bros. & Hardy, State Printers, 1916), pp. 44-45.
- ⁵¹ Ibid., pp. 45-46.
- ⁵² Ibid., pp. 46, 49, 60.
- ⁵³ Ibid., pp. 60-61.
- ⁵⁴ Richard G. Heinert, "The North Dakota Board of Railroad Commissioners, 1889-1916" (M.A. thesis, University of North Dakota, 1974), p. 169. In succeeding years the rate charged for hauling lignite was increased, but the escalation was due to an inflated economy, general complaints of discrimination, and not by reason of controversial issues involving the right or power to enact rate schedules. See Twenty-Seventh and Twenty-Eighth Annual Reports of the Board of Railroad Commissioners to the Governor of North Dakota for the Biennial Period Ending June 30, 1918 (Bismarck: Bismarck Tribune Company, State Printers and Binders, 1918), pp. 10-12.
- ⁵⁵ Henry R. Martinson, History of North Dakota Labor (n.p., 1970), p. 56.
- ⁵⁶ William Hurtado, President of District 15, United Mine Workers of America, 1516 Xavier Street, Denver, Colorado, personal communication, 2 September 1977.
- ⁵⁷ "1500 Miners Would Go Out November 1 Under Original Order of United Mine Workers," Bismarck Tribune, 28 October 1919, p. 1.

- ⁵⁸ U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, "The Bituminous Coal Strike," by C. F. Stoddard, 9(December 1919): 61, 65.
- ⁵⁹ "Where Coal Strike Threatens," Bismarck Tribune, 20 October 1919, p. 6.
- ⁶⁰ Ibid.
- ⁶¹ "The Coal Miners' Strike," The New York Times Current History 11(December 1919): 420, 424.
- ⁶² "North Dakota Solves Its Coal Problem," The Nonpartisan Leader, 24 November 1919, p. 3.
- ⁶³ "Special Convention of the District No. 27, UMW of A., Billings, Montana, February 2, 1920," p. 9 [located in the files of the District 15 Office of the United Mine Workers of America, 1516 Xavier Street, Denver, Colorado].
- ⁶⁴ "North Dakota Will Get Its Fuel Supply," The Nonpartisan Leader, 17 November 1919, p. 3; One small group of miners in Burlington did not receive Drennan's message in time and went out on strike. Once they received the cancellation order, they returned to work.
- ⁶⁵ Ibid.
- ⁶⁶ "Drennan Delivers Ultimatum to Coal Operators But Grants More Time to Permit Second Pow-Wow," Bismarck Tribune, 5 November 1919, pp. 1, 3.
- ⁶⁷ "North Dakota Wakes in Blizzard to Find Mining at Standstill in All Mines Controlled by Unions," Bismarck Tribune, 8 November 1919, p. 1.
- ⁶⁸ "North Dakota Not Mining Coal Today: Wilton Men Balk at Walking," Bismarck Tribune, 13 November 1919, p. 4.
- ⁶⁹ "Special Convention of the District No. 27, UMW," pp. 9-10.
- ⁷⁰ "North Dakota Not Mining Coal Today," Bismarck Tribune, p. 4.
- ⁷¹ "N.D. Fuel Mines Producing 100 Per Cent," The Nonpartisan Leader, 8 December 1919, p. 3.
- ⁷² "Admits Order May Cause Civil War; Think That Better Than Despotism," Bismarck Tribune, 19 November 1919, pp. 1, 3.
- ⁷³ "N.D. Mines Producing 100 Per Cent," The Nonpartisan Leader, p. 3.
- ⁷⁴ "Amidon Upholds Frazier's Acts in Coal Strike," Bismarck Tribune, 26 November 1919, p. 1.
- ⁷⁵ "Special Convention of the District No. 27, UMW," p. 10.
- ⁷⁶ "Martial Law's Reign in State Virtually Ends," Bismarck Tribune, 23 December 1919, p. 1.
- ⁷⁷ U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, "Report of the United States Coal Commission," 10(April 1920): 41-47; For further information on the coal strike of 1919, see Ann H. Sande, "The Coal Strike of 1919 in North Dakota," Seminar 511 paper, University of North Dakota, 1976 [located in the holdings of the Department of Special Collections, Chester Fritz Library, Grand Forks, North Dakota].
- ⁷⁸ "Scale Becomes Effective Now," Grand Forks Herald, 30 March 1920, p. 1.

⁷⁹ Earle Jay Babcock accepted a faculty position at the University of North Dakota in 1889. In 1897 he became the State Geologist for North Dakota. In the following year he became a professor of Industrial Chemistry and was named Dean of the College of Mining and Engineering. Babcock was a member of the American Institute of Mining Engineers, the Society for Promotion of Engineering and Education and the American Chemical Society. Babcock's long years of research into North Dakota resources led him into international fame, and as a teacher at the University, he was greatly admired by both the students and the faculty. Much of Babcock's early field work in the western part of the state was carried on during the summer months, and he donated his time and money freely "for the good of the cause." For more information see "Services for Dean Babcock Here Saturday," Grand Forks Herald, 4 September 1925, pp. 1-2; William O. Beck, "Earle J. Babcock and North Dakota Lignite," North Dakota History, 41(Winter 1974): pp. 4-15.

⁸⁰ Louis Geiger, University of the Northern Plains (Grand Forks: University of North Dakota Press, 1958), p. 155; Laws Passed at the Eleventh Session of the Legislative Assembly of the State of North Dakota, 1909 (Bismarck: Tribune, State Printers and Binders, 1909), pp. 29-30.

⁸¹ Earle J. Babcock, "The Economic Utilization of Lignite Coal," The Quarterly Journal of the University of North Dakota, 1(April 1911): 204-205.

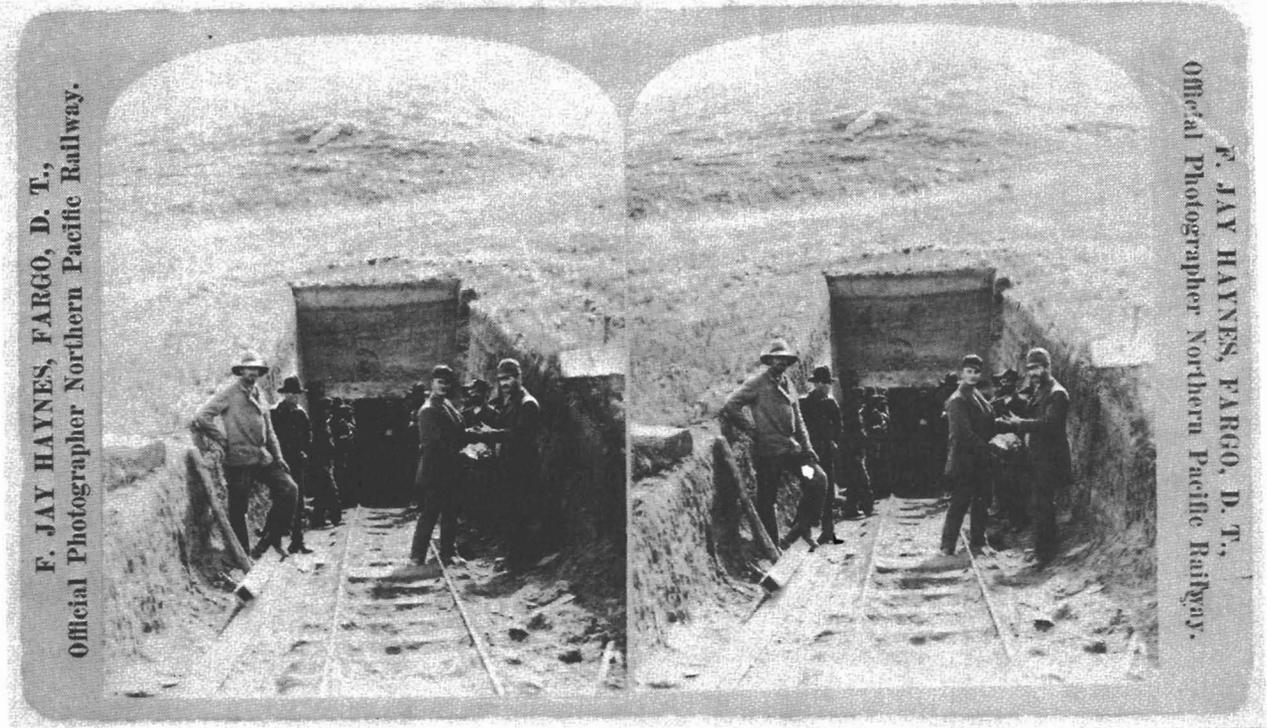
⁸² Ibid., pp. 205-206.

⁸³ Ibid., pp. 200-201.

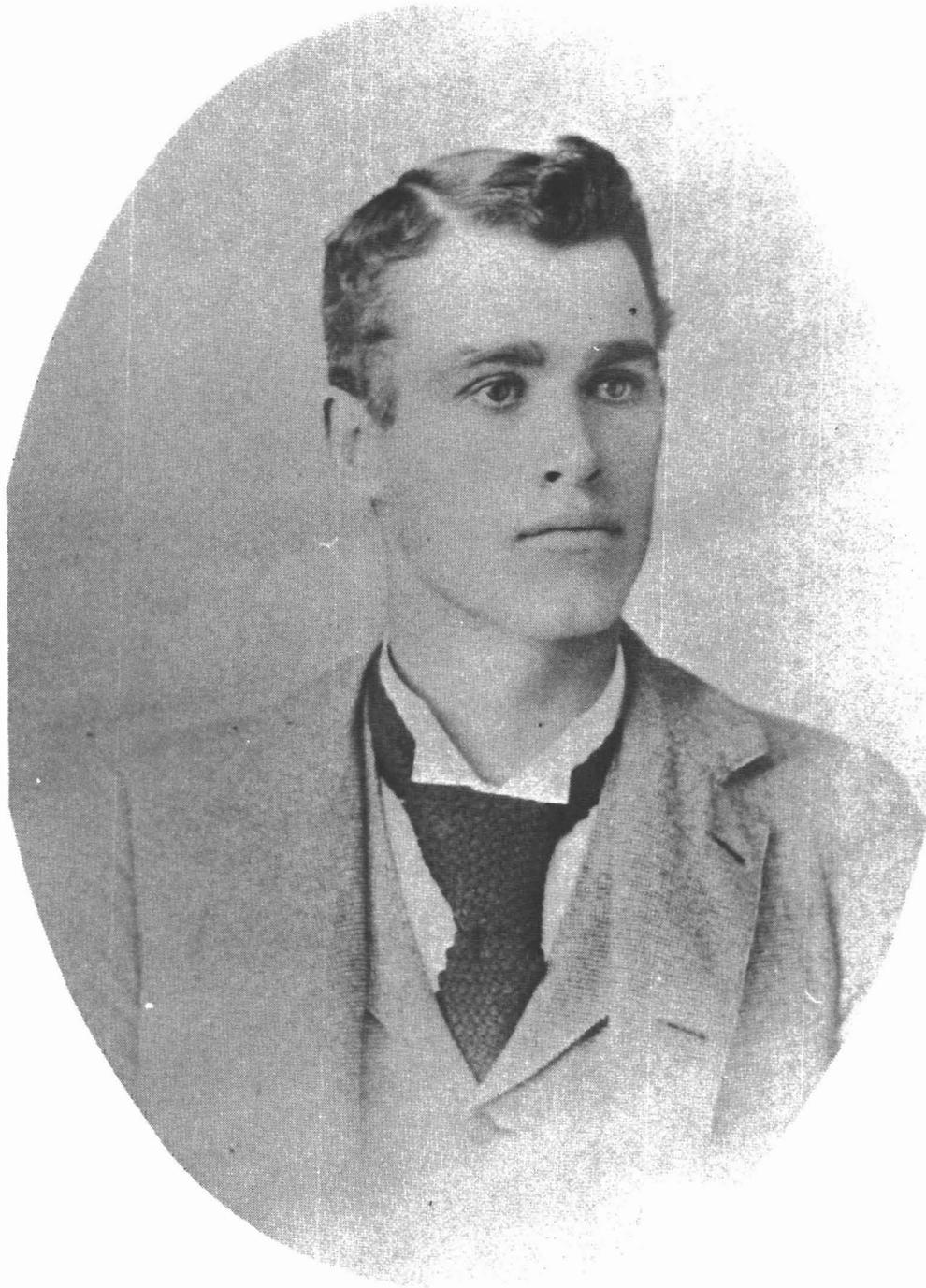
⁸⁴ U.S. Department of Interior, Bureau of Mines, Economic Methods of Utilizing Western Lignites, by Earle J. Babcock, Bulletin 89 (Washington, D.C.: Government Printing Office, 1915), pp. 46-48.

⁸⁵ W. C. Gilbreath, "Ward County," North Dakota Year Book, 1913 (Bismarck: Department of Agriculture, 1913), p. 243.

⁸⁶ Earle J. Babcock, "The Coal and Clay Resources of North Dakota," The Quarterly Journal of the University of North Dakota, 5(October 1914): 54.



A stereoscopic view of the Northern Pacific Coal Company's Baby Mine located at Sims, North Dakota, ca. 1883. Photo courtesy of the Institute for Regional Studies, North Dakota State University, Fargo, North Dakota.



John F. Brodie, Superintendent of the Lehigh Mine, Dickinson, North Dakota, ca. 1895. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



The formation of John Satterlund's Black Diamond Mine near Washburn, North Dakota, 1895. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



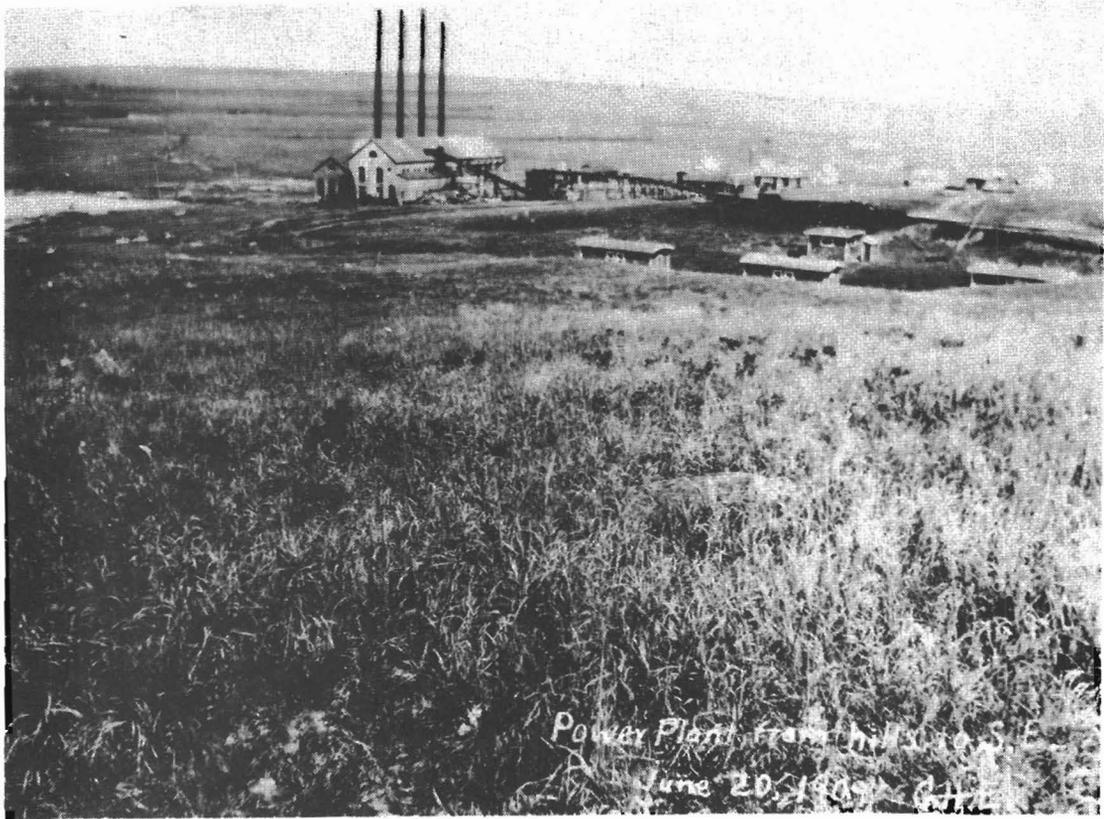
John Satterlund, owner of the Black Diamond Mine, Washburn, North Dakota. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



Early open pit mining, Morton County, North Dakota, ca. 1900. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



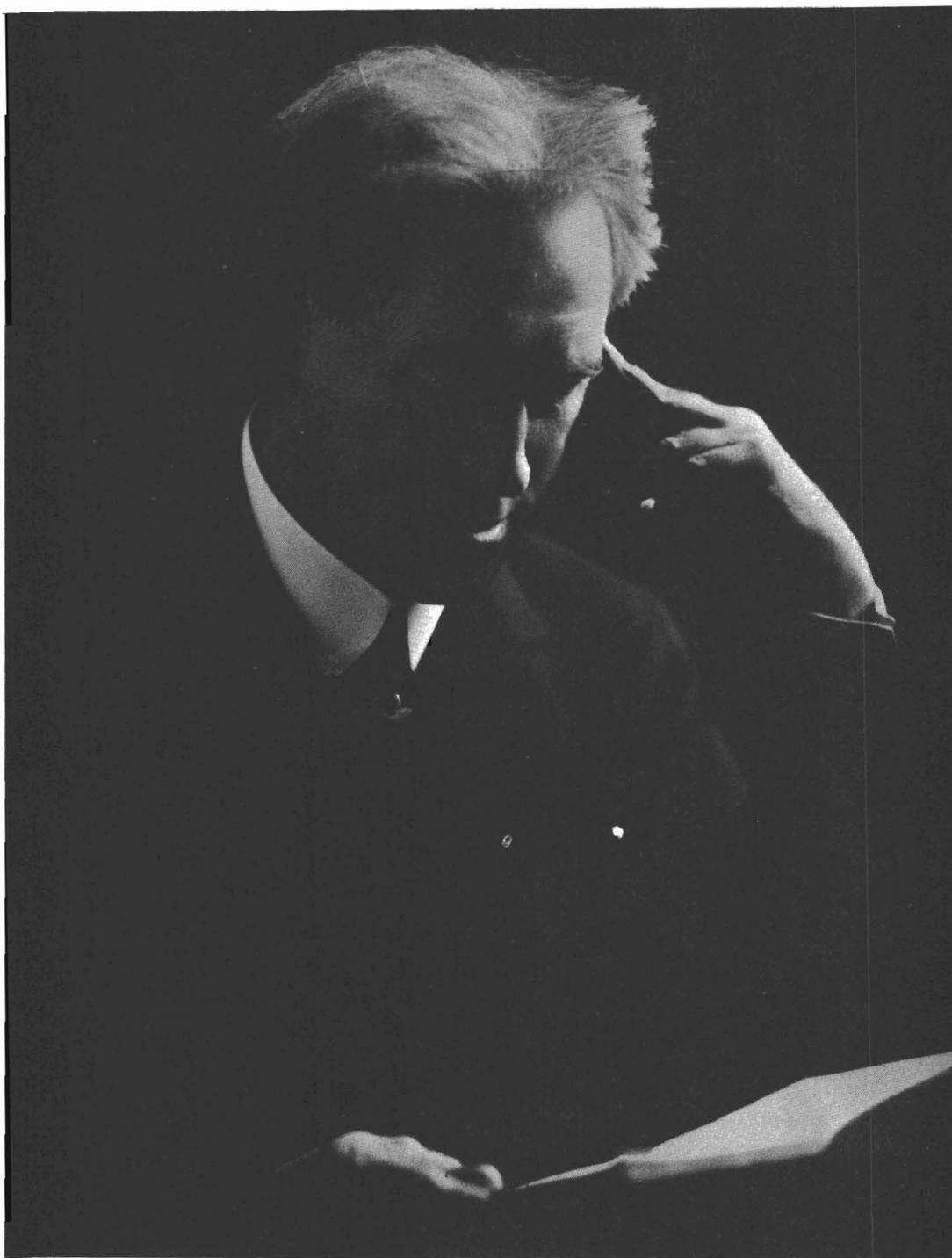
Clement A. Lounsberry, pioneer journalist and chief booster of North Dakota's resources. In 1901 Lounsberry stated that there was enough coal in North Dakota "...to warm the entire population of the United States for ten thousand years." Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



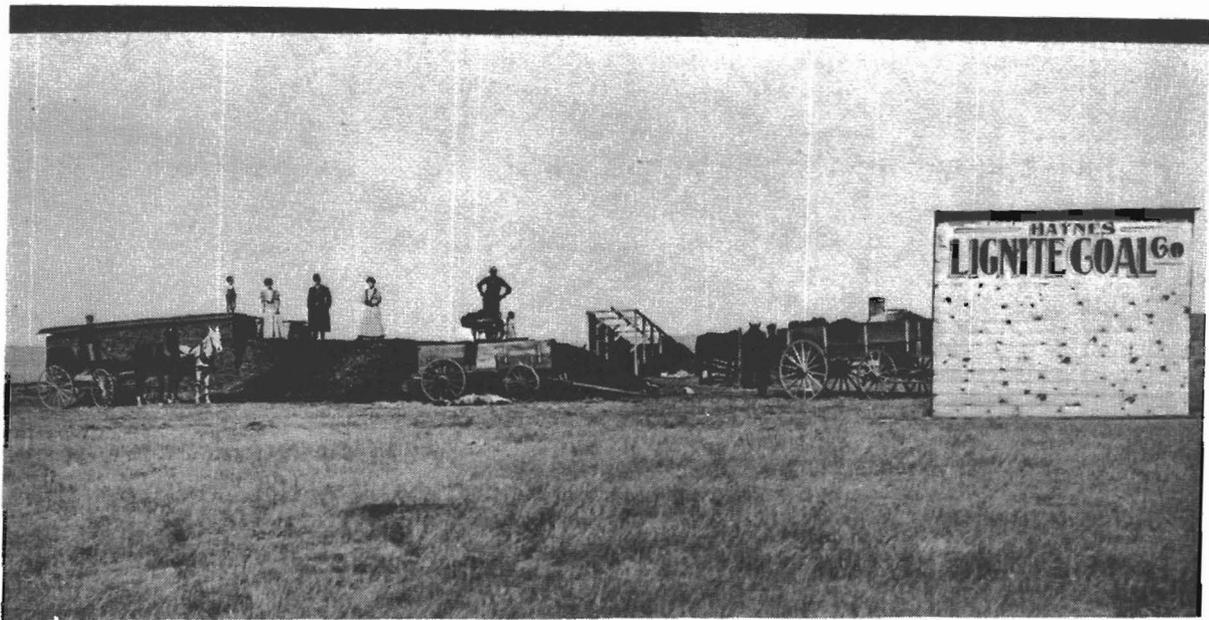
The Government Mine and Power Plant operated by the United States Reclamation Service near Williston, North Dakota, 1909. Photo courtesy of the Institute for Regional Studies, North Dakota State University, Fargo, North Dakota.



Mining coal in McKenzie County, North Dakota around 1915. Photo courtesy of the Institute for Regional Studies, North Dakota State University, Fargo, North Dakota.



Earle J. Babcock, known as the "Dean of North Dakota Lignite." Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



The Haynes Lignite Coal Company, located north of Haynes in Adams County, North Dakota, ca. 1910. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



A view of the University of North Dakota's Mining Sub-station at Hebron, North Dakota, 1919. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.

EVENING
EDITION

Grand Forks Herald.

NORTH DAKOTA'S

GREATEST

NEWSPAPER

EVENING
EDITION

14, NO. 269.

GRAND FORKS, N. D., WEDNESDAY, NOVEMBER 12, 1919.

PRICE FIVE CENTS.

N. D. MINES ARE UNDER MARTIAL LAW

Centralia Patrolled By Troops After Riot During Armistice Day

GERMAN NAVAL OFFICER PUT ON THE STAND

General Fraser is Ordered to See That Mines Are Operating

OUR LEGION MEN AND L. W. W. MEMBER KILLED

TWO IMPORTANT QUESTIONS ARE BEFORE THE AMERICAN LEGION ON LAST DAY OF ITS CONVENTION

German War Officials Want
to Know Why Subma-
rines Failed.

MINE OWNERS AND OPERATORS' SCALE COMMITTEE WILL MEET FRIDAY TO DISCUSS NEW WAGES

ALL BIG MINES OF THE STATE ARE TAKEN OVER

... of Radicals Ar-
rested in Connection
With Fight.

Decision Of Legion's Atti-
tude Toward Cash Bonus
For Service Men And
Women And Election Of
Officers Will Be Dis-
posed Of.

U. S. DELEGATES TO LEAVE PARIS EARLY IN DEC.

Peace Conference Expected
To Finish Its Work
This Month

Grand Forks, N. D., Nov. 12.—(Special Herald Staff Writer.)—The German naval officer, who was put on the stand today, was charged with the failure of the submarine campaign during the war. The officer, who was named as being the commander of the submarine, was charged with the failure of the submarine campaign during the war. The officer, who was named as being the commander of the submarine, was charged with the failure of the submarine campaign during the war.

PALMER MAY INTERFERE IN NORTH DAKOTA

Reported That He Will Take
Action in Connection
With Strike

Lewis Accepts Secretary
Wilson's Proposition But
In Meantime Declines Of-
fer From Owners To Nego-
tiate New Contract For
Next Year.

State Will Continue Control
Until Workers and Own-
ers Agree.

LEWIS REFUSES TO CANCEL N. D. STRIKE

Operators Take Stand That
Contract Fixes Wages
Until Next Year.

Headline from the Grand Forks Herald announcing the seizure of North Dakota lignite mines by state officials during the coal strike of 1919. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.

CHAPTER III

CHANGING TIMES 1920-1941

In almost any industry, there are times of great change. For North Dakota's lignite industry, the period of change began in 1920 with a sharp rise in the number of strip or surface mining operations. The object responsible for this revolution in the mining industry was the steam shovel. Within a few short years, strip mines outproduced underground structures. Economically they were more profitable than underground mines in terms of coal recovery, time, employment, and safety. Before long, operators of strip mines became the new captains of the coal industry. During the 1900-1920 era General William D. Washburn commanded the field. In 1920 two brothers emerged to take his place. A. H. (Harold) and Elmer M. Truax created one of the largest surface mining enterprises in the history of coal development. Although underground mining suffered a decline in use, it still claimed one very large firm, the Knife River Coal Mining Company.

If the decade of the 1920s was one of profitable changes, the years of the Great Depression were not. Economic conditions during the thirties did not seriously damage the coal industry. However, production levels fell periodically from 1930 to 1938 with the most severe decrease in 1931. The price of lignite also declined throughout the 1930s and never recovered from the downward cycle. The federal government aided those associated with the coal industry, particularly those in the field of research.

As the industry emerged from the Great Depression, another change developed which inaugurated the modern era in coal development. The rival fuels, natural gas and fuel oil, had made serious inroads into the lignite consumption market by the early 1940s. The number of active mines began to decrease and the lignite industry began to look at the marketability of the soft coal in the generation of electrical power.

The first major change during this period was the conversion to surface mining technology. North Dakota proved to be an excellent state for strip mining with comparatively flat topography and thick, level beds of coal. The region held an advantageous ratio of overburden to coal. Moreover, the content of the overburden consisted of soft clays and glacial deposits, an overburden more yielding than that of the eastern bituminous coal fields.¹ Together, these factors produced optimum conditions for the development of strip-mine activity.

Strip mining began long before the turn of the century, but the mines opened were small and in some cases, mere open pits. The horse-drawn scraper was used to remove the overburden. The coal was then extracted manually with the aid of picks, shovels, and dynamite. The horse and scraper, however, were not capable of removing huge tracts of overburden, which effectively limited production. Surface mining on a commercial scale was not achieved until the horse-drawn scraper was replaced with a mechanical shovel capable of removing overburden in cubic yards instead of in cubic feet.

The steam shovel made strip mining a lucrative enterprise, and eventually it became more profitable than underground mining. In 1920 there were only twelve strip mines as opposed to 104 subsurface. (See table 7.) By the end of the decade the number of strip mines had risen to sixty-nine and in 1939 they surpassed the underground total. Although it took the strip mine nineteen years to overcome the traditional subterranean mine, its profitability was well demonstrated by 1929. In that year there were only sixty-nine strip mines, one-third of the total number, but they produced 46 percent of the total tonnage. More significant is the fact that three strip mines owned by two companies produced 86 percent of the total production for surface mining. The three operations included the Zap Colliery Company at Zap, Mercer County, with a production of 155,651 tons and the Truax-Traer Coal Company mines at Velva and Kincaid (McHenry and Burke Counties, respectively) with a combined tonnage of over 600,000. Steam shovels and draglines were responsible for the tremendous production at all three mines.²

Strip operations were not only more profitable than deep mining, but they were also more economical. Underground mines generally lacked systematic mining procedures. Most mines were haphazardly worked, which often reduced coal production to less than 60 percent of the whole. Operators of surface structures, on the other hand, extracted lignite with a simple, yet thorough, process that returned a high

TABLE 7.--Active Lignite Mines and Production in North Dakota, 1920-1939.

Year	Total Number of Mines	Total Production (tons)	Number of Underground Mines	Production (tons)	Number of Strip Mines	Production (tons)
1920	116	878,969	104	791,281	12	87,688
1921	127	895,715	104	786,511	23	109,204
1922	108	1,057,823	figures	missing	figures	missing
1923	171	1,435,605	127	1,092,726	44	342,879
1924	135	1,029,449	figures	missing	figures	missing
1925	211	1,357,408	150	815,229	61	542,179
1926	272	1,385,362	183	837,964	89	547,398
1927	249	1,529,154	165	882,079	84	647,075
1928	226	1,783,624	157	943,604	69	840,020
1929	217	1,909,303	148	1,023,832	69	885,471
1930	248	1,849,144	174	924,693	74	924,451
1931	293	1,552,242	193	644,379	100	907,863
1932	279	1,743,053	185	766,738	94	976,315
1933	218	1,872,381	141	762,674	77	1,109,707
1934	268	1,746,226	167	650,485	101	1,095,741
1935	286	1,828,213	170	763,747	116	1,064,466
1936	294	1,704,983	155	681,964	139	1,023,019
1937	290	2,184,927	151	871,828	139	1,313,099
1938	299	2,142,061	151	797,159	148	1,344,902
1939	306	2,176,841	137	787,511	169	1,389,330

SOURCE: Second Annual Report of the State Mine Inspector to the Governor of North Dakota for the period Ending October 31, 1920 (Bismarck: Tribune, State Printers, 1920), pp. 7-23; Third Annual Report of the State Mine Inspector for the Period Ending October 31, 1921 (n.p., n.d.), pp. 6-29; Fourth Annual Report of the State Mine Inspection Department, October 31, 1921 to October 31, 1922 (n.p., n.d.); Fifth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1923 (n.p., 1923), pp. 5-18; Sixth Annual Report of the North Dakota State Mine Inspection Department, October 31, 1923 to October 31, 1924 (n.p., n.d.); Seventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1925 (n.p., 1925), pp. 5-18; Eighth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1926 (n.p., 1926), pp. 5-62; Ninth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1927 (n.p., 1927), pp. 11-25; Tenth Annual Report of the Coal Mine Inspection Department of the

TABLE 7.--Active Lignite Mines and Production in North Dakota, 1920-1939.--Continued

State of North Dakota, 1928 (n.p., 1928), pp. 17-31; Eleventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1929 (n.p., 1929), pp. 7-21; Twelfth Annual Report of the Coal Mine Inspection Department, 1930 (n.p., 1930), pp. 7-21; Thirteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1931 (n.p., 1931), pp. 7-23; Fourteenth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1932 (n.p., 1932), pp. 7-23; Fifteenth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1933 (n.p., 1933), pp. 6-21; Sixteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1934 (n.p., 1934), pp. 6-22; Seventeenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1935 (n.p., 1935), pp. 8-24; Eighteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1936 (n.p., 1936), pp. 8-25; Nineteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1937 (n.p., 1937), pp. 8-24; Twentieth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1938 (n.p., 1938), pp. 8-25; Twenty-First Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1939 (n.p., 1939), pp. 8-25.

NOTE: Active refers to the number of mines that have produced coal in a given year, according to the Coal Mine Inspection Department. The mine inspector usually has a large number of mines listed in his report, more than that in the above table. His reports include new mines, mines that are on fire, those that have caved in, those that have been condemned, the mines that simply lie dormant and those mines in which the operators have failed to report the necessary information. These mines are classified as inactive and, therefore, are not listed above.

percentage of the available coal. Strip mines were also more economical in respect to manpower. In 1929 the Knife River Coal Mining Company at Beulah in Mercer County, a subterranean structure, produced 318,964 tons of coal. The Truax-Traer mine at Kincaid produced 317,518 tons, approximately the same amount. Both mines used modern machinery to extract the lignite. Knife River used undercutting machines to break up the coal and hoisting devices to transfer it to the surface. At the Kincaid field, draglines removed the overburden and smaller steam shovels dug the coal and loaded it into haulage cars. The advantage of Truax-Traer over Knife River lies in the ratio of employment to coal production. At Knife River 220 miners were employed and at Kincaid, only 48. Further comparisons show that the mine at Knife River produced only 1,459 tons per man in 1929. At Kincaid the ratio stood at an amazing 6,406 tons per man.³ Surface mining technology had a definite advantage over the old underground method.

The largest strip operation in the state during this era was the Truax-Traer Coal Company. This immense open pit enterprise began in 1902 as a small underground mine at Noonan in Divide County. It was owned and operated by Harold Truax. In 1912 Elmer Truax joined the firm. The operation expanded with \$20,000 invested in coal cars, tracks, timbering, and surface equipment. Before long, the Truax brothers became important shippers of the native fuel. In 1917, the company shipped 50,282 tons of lignite valued at \$125,705.⁴

In 1918, the Truax brothers moved their enterprise to Kincaid in Burke County. There they began their ". . . history-making job of strip mining."⁵ The eight-foot vein of coal at the Kincaid field was initially uncovered by horse and scraper. In due time, the firm replaced the horse and scraper with a Bucyrus 35-B steam shovel with a half cubic yard capacity--a small machine in comparison to today's earth movers. The 35-B shovel was ". . . excellently adapted to shallow stripping. . ." but technologically unable to recover deeply buried veins. In 1922, therefore, the Truax Company purchased a 175-B shovel capable of removing the deep overburden. The company also acquired a Bucyrus 50-B 1 3/4 cubic yard shovel for loading the lignite. The installation of these two steam shovels ". . . made possible the handling of first the overburden, and then the coal itself from vein to cars by modern excavating machinery."⁶ By 1923, the shovels at the Kincaid field were producing over 100,000 tons of coal per year.⁷

The Truax brothers continued to enlarge the Kincaid operation and to increase its production level. The company installed a narrow-gauge railroad system with five engines and several coal cars equipped with a side dumping arrangement to haul the lignite from the pit to the tipple. The tipple, a modern steel structure with a shaker screen system, graded coal into various sizes, including lump, steam, nut, screened nut, and screening coal. After the coal was graded, it was loaded into Great Northern railroad cars by mechanical loaders purchased from the Ottumwa Box Car Loader Company. The coal was shipped to all points in North Dakota and heated numerous schools, hospitals, institutions, businesses, and homes. By 1926, the company was hiring seventy-five miners and selling lignite at \$1.90 per ton. The amount of coal excavated reached 171,804 tons valued at \$326,966.⁸

Events during the following year ultimately led the Truax Coal Company into national prominence as one of the country's largest strip-mining firms. Glen W. Traer, Sr.⁹, a pioneer in the fuel business from Chicago, Illinois, saw great potential in North Dakota's young industry. Traer's desire was to extend his business interests into the state, but more importantly, he wished

. . . to participate in the development of a project where the business could grow with the state, as contrasted with possibilities of central states where a new business would be obliged to enter a field already highly competitive.¹⁰

Traer made two trips to the coal fields near Velva in McHenry County and secured options on lands which appeared well laden with coal. He then ordered a series of investigations in which 700 test holes were sunk on 3,000 acres of land. The coal was analyzed and the boundary of the lignite bed was measured as well as the overburden. After over two years of investigations, the tests indicated that the Velva field contained a uniform bed of high quality coal averaging fifteen feet in thickness with an overburden of soft glacial drift. With a confident outlook, Traer purchased 1,100 acres of land in the Velva area and in 1927, he merged his finan-

cial resources with the strip-mining expertise of the Truax brothers and the new enterprise became the nationally known Truax-Traer Coal Company.¹¹

The year 1927 saw further developments. The Truax-Traer Company acquired a large strip mine one-half mile north of the mine at Kincaid. The strip mine, owned by the Whittier-Crockett Coal Company, began operations in 1919. The coal bed was eight feet thick and the overburden averaged twenty-eight feet. Within one year it became the largest strip mine in the state, with a production of 58,083 tons. By 1926, the company was using a dragline with a 2 1/2-yard capacity, along with two Marion steam shovels. Together the shovels were valued at \$163,000. A modern steel tipple, built at a cost of \$75,000, prepared coal in five sizes; lump, steam, four-inch, nut, and screened slack. Modern machinery also hauled the coal from the tipple to the railroad cars. The seventy-five men employed in and around the mine were capable of excavating 2,500 tons of coal per day. By the time it was sold to Truax-Traer in 1927, the mine was producing almost 125,000 tons of lignite.¹²

The addition of the Whittier-Crockett Coal Company to the holdings of Truax-Traer was the first step in the building of a coal empire. The second step was the opening of the Velva mine in October of 1927. Beneath the 1,100 acres of land owned by the company southwest of the town were an estimated 31,000,000 tons of coal, enough to keep the mine in operation for seventy-seven years based on a 400,000-ton annual capacity. The company invested roughly \$1,000,000 in retrieving the 31,000,000 tons. The most costly item was, of course, the shovel. A massive product of mining technology, the 320-B Bucyrus shovel received lengthy coverage on page one of the Minot Daily News:

Visitors at the mine usually center their inspection on the new shovel, especially constructed in several ways for the use of the Truax-Traer Company. The dipper used to scoop up the earth has a capacity of eight cubic yards. It has a boom 90 feet in length and a stick 65 feet long, and is operated by electricity. . . . the huge new power shovel. . . was purchased at a cost of \$140,000, which includes \$19,000 paid for freight to ship the 370 ton machine from Wisconsin to the site of its operation.¹³

The shovel, described above, was used in stripping the overburden which averaged twenty-five to thirty feet. From the pit the lignite was loaded into cars by a Bucyrus 50-B loading shovel. The coal cars were drawn by five Plymouth gasoline engines and ran on tracks from the top of the vein to the tipple.¹⁴

The tipple was another costly structure designed particularly for operation at the Velva field. It was built by the Pittsburg Boiler & Machine Company of Pittsburg, Kansas at a cost of \$80,000. The steel-built refining plant was an excellent example of coal production via assembly line. The process is described below.

. . . the tram cars as they come in from the pit, dump the coal from the car by the use of a Pittsburg rotary dump which turns the car upside down, making a complete revolution without uncoupling the car from the one next to it in the train. The coal passes into a hopper which has sufficient capacity to allow the dumping of several cars. The bottom of the hopper forms a Pittsburg reciprocating feeder which gives an even flow of coal to the Pittsburg conveyors or direct to a Pittsburg crusher. . . capable of crushing a lump of coal five feet long and from two to three feet thick. . .

After leaving the main conveyor, the coal passes onto the Pittsburg shaker screen where it is graded into different sizes for the market. The coarser sizes pass onto Pittsburg picking tables where it is hand picked and loaded into the cars. The finer coal passes into a Pittsburg rapid shaker screen where it is further graded and sized, then is conveyed to the storage bins or to the cars.¹⁵

The entire process from the pit to the railroad cars was an example of highly efficient mining of lignite coal on a massive scale.

Although machines replaced the efforts of human labor, men still controlled the machines. A year after the Velva mine opened, sixty-five men were employed

throughout the mine area as shovel operators, pit foremen, tram operators, preparation plant operators, maintenance workers, and office personnel.¹⁶ Since the mine was situated quite a few miles from Velva, Truax-Traer erected a series of dwellings to house the employees and their families. The homes lined both sides of what was called "Main Street." The company town also had a general merchandise store, a commissary, and the mine offices. With the Velva mine on a productive scale, the Truax-Traer Coal Company became the largest coal enterprise in North Dakota. The combined production of the three mines at Velva and Kincaid amounted to 573,744 tons in 1928.¹⁷

The expansive years for Truax-Traer did not end with Velva and Kincaid. One of the largest underground mines in the state came under the control of Truax-Traer in 1930. The Washburn Lignite Coal Company, the unrivaled leader in coal production during the 1900-1920 era, was leased to the new commanders of the soft coal industry in 1930 and converted to a strip mine. By the end of the first short coal season, the power shovels had hoisted over 143,000 tons of coal from the Washburn fields.¹⁸

Firmly rooted in North Dakota by 1930, the Truax-Traer Coal Company was unsurpassed in the production of the fossil fuel. With mines at Kincaid, Velva, and Wilton producing coal in the several-hundred-thousand-ton range, with power shovels, tipples, and narrow-gauge railroads valued at several million dollars, and with camp dwellings the size of small towns, Truax-Traer became the symbol of the new era in coal development.

Another strip mine to make its name during the decade of the 1920s was the Zap Colliery Company located two miles east of Zap. Stripping began in 1922 under the operation of Hadley M. Graves. The vein measured about eleven feet thick and was discovered at a depth of thirty feet. A 4 1/2-cubic-yard steam shovel excavated the fuel and dumped it into coal cars which were pulled up to the tipple by three Vulcan steam engines. The coal was prepared in three sizes and mechanically loaded into railroad cars for transport throughout the state. The coal from the Zap Colliery was sold under the trade name "Indian Head Lignite." From its inception until 1929, the enterprise had a seven-year history of sound prosperity. Beginning with a fair-sized productivity of 65,000 tons in 1923, excavation of the soft coal climbed steadily upward. By the end of the twenties, the Zap Colliery Company was producing over 155,000 tons of coal which netted the firm \$263,447. By 1929 "Indian Head Lignite" was the trade name of the largest strip operation west of the Missouri River.¹⁹

Divide County also laid claim to a substantial strip mine under the name of Baukol-Noonan Lignite, Inc. In 1928, Harris Baukol, bookkeeper for the Hought Coal Company, and Hugo Domrese, a coal operator from Larson in Burke County, formed a holding company to secure coal lands east of Noonan. They acquired an option on the Hought Coal Company land and leased approximately 900 acres nearby. Field investigations indicated that the coal averaged 6,000 tons per acre, with a heating capacity of 7,000 to 7,500 BTU's and considered ". . . the best quality lignite in the state of North Dakota."²⁰

In 1929, Baukol incorporated a mining company under the name of Baukol-Noonan Lignite, Inc., to uncover the estimated 5,000,000 tons of coal that lay twenty to sixty feet beneath the surface. An eight-cubic-yard Bucyrus steam shovel was shipped from Pittsburg, Kansas, and placed in the field to remove the overburden. A smaller loading shovel hoisted the coal from the pit into small trucks and horse-drawn wagons. The trucks and wagons delivered the coal to an electrically operated tipple where it was processed into four grades. A railroad spur was constructed from the tipple to the Great Northern Railroad. Storage tracks capable of holding 100 coal cars were built near the mine.²¹ In 1931 the steam shovel retrieved over 60,000 tons of lignite and by 1933, Baukol-Noonan had become the third largest mining company in the state with a production nearing 200,000 tons.²²

During the decade of the twenties, the number of large underground mines decreased to a point where only one could claim prominence as a substantial enterprise. The Knife River Coal Mining Company of Beulah was the number one deep mine and for several years it led the state in coal production. The Knife River enterprise was known as the Beulah Coal and Mining Company when the first shaft was sunk in 1917. Five years later, the firm was reorganized as the Knife River Coal Mining Company and operations were moved to a new site north of Beulah because of water in the old operation. The double entry drift style mine contained a

TABLE 8.--Production Record of the Knife River
Coal Mining Company, 1925-1929 (tons).

1925	1926	1927	1928	1929
123,703	203,053	230,368	284,185	318,964

SOURCE: Seventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1925 (n.p., 1925), p. 16; Eighth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1926 (n.p., 1926), p. 13; Ninth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1927 (n.p., 1927), p. 18; Tenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1928 (n.p., 1928), p. 23; Eleventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1929 (n.p., 1929), p. 13.

vein twenty-two feet thick, averaging eight thousand BTU's and an ash content of 5 percent. It was an exceptional bed of lignite.²³

During the twenties, Knife River installed up-to-date mining equipment. Undercutting machines, capable of efficient coal retrieval, reduced the difficulty of removing coal by manual labor. In a pamphlet issued in 1924, Knife River gave a description of undercutting devices.

These machines have a seven foot cutter bar equipped with a rotating chain of bits and picks to cut the coal with a twenty foot sweep, operating without leaving the track. Each of these machines is capable of cutting one thousand tons of coal per day.²⁴

After the coal had been cut it was loaded into mine cars which were pulled by an electric locomotive to the mine entrance. There the cars were coupled to a steam locomotive (fired with Knife River coal) and taken a distance of two miles to the tippie. Rotary dumps loaded the coal onto the screen conveyors where coal crushers began the preparation process. The grades of "Beulah Coal" included lump, four-inch, crushed coal, and screenings. Mechanical loaders also put the lignite into the box cars of the Northern Pacific Railroad for shipment throughout the state.²⁵

The year 1925 was significant in the history of the Knife River Coal Company. During the year, the company lost thousands of dollars when the old wooden tippie was destroyed by fire. Without delay they began building a new one, constructed of steel and concrete. In May of the same year, the Hughes Electric Company of Bismarck erected a power plant north of the mine to furnish the surrounding area with electrical power. The company was owned in part by Edmund A. Hughes, one of the founders of Knife River Mining. High lines were extended to Bismarck and Mandan. A year later, power was fed to the communities south and west of Beulah. In 1927, the power plant was enlarged to a capacity of 6,000 kilowatts. The two turbines, measuring 2,500 kilowatts and 3,500 kilowatts, were powered by two 750 horsepower boilers. The fuel used to fire the boilers was lignite slack from the Knife River Mine.²⁶ This development confirmed the value of lignite in the generation of electricity.

From 1925 to 1929, Knife River demonstrated the effectiveness of the deep mine through its high productivity. As a healthy competitor, it proved that the deep mine was far from extinction. Table 8 indicates the remarkable record held by Knife River. During each of the five years, the company excavated a sound increase in tonnage. The price of the coal averaged about \$1.67 per ton.²⁷ In 1929, Knife River was the largest producer of lignite, with Truax-Traer's Kincaid mine close behind.

During the twenties, many smaller underground mines that produced over 20,000 tons per year were well known in their own market areas. The High Grade Coal Company at Medora in Billings County was a familiar enterprise during the

early years of the decade. Most of the "original Medora Coal"²⁸ was shipped throughout the state. High Grade lignite also heated the State Normal School (Dickinson State College) at Dickinson.²⁹ The Pittsburg Coal Mining Company was another shipping mine. It was located in Dickinson, and the firm consigned 29,000 tons of lignite over the rails of the Northern Pacific Railroad in 1925.³⁰ The company stood behind a bolstering motto, "You can buy a lot of Coal but you can't buy better Coal than our 'Old Hickory.'" ³¹ Other mines of note included the Lucky Strike Coal Company at Zap, the Kunkel Coal Company at Garrison, and the McCormick Coal Company in New Salem, Morton County.³²

During the 1920s, coal mining in North Dakota was an expanding industry. At a time when agriculture struggled with debts, high costs, and low prices; banks collapsed because credit was extended far beyond the bounds of caution; and people left the state as a result of farm failure, the mining of the soft coal was a profitable and stable business.³³ Table 7 indicates the production levels for the years 1920-1929. In 1920 productivity stood at roughly 878,000 tons. By 1929 that figure had more than doubled. There were fluctuations in the tonnage record during the intervening years, but they may be attributed to changing winter conditions. The number of active mines also varied; again due to climatic conditions. As productivity increased, so too did the amount of coal shipped throughout the state and into parts of Minnesota. The average price of coal decreased over the nine-year period from a high of \$2.53 per ton in 1920 to about \$1.99 in 1929.³⁴ It appears that the mass production of coal by the larger companies forced the price downward. In addition, the introduction of several sizes of coal accommodated the varying needs of residential and business establishments. By 1929, horses and mules had been replaced by huge steam shovels, undercutting machines, drills, and narrow-gauge railroads. The new technology also reduced the strenuous labors of men and elevated them to the position of controlling the power machines. Many of the large mines, both underground and strip, were totally mechanized by 1929. The decade of the 1920s can be characterized by four factors: tremendous technological advancement, an increase in the number of mines, a decline in the coal price, and an escalation in production.

As the state moved out of the twenties and into the economic crisis, mass unemployment, and traumatic conditions of the Great Depression, the coal industry followed, although with much less hardship than that experienced by other industries, such as agriculture. The state of North Dakota suffered more than much of the rest of the nation.³⁵ Farmers suffered through droughts, grasshoppers, and thirty-six-cent wheat. As early as 1931 over half of the farmers in the northwestern counties of the state needed relief, and in late 1936, one-half of the total population, or 330,000 people, were on the relief rolls. From 1932 to 1937 the personal per capita income of North Dakotans was only 47 percent of the national average. The result was a decline in land values, foreclosures on mortgages, outstanding loans, delinquent taxes, bank failures, increased numbers on relief, and an exodus of people out of the state.³⁶

The economic collapse during the Great Depression did not wreak havoc on the state's coal mining industry, but it did force reverses in production and drove the price of lignite downward. Table 9 shows the productivity and the average selling price of lignite during the depression. In 1929, production reached an all-time-high of two million tons. During the first year of the depression, output dropped only slightly, but in 1931 it fell to one and one-half million tons, the lowest during the thirties. Gradually the industry escalated production; by 1937, the level passed the two-million-ton mark, exceeding the industry's previous highest level in 1929. By 1937, the industry was emerging from the depression.

The price of lignite also suffered a decline. At a high of \$1.99 in 1929, the rate fell 15 percent by 1931 and gradually decreased to a low of \$1.30 by 1939, a price which was only 60 percent of the 1929 rate. The price of lignite had been dropping at a somewhat constant rate since 1925 because of the mass production of coal by larger companies, but when the industry entered the thirties, it plummeted to an even lower price. It appears that the economic conditions of the depression years forced the industry to reduce the price of lignite in order to retain a sizeable market. For example, in 1933, the seven largest coal mines in the state produced almost 60 percent of the lignite and sold the fuel at an average of \$1.24 per ton, a rate of \$.14 less than the general average.³⁷

TABLE 9.--Production Record and Average Price of Lignite, 1929-1939.

Year	Production ^a (tons)	Price ^b (per ton)
1929	1,909,303	\$1.99
1930	1,849,144	1.96
1931	1,552,242	1.69
1932	1,743,053	1.44
1933	1,872,381	1.38
1934	1,746,226	1.42
1935	1,828,213	1.40
1936	1,704,983	1.35
1937	2,184,927	1.33
1938	2,142,061	1.36
1939	2,176,841	1.30

SOURCE: Eleventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1929 (n.p., 1929), pp. 10-16; Twelfth Annual Report of the Coal Mine Inspection Department, 1930 (n.p., 1930), pp. 9-16; Thirteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1931 (n.p., 1931), pp. 9-17; Fourteenth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1932 (n.p., 1932), pp. 9-17; Fifteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1933 (n.p., 1933), pp. 8-16; Sixteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1934 (n.p., 1934), pp. 8-16; Seventeenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1935 (n.p., 1935), pp. 10-18; Eighteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1936 (n.p., 1936), pp. 10-18; Nineteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1937 (n.p., 1937), pp. 10-18; Twentieth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1938 (n.p., 1938), pp. 10-19; Twenty-First Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1939 (n.p., 1939), pp. 10-19.

^aThe production figure for 1936 appears somewhat low and resulted from a change in the reporting period. The 1936 report covered only the period from November 1, 1935 to June 30, 1936. The following reports covered the period July 1 to June 30.

^bThe average price of the coal was not listed by the mine inspector. However, the selling price of each mine was included and the above statistics were calculated from those figures.

The Great Depression also caused a surge in small mine activity. During the thirties there were seven coal counties in the state that had no large commercial mines. They included the counties of Dunn, McKenzie, Mountrail, Oliver, Slope, Golden Valley, and Billings. The number of mines more than doubled in the seven counties and production rose from 24,243 tons in 1929 to a high of 45,018 in 1938.³⁸ This surge was due to the rise in the number of farmers mining their own coal in an effort to reduce expenses. As the state mine inspector reported in 1931:

. . .the lignite deposit has been a godsend. . .to the drought sufferers in the western part of the state, who availed themselves of the opportunity to mine their own coal.³⁹

The economic plight of North Dakotans, like the rest of the nation during the 1930s, soon became a problem too large for the state government to manage. By the end of 1932 public and private charities could no longer maintain the necessary relief. In June 1933, the federal government intervened and assumed the responsibility for relief with the installation of the Federal Emergency Relief Administration (FERA). Under FERA, work projects and direct relief were made available. FERA was followed by numerous other federal programs, including the Civilian Works Administration (CWA), the Farm Security Administration (FSA), the Civilian Conservation Corps (CCC), and the Works Progress Administration (WPA). These programs not only supplied direct relief, but also created thousands of work projects for the indigent. Many of the projects dealt with the construction of bridges, highways, dams, airports, libraries, and other public structures. From 1933 to 1940 the federal government spent approximately \$266,000,000 in North Dakota. Public relief during the depression became the biggest business in the state.⁴⁰

The projects and programs of the federal government affected the coal mining industry to only a slight degree in comparison to the aid given to agriculture. The projects organized to aid the mining industry were primarily research oriented. Very few of them were designed to aid impoverished miners, primarily because there were less than 2,000 miners in the state, and they were, of course, entitled to general relief benefits.⁴¹

Although specific aid to miners was minimal, there was one project which provided housing and subsistence for poverty-stricken miners near Minot. In 1934, the Rural Rehabilitation Corporation (RRC), organized under FERA, established the Burlington Subsistence Homestead Project. The program aimed to reduce the number of miners who were forced onto the relief rolls during the slack coal seasons, and to

. . . provide comfortable and attractive homes, supplementary income and the assurance of a plentiful supply of home produced milk, fruit, and vegetables for the families of the men employed in the lignite coal mines at Burlington.⁴²

Aside from building small farmsteads, dams for irrigation, and grazing pastures, the RRC authorized construction of a community coal mine,

. . . in order that the miners making up the Burlington subsistence homestead settlement might establish a cooperative coal mine of their own and retain for themselves and their families all of the profits resulting from their coal mining endeavors.⁴³

As mentioned earlier, most of the federal coal projects dealt with research. From 1934 through 1938 FERA and WPA authorized close to \$96,000 in coal projects to be administered by the University of North Dakota's School of Mines.⁴⁴ Louis C. Harrington, Dean of the College of Engineering, William E. Budge, Professor of Ceramics Engineering, and Arthur M. Cooley, research assistant, served as directors of the eleven projects. Four of the projects concerned the manufacture of activated carbon from lignite. During the thirties, Grand Forks had a severe water problem. Sewage began flowing into the river and drinking water acquired an obnoxious taste and odor. Activated carbon was manufactured at the University and used to purify the water.⁴⁵ The School of Mines also experimented with the drying of lignite in order to make it more stable for long-distance travel. Under three projects authorized by the WPA, Budge developed several successful rotary dryers and other equipment for reducing the water content. Budge also supervised a WPA project in which lignite and other fuels from the University Power Plant were analyzed for their heating abilities. Budge stated in his report that the tests would be of future value in connection with lignite purchases.⁴⁶

Not all of the projects were experimental in nature. FERA and WPA each sponsored a statewide survey of all producing lignite mines. In August 1934, surveying parties under FERA were sent into the coal field and by October the investigators had compiled surveys on 240 coal mines. The survey included over forty questions concerning the location and ownership of the mine, the characteristics of the deposit and the overburden, the type of mining used, equipment, labor relations, and production. The investigators also secured samples of lignite from each of the

mines. The samples were tested for their heat value and moisture content. The results of the analyses indicated the better quality mines. The second survey, sponsored by WPA, was taken in late 1935 and was quite similar to the FERA survey.⁴⁷

The last federal project dealt with the utilization of lignite. A study was made of those domestic and semi-commercial heating plants in the eastern part of the state not using bituminous coal. Harrington conducted numerous demonstrations on the adaptation of boiler equipment to the use of the brown coal and on the proper methods of handling it. The benefits of the project were permanent according to Harrington, "since the people were made 'lignite conscious.'"⁴⁸

The Great Depression sent the economy of the nation, the state, and, to a lesser extent, the lignite industry into a period of turbulence and change; but as the decade drew to a close, the United States entered an era of global conflict which eventually caused sweeping changes throughout the world. North Dakota's coal industry also entered a time of change in 1941, and, like World War II, the causes of the event were camouflaged in the past. A superficial observation of the industry from 1939 to 1941 showed that coal production increased, technology maintained its mechanization of mining procedures, and the largest lignite enterprises grew. Hidden within that apparent onward march of the industry, however, were two formidable opponents of lignite. The rival fuels, natural gas and fuel oil, made their advances slowly, but they eventually forced a reversal on the coal industry by 1941 and marked the onset of the decline in the number of active mines and the sure journey of the soft coal into another market place.

Natural gas was another resource native to North Dakota. In 1925, Dr. Arthur G. Leonard, the State Geologist, reported on the development of natural gas from one of its earliest discoveries in 1907. Leonard also reported on the number of active and potentially productive wells in the state. In Williams County, near Williston, natural gas was discovered at a depth of 750 feet. A large number of wells were reported in Renville County west of Mohall. Ward County also contained natural gas pools, as did Bottineau and LaMoure Counties.⁴⁹ By 1930, natural gas had already threatened the lignite market. As the state coal mine inspector announced:

The introduction of Natural Gas has caused a noticeable decrease in the consumption of coal in western North Dakota. Pipe lines have been laid and extended into the very heart of the lignite fields. . .⁵⁰

As time passed, the production and consumption of natural gas rose throughout North Dakota and the nation. Consumption far exceeded production of natural gas in North Dakota and the state was forced to import much of its gas supplies. Table 10 outlines the rise in consumption.

The plains of western North Dakota held another precious cargo, petroleum; and fuel oil became another contending source of heat energy. During the 1920-1941 period, North Dakota produced no commercial oil. In fact, the petroleum industry was insignificant until about 1938, when a number of the nation's major oil companies began drilling operations in the western part of the state.⁵¹ Although North Dakota did not produce fuel oil, the number of barrels imported rose steadily and rapidly. Table 11 indicates the rise in fuel oil consumption in North Dakota and in the United States.

The year 1941 was a turning point in the history of the coal industry. It was the beginning of a long, steady decline in the number of active mines. The number dropped from a high of 320 in 1940 to 296 in 1941, a decrease of 7 percent.⁵² All of the mines closed in 1941 were small operations that served local area residents and businesses. The use of lignite by this population had declined to a point where the local mines could not maintain a profit margin. The invasion of natural gas and fuel oil forced the decline.

As the use of these two fuels increased, the utilization of lignite changed from that of a domestic and commercial heater to a catalyst in the manufacture of electrical power. Symptoms of this keynote change appeared quite early, for in the April 12, 1923 issue of Coal Age, the industry's future industrial capabilities were outlined.

TABLE 10.--Natural Gas Consumed in the United States and in North Dakota, 1934-1941.

Year	United States Total (millions of cubic feet)	North Dakota Total (millions of cubic feet)
1934	1,764,988	1,112
1935	1,909,901	1,382
1936	2,160,518	1,578
1937	2,403,041	1,641
1938 ^a	2,294,097	1,533
1939	2,473,765	1,607
1940	2,654,659	1,725
1941	2,805,192	1,741

SOURCE: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1939 (Washington, D.C.: Government Printing Office, 1939), pp. 1040-1043; U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1942 (Washington, D.C.: Government Printing Office, 1943), p. 1150.

^aThe decrease in 1938 was due to unusually warm weather during the months of heavy gas consumption and depressed business conditions during the first three quarters of 1938.

Vigorous propaganda is being instituted on behalf of the lignite industry of North Dakota, with frequent publicity in which that fuel is credited with possibilities for an industrial development of the Northwest the like of which Pittsburgh never dreamed. Visions are portrayed of the removal of the steel center to the Twin Cities; of developing immense power plants at the scene of the mines, and transmitting power electrically to the Twin Cities. . . ⁵³

North Dakota did not, of course, replace Pittsburgh as a great industrial center, but the trend toward using lignite in the production of electrical power had begun. Near a number of the state's largest mines, power companies established electrical generating plants. At the Knife River Coal Company, the Hughes Electric Company erected a generating plant as early as 1925. Two years later, the Otter Tail Power Company constructed a steam generation plant near Washburn for the generation of electricity and it was fired by lignite from the Washburn Lignite Coal Company. Montana-Dakota Utilities located a power plant near the Truax-Traer Kincaid mine in 1928. ⁵⁴ In 1941, 30 percent of the total production of coal in the United States was used in the generation of electrical energy, and North Dakota provided 83 percent of the total tonnage. ⁵⁵

When the steam shovel first stirred the North Dakota soil, a new technological harvest of the soft coal began and the industry met changing times. Before the end of the twenties, strip mining had demonstrated its superiority. Underground mining, although second best, still maintained a major following. Technology forced the change in 1920. In 1930 the nation's depressed economy was the instrument of change, and it left the lignite industry with recurrent decreases in production and a steady decline in the coal price. The industry did not sustain irreparable harm during the Great Depression; in fact, the coal projects funded by the federal government proved to be quite beneficial for the state and the industry. Deep within this twenty-one year period was another force of change that eventually

TABLE 11.--Sales of Fuel Oil in the United States and in North Dakota, 1934-1941.

Year	United States Total (thousands of barrels)	North Dakota Total (thousands of barrels)
1934	330,321	199
1935	365,985	269
1936	408,409	294
1937	441,803	416
1938 ^a	407,850	442
1939	456,943	594
1940	498,758	647
1941	554,329	677

SOURCE: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1939 (Washington, D.C.: Government Printing Office, 1939), p. 931; U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1940 (Washington, D.C.: Government Printing Office, 1940), pp. 1017-1018; U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1942 (Washington, D.C.: Government Printing Office, 1943), p. 1106.

^aThe decrease in 1938 was due to mild weather during the first and fourth quarters and to depressed economic conditions.

surfaced in the early 1940s. Competition in the form of natural gas and fuel oil began to drive lignite out of the fuel consumption market and many of the local mines could no longer afford to remain open. Paralleling the rise in the competitor fuels was the growth of lignite in the manufacture of electrical power. By the early 1940s, this growth, coupled with the decline in active mines, had launched the lignite industry on a new course which led to the modern industrial era.

FOOTNOTES--CHAPTER III

¹ L. P. Dove, "Strip Process Brings Big Increase in Mining Output," Minot Daily News, October 20, 1927, p. 14.

² Eleventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1929 (n.p., 1929), pp. 8-21.

³ State Mine Inspector's Report, 1929, pp. 10, 13; Eighth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1926 (n.p., 1926), p. 24; Knife River Coal Mining Company, Beulah Coal (n.p., 1924), p.2.

⁴ Sixth Biennial Report of the State Engineer to the Governor of North Dakota For the Years 1913-1914 (Devils Lake: Journal Publishing Company, State Printers, 1914), pp. 128-129; Eighth Biennial Report of the State Engineer to the Governor of North Dakota For the Biennial Period Ending June 30, 1918 (Bismarck: Tribune Printing Company, 1918), p. 114.

⁵ "E. M. Truax Is Victim of Heart Attack in Illinois," Ward County Independent, January 9, 1936, p. 3.

⁶ "Great Range Possible With Eight Yard Load," Minot Daily News, October 20, 1927, p. 13.

⁷ Fifth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1923 (n.p., 1923), p. 13.

⁸ "Scraper Line Loaders Bought From Ottumwa," Minot Daily News, October 20, 1927, p. 17; State Mine Inspector's Report, 1926, pp. 8, 24.

⁹ Glen W. Traer, Sr., operated mines in Illinois and Iowa. In 1924 he formed a syndicate to investigate the coal fields in Wyoming and in North and South Dakota in order to determine what specific area would be most favorable in terms of mining conditions, coal resources, transportation facilities and markets. His choice was North Dakota. See "Lignite Deposit Proved Major Find in Ward County," Minot Daily News, August 19, 1961, sec. C, pt. 2, p. 2.

¹⁰ "State Has Wonderful Future Avers Traer of New Lignite Firm," Minot Daily News, October 20, 1927, p. 20.

¹¹ "Velva Coal Field Prospected With Great Care Before Mine Lands Purchased by Company," Minot Daily News, October 20, 1927, p. 19.

¹² Second Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1920 (Bismarck: Tribune, State Printers, 1920), pp. 11, 18; State Mine Inspector's Report, 1926, p. 23.

¹³ "Truax-Traer Launch Immense Industrial Venture Near Minot," Minot Daily News, October 20, 1927, p. 1.

¹⁴ "Great Range Possible," Minot Daily News, p. 13.

¹⁵ "Tipple Cost \$80,000 at Velva Field," Minot Daily News, October 20, 1927, p. 11.

¹⁶ Tenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1928 (n.p., 1928), p. 24.

¹⁷ "New Town at Truax-Traer Mine," Minot Daily News, October 20, 1927, pp. 19-20; State Mine Inspector's Report, 1928, pp. 20, 25.

¹⁸ John A. Gjevre, Saga of the Soo: West From Shoreham (LaCrosse, Wisconsin: By the Author, 1973), p. 52; Twelfth Annual Report of the Coal Mine Inspection Department, 1930 (n.p., 1930), p. 9.

¹⁹ C. B. Heinemeyer, Historical Data of Mercer County, North Dakota (Hazen: Hazen Star, 1932), p. 59; State Mine Inspector's Report, 1923, p. 15; Sixth Annual Report of the North Dakota State Mine Inspection Department, October 31, 1923 to October 31, 1924 (n.p., n.d.), no page numbers; Seventh Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1925 (n.p., 1925), p. 16; State Mine Inspector's Report, 1926, pp. 13, 43; Ninth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1927 (n.p., 1927), p. 18; State Mine Inspector's Report, 1928, p. 23; State Mine Inspector's Report, 1929, p. 13.

²⁰ Stories and Histories of Divide County, Written by the Participants or Relatives (n.p., 1964), p. 12; History Book Committee, Divide County History (n.p., 1970), p. 385.

²¹ Ibid.

²² Divide County History, p. 385; Thirteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1931 (n.p., 1931), p. 10; Fifteenth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1933 (n.p., 1933), p. 9.

²³ Mrs. D. H. Dettman, Chairman, Beulah, North Dakota Golden Anniversary, 1914-1964 (n.p., 1964), p. 102; Beulah Coal, p. 4.

²⁴ Beulah Coal, p. 3.

²⁵ Beulah Coal, pp. 10, 14, 16; State Mine Inspector's Report, 1926, pp. 43-44.

²⁶ C. B. Heinemeyer and Mrs. Ben Janssen, History of Mercer County, North Dakota, 1882 to 1960 (Hazen: Hazen Star, 1960), pp. 42-43.

²⁷ State Mine Inspector's Report, 1925, p. 16; State Mine Inspector's Report, 1926, p. 13; State Mine Inspector's Report, 1927, p. 18; State Mine Inspector's Report, 1928, p. 23; State Mine Inspector's Report, 1929, p. 13.

²⁸ V. E. Smart, North Dakota Lignite Coal Rates With Distances From Shipping Points To All Stations in North Dakota (n.p., 1923), p. 8.

²⁹ "Bids For Coal Are Awarded," North Dakota Nonpartisan, July 30, 1924, p. 3.

³⁰ State Mine Inspector's Report, 1925, p. 17.

³¹ Smart, North Dakota Lignite Rates, p. 8.

³² State Mine Inspector's Report, 1923, p. 15; State Mine Inspector's Report, 1927, pp. 14, 17-18.

³³ Elwyn B. Robinson, History of North Dakota (Lincoln: University of Nebraska Press, 1966), pp. 372, 376.

³⁴ State Mine Inspector's Report, 1920, pp. 11-13; State Mine Inspector's Report, 1929, pp. 10-16. The average price of coal was not listed by the mine inspector. However, the selling price for each mine was included and the statistics were calculated from those figures.

³⁵ Robinson, History of North Dakota, pp. 397-400.

³⁶ Ibid.

³⁷ State Mine Inspector's Report, 1929, pp. 10-16; State Mine Inspector's Report, 1930, pp. 9-16; State Mine Inspector's Report, 1931, pp. 9-17; Fourteenth Annual Report of the Coal Mine Inspection Department for the State of North Dakota, 1932 (n.p., 1932), pp. 9-17; State Mine Inspector's Report, 1933, pp. 8-15; Sixteenth

Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1934 (n.p., 1934), pp. 8-16; Seventeenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1935 (n.p., 1935), pp. 10-18; Eighteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1936 (n.p., 1936), pp. 10-18; Nineteenth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1937 (n.p., 1937), pp. 10-18; Twentieth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1938 (n.p., 1938), pp. 10-19; Twenty-First Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1939 (n.p., 1939), pp. 10-19. The average price of the coal was not listed by the mine inspector. However, the selling price for each mine was included and the statistics were calculated from those figures.

³⁸ State Mine Inspector's Report, 1929, pp. 11-14; State Mine Inspector's Report, 1938, pp. 10-16.

³⁹ State Mine Inspector's Report, 1931, p. 5.

⁴⁰ Robinson, History of North Dakota, pp. 406-409.

⁴¹ State Mine Inspector's Report, 1930, pp. 9-16. The mine inspector did not report the total number of miners. However, the number of miners employed at each mine was listed and the total was calculated from those figures.

⁴² Federal Emergency Relief Administration for North Dakota, Relief In Review In North Dakota (Bismarck: n.p., 1936), p. 74.

⁴³ Ibid., pp. 74-76.

⁴⁴ J. W. Wilkerson to Dean L. C. Harrington, 17 February 1938, "Community Improvement Appraisal," Box 31, Folder 3, Works Progress Administration, 1935-1941, College of Engineering Papers, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.

⁴⁵ A. M. Cooley, Professor Emeritus, Chemical Engineering, Grand Forks, North Dakota, Telephone Interview, 23 May 1978.

⁴⁶ Dean L. C. Harrington Correspondence, "Report on the Activation of Lignite, January 21, 1935-October, 1935," "Report on the Activation of Lignite, January 15, 1936-September 25, 1936," "Report on Sampling and Analyses of Fuels, November 26, 1936-June 10, 1937," "Report on Activation of Lignite, October 6, 1936-November 10, 1937," Box 31, Folder 3, Works Progress Administration, 1935-1941, College of Engineering Papers.

⁴⁷ Dean L. C. Harrington, "Progress Report of Lignite Survey and Investigation Under the Federal Emergency Relief Administration, Project S-F2-56," Records of the School of Mines, College of Engineering, Engineering Library, University of North Dakota, Grand Forks, North Dakota; "Sampling of North Dakota's Lignite Producing Mines," Records of the School of Mines, College of Engineering; Dean L. C. Harrington Correspondence, "Report on the Survey and Sampling of All Producing Mines," Box 31, Folder 3, Works Progress Administration, 1935-1941, College of Engineering Papers.

⁴⁸ Dean L. C. Harrington Correspondence, "Federal Emergency Relief Administration Supports Investigations of North Dakota's Mineral Resources," Box 23, Folder 24, North Dakota Engineer, 1934-1935, College of Engineering Papers.

⁴⁹ Dr. A. G. Leonard, "The possibilities of Oil and Gas in North Dakota," North Dakota Engineer 2(November, 1925): 12-13.

⁵⁰ State Mine Inspector's Report, 1930, p. 5.

⁵¹ Dr. Wilson M. Laird, "Oil in North Dakota," North Dakota Engineer 24(November, 1948): 6-7.

⁵² Twenty-Second Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1940 (n.p., 1940), pp. 8-17; Twenty-Third Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1941 (n.p., 1941), pp. 8-17.

⁵³ "North Dakota," Coal Age 23(April 12, 1923): 622.

⁵⁴ North Dakota: A Guide to the Northern Prairie State (Fargo: Knight Printing Company, 1938), p. 242.

⁵⁵ U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, 1942 (Washington, D.C.: Government Printing Office, 1943), p. 904.

CHAPTER IV

NORTH DAKOTA COAL SINCE 1941: AN OVERVIEW

Throughout the history of the coal industry there existed a widely held belief that lignite would create a more diversified economy for North Dakota. The state would no longer be totally dependent upon an unstable agricultural base. The future would count coal among its major economic assets.¹ This promise of industry associated with the lignite industry could be found on the front page of county newspapers in 1885 as well as in coal mining journals fifty years later. However, as the lignite industry emerged as the major fuel source in the production of electrical energy in the 1970s, the people of western North Dakota began to question the effects of the large-scale mining required to supply the power stations. The "boom" years for the coal industry, unlike that of oil in the 1950s, were marked by skepticism and even fear.

By 1941, the lignite industry was on the threshold of a new era. In 1943, the state government created the North Dakota Research Foundation which was designed to investigate the chemical properties of lignite and to determine the feasibility of conversion. Although 65 percent of the coal mined was being used to fire electrical generators by 1948, the Foundation's researchers believed that the coal was more valuable as a chemical raw material. They predicted that lignite would be converted to synthetic gases, liquid fuels, waxes, tar products, fertilizers, and plastics.² In 1949, the United States Bureau of Mines established a gasification pilot plant at the University of North Dakota in Grand Forks where scientists began to experiment on conversion of lignite to natural gas, octane gasoline, and as a reducing agent in the production of iron ore. In 1951 the Bureau of Mines constructed another research facility at the University, the Charles R. Robertson Lignite Laboratory.³

As the research staff increased its knowledge of the coal's chemistry, the industry itself was actually declining in terms of active mines and production. From 1941 to 1950, the number of active mines decreased from a high of 296 to 100. By 1965, only thirty-eight mines were left in operation. The mine inspection reports indicated that production increased to a high of 3,280,847 tons in 1951 and then declined to 2,325,545 tons by 1958.⁴ Fluctuations in the tonnage record continued until 1966.⁵ Many factors were responsible for the decline, including the reliance on oil and natural gas and the inability of small mine owners to compete with the larger coal firms. In addition, the installation of three 80,000 kilowatt generators at Garrison Dam in 1956 further reduced the need for coal. The discovery of oil near Williston in 1951 also had an adverse effect upon coal production.⁶ The demand for lignite as a market commodity appeared to be diminishing in proportion to the growth in imported and home-produced oil and hydroelectric power.

When the Economic Development Commission replaced the North Dakota Research Foundation in 1957, the interest in lignite switched from research to promotion as a cheap industrial fuel.⁷ Five years later, the members of the Democratic State Convention praised Governor William L. Guy for his efforts to accelerate the use of lignite in the generation of thermal energy. The 1962 Democratic State Platform proclaimed that North Dakota would become the "power hub of the nation."⁸ Accordingly, in 1966, the first significant coal-fired generating station began operations at Stanton, North Dakota. Known as the Leland Olds Station, it was built by Basin Electric Power Cooperative, Inc., a consortium of rural energy companies. United Power Association constructed a second plant at Stanton in 1968. A third generating station, named after Senator Milton R. Young and built by Minnkota Power Cooperative, Inc., at Center, North Dakota, was dedicated in 1970.⁹

The lignite industry responded to a greater challenge in the 1970s. As the United States entered the energy crisis years during the Ford and Carter Administrations--a crisis precipitated in great measure by the oil embargo of 1973, the state and the nation turned to their vast coal supplies as a source of electrical power. From 1975 to 1981, several new generating stations and units were constructed in North Dakota, with each unit producing three billion kilowatt hours annually. The new facilities, fired by lignite from nearby mines, included the Leland Olds Station #2, the Coal Creek Plants #1 and #2, the Coyote Station and the Square Butte Creek Plant, also known as the Milton R. Young Station #2.¹⁰

Today, six large-scale plants are clustered near the plentiful water supply of Lake Sakakawea in west-central North Dakota. These six stations, some with twin units, have a combined electrical production of over twenty billion kilowatt hours annually.¹¹ In addition to the existing facilities, the twin units of the Antelope Valley Plant near Beulah are presently under construction. Proposals for the construction of two more stations have also been made.¹² The gasification of North Dakota's soft coal will also soon become a reality. Not only will North American Natural Gas Company's Beulah plant be completed in 1983, but Natural Gas Pipeline Company of America has also considered the building of a gasification plant at Dunn Center, Dunn County.¹³

With the establishment of these electrical generation plants, the production of lignite increased significantly. Between 1966 and 1970, the amount of lignite mined each year increased from 3,067,119 tons to 5,001,828 tons. During the decade of the 1970s, the production of coal more than tripled. By 1981, the lignite production level in North Dakota reached 17,613,742 tons.¹⁴ At the present time, seven mining firms are operating in North Dakota. They include Baukol-Noonan Lignite, Inc., Consolidated Coal Company, North American Coal Corporation, Falkirk Mining Company, Husky Industries, Knife River Coal Mining Company, and Coteau Properties Company.¹⁵

The growth of the energy industry in North Dakota has been of great concern to environmentalists and western landowners. As the power companies began construction of plants near the vast coal fields in western North Dakota and the plentiful water supplies behind Garrison Dam in Mercer, McLean, and Oliver Counties, a coalition of landowners, politicians, and environmentalists began to ask questions. Would the strip-mined land ever be agriculturally productive again; could it be restored to its original condition? Who would pay the cost of reclamation? What would be the social and economic impact of coal development on school districts, housing facilities, and public utilities in the coal-mining areas; and who would pay for this? How many acre feet of North Dakota water should the state allow for each plant? What about air quality standards and the pattern of high voltage wires required to carry the electricity east?

In 1967, the state legislature passed a resolution calling for an investigation into the need for reclamation. They were asked to prepare a cost-benefit analysis on reclamation and to recommend appropriate legislation.¹⁶ In accordance with the findings of the study, the next legislature passed a reclamation bill in 1969. The act provided for reclamation of surface mined areas to "encourage" productive usage. The bill outlined the responsibilities of surface-mining operators in reclaiming disturbed lands and it carried a penalty for non-compliance.¹⁷ During the 1971 and 1973 sessions, the legislature amended the law, but only in minor areas unrelated to the basic issue of the technical rehabilitation of strip-mined lands.¹⁸

In 1975, the legislature made significant changes in the law. New amendments required strip-mine operators to submit a survey of the soil material overlying areas of planned coal development. The survey was to be conducted by a professional soil classifier and was to include hydrologic data together with maps concerning the geology, topography, and soils of affected lands. Another amendment required the operators to save, segregate, and respread the topsoil according to an accepted reclamation plan. The state legislature also restricted surface mining to those areas which could be reclaimed.¹⁹

During both the 1975 and 1977 legislative sessions the coal severance tax became the most partisan, energy-related issue. In 1975, the Republicans passed a flat rate severance tax of fifty cents per ton. However, attached to the rate was an escalator clause proposed by the Democratic-NPL Party. This clause increased the tax by one cent whenever the Wholesale Price Index went up three points. The revenue accrued through the severance tax was allocated to various government agencies. Thirty-five percent was placed in a special fund in the state treasury for distribution by the coal development impact office through grants to impacted counties, cities, school districts, and other sectors. Thirty percent was credited to a trust fund in the state treasury for administration by the Board of University and School Lands. The coal impact counties received 5 percent of the revenue and the remaining 30 percent was deposited in the state's general fund. This tax was passed for a two-year period only.²⁰

With a divided House of Representatives in 1977, the severance tax continued to be a bitter partisan issue. While the Democrats proposed a percentage tax on the

price of coal, the Republicans favored a flat rate tax with an escalator clause. As the session neared adjournment, the legislature passed a compromise tax which set the rate at sixty-five cents per ton with a graduated increase of one cent whenever the Wholesale Price Index went up one point. Two years later the severance tax was amended to a flat rate of eighty-five cents per ton with an escalation of one cent per ton per four-point increase in the Wholesale Price Index.²¹

Between 1967 and 1981 the North Dakota Legislature tackled many problems associated with coal development and the energy industry. As a result, even though the severance tax, land reclamation, plant sitings, water use, and the socio-economic impact of coal development still are issues of concern and contention, today North Dakota has a comprehensive set of regulations governing energy development.

Throughout the history of North Dakota there have been certain periods of economic prosperity and growth, known as "boom" periods. The great influx of land-hungry immigrants in two distinct stages before and after the turn of the century, created the state of North Dakota. Bonanza farming in the Red River Valley in the 1870s and 1880s made the state famous for its production of spring wheat. Both world wars stimulated agricultural growth, and the oil boom in the Williston Basin in the early 1950s created a more diversified economy. Agricultural processing, the manufacture of farm implements, the installation of air bases and missile systems across the northern half of the state and tourism are more recent changes in the state's economic base. Finally, the harvest of North Dakota's lignite grew at a tremendous rate during the 1970s. In response to the need for electrical generation, lignite became the alternative energy source, born out of a crisis over the international supply and cost of the earth's precious staple, oil. The energy industry brought new people and new wealth to the western coal counties. The giant draglines and twin smokestacks, symbols of the mining and energy industries, changed the landscape of western North Dakota during the 1970s. Today they are part of it.

FOOTNOTES--CHAPTER IV

¹ A good example of this anticipation or future benefit associated with coal development is found in an article in North Dakota Magazine. In speaking of Ward County, the author stated: "the day will come, and the children are now living within the county that will see it, when the glory of the county will not be flax nor wheat nor any of those things which pertain to the product of the farm, splendid as they are, but it will be coal, and the direct and indirect products of its consumption through the efforts and skill of American artisans employed in shop and factory and furnace." See "Coal in Ward County," North Dakota Magazine 1(December 1906): 60.

² Alex C. Burr, "The Future of Lignite," North Dakota Engineer 23(January 1948): 9-10.

³ Burr, "Future of Lignite," p. 10; Elwyn B. Robinson, History of North Dakota (Lincoln: University of Nebraska Press, 1966), pp. 454, 502.

⁴ Twenty-Third Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1941 (n.p., 1941), pp. 8-17; Thirty-Second Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1950 (n.p., 1950), pp. 10-14; Second Biennial Report of the Coal Mine Inspection Department of the State of North Dakota, July 1, 1964-June 30, 1966 (n.p., n.d.), pp. 10-11; Thirty-Third Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1951 (n.p., 1951), p. 8; Fortieth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1958 (n.p., 1958), p. 7.

⁵ Forty-First Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1959 (n.p., 1959), p. 7; Forty-Second Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1960 (n.p., 1960), p. 7; Forty-Third Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1961 (n.p., 1961), p. 6; Forty-Fourth Annual Report of the Coal Mine Inspection Department of the State of North Dakota, 1962 (n.p., 1962), p. 7; First Biennial Report of the Coal Mine Inspection Department of the State of North Dakota, July 1, 1962-June 30, 1964 (n.p., n.d.), p. 6; State Mine Inspector's Report, 1964-1966, p. 6.

⁶ Robinson, History of North Dakota, pp. 458-462.

⁷ Ibid., p. 454.

⁸ "Coal Perspective," Grand Forks Herald, April 5, 1977, sec. A, p. 4.

⁹ Steven Kahl, Staff Engineer, Public Service Commission, Bismarck, North Dakota, personal communication, 17 January 1983; Robert P. and Wynona H. Wilkins, North Dakota: A History (New York: W. W. Norton & Company, Inc., 1977), p. 184.

¹⁰ Kahl, personal communication, 17 January 1983.

¹¹ Ibid., 17 December 1982.

¹² Ibid., 17 January 1983.

¹³ U.S. Department of the Interior, Bureau of Land Management and the State of North Dakota, Summary of Draft West-Central North Dakota Regional Environmental Impact Study on Energy Development, March, 1978, pp. 2-6; Kahl, personal communication, 17 December 1982.

¹⁴ State Mine Inspector's Report, 1964-1966, p. 6; Fourth Biennial Report of the Coal Mine Inspection Department for the State of North Dakota, July 1, 1968-June 30, 1970 (n.p., n.d.), p. 5; Kathy Dwyer, Administrative Secretary, Public Service Commission, Bismarck, North Dakota, personal communication, 16 December 1982.

¹⁵David Thompson, Environmental Engineer, Reclamation Division, Public Service Commission, Bismarck, North Dakota, personal communication, 17 January 1983.

¹⁶Laws Passed at the Fortieth Session of the Legislative Assembly of the State of North Dakota, 1967 (n.p., 1967), pp. 1261-1263.

¹⁷Laws Passed at the Forty-First Session of the Legislative Assembly of the State of North Dakota, 1969 (n.p., 1969), pp. 677, 680-685.

¹⁸Mike Jacobs, One Time Harvest (Jamestown: North Dakota Farmers Union, 1975), pp. 60-61.

¹⁹Laws Passed at the Forty-Fourth Session of the Legislative Assembly of the State of North Dakota, 1975, 2 vols. (n.p., 1975), vol. 2, pp. 905-910.

²⁰Ibid., pp. 1476, 1479-1481.

²¹Laws Passed at the Forty-Fifth Session of the Legislative Assembly of the State of North Dakota, 1977, 2 vols. (n.p., 1977), vol. 2, p. 1186; Laws Passed at the Forty-Sixth Session of the Legislative Assembly of the State of North Dakota, 1979, 2 vols. (n.p., 1979), vol. 2, p. 1549.



MOVING THE BIG SHOVEL FROM
SOUTH TO NORTH PITS.

WHITTIER-CROCKETT COAL CO.
COLUMBUS, N. D. NO 9677

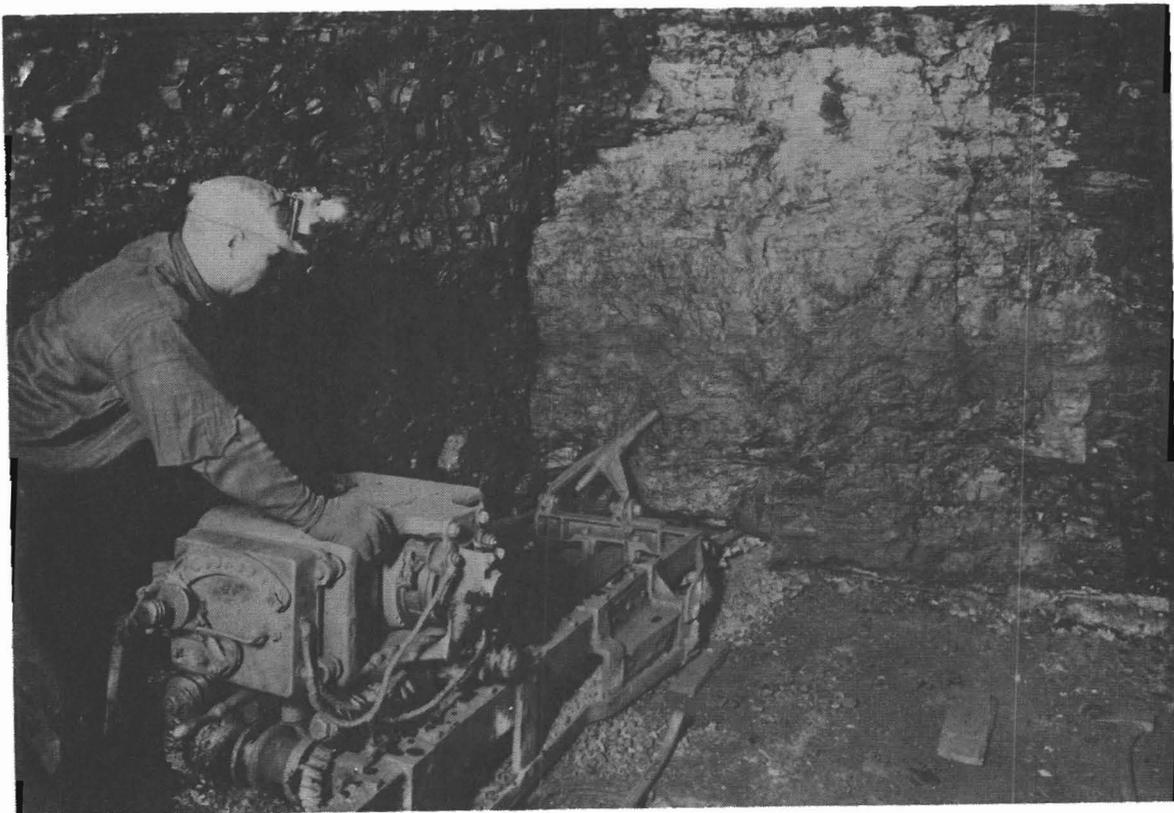
Moving the Marion steam shovel to the north pit of the Whittier-Crockett Coal Company's mine at Columbus, North Dakota, ca. 1926. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



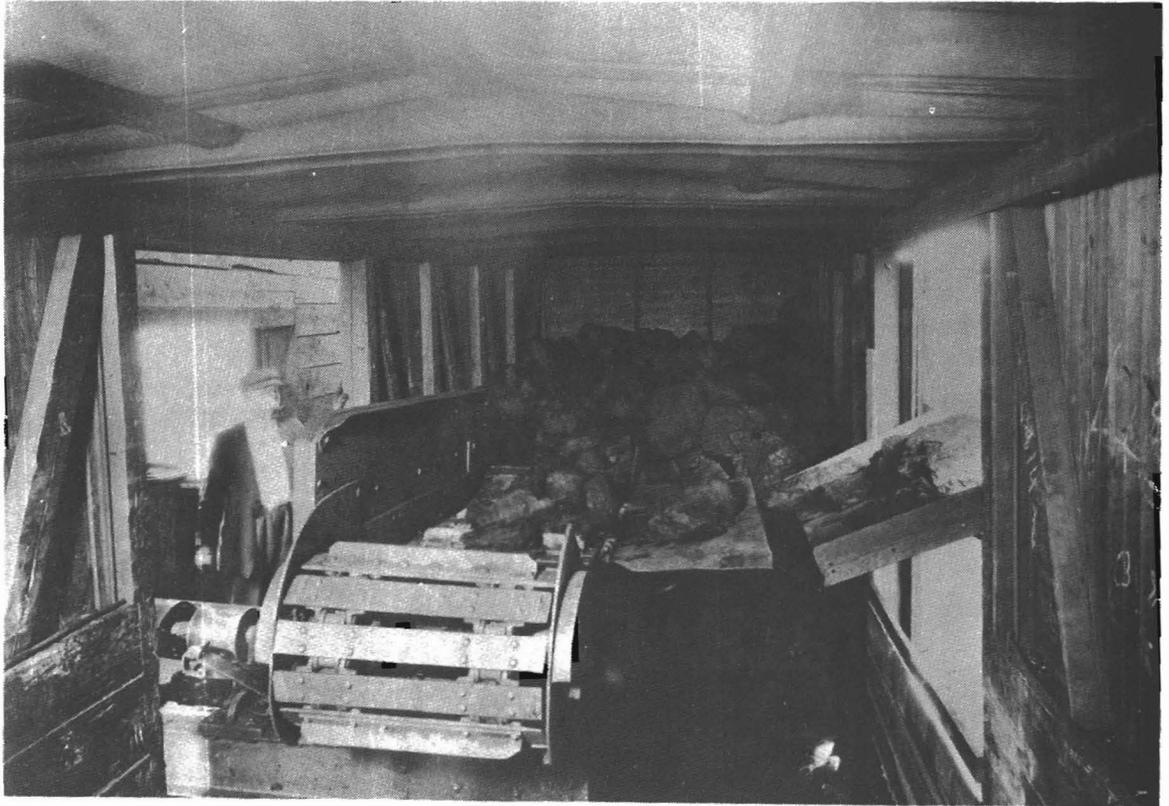
William D. Washburn, founder of the Washburn Lignite Coal Company, Wilton, North Dakota. Photo courtesy of the Institute for Regional Studies, North Dakota State University, Fargo, North Dakota.



View of the Main Office, Washburn Lignite Coal Company, Wilton, North Dakota, ca. 1925. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



An undercutting machine in operation at the Washburn Lignite Coal Company, Wilton, North Dakota, c.a. 1925. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



A box car loader in operation at the Washburn Lignite Coal Company, Wilton, North Dakota, ca. 1925. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.

No Sulphur

2½% Ash

STEVENS BROS.

GARRISON

HARD LIGNITE

COAL

THE COAL THAT HAS MADE MORE FRIENDS
IN SIX MONTHS THAN ANY OTHER COAL IN
SIX YEARS

FOR QUOTATIONS AND FREIGHT RATES
APPLY TO

STEVENS BROS.

ST. PAUL, MINN.
General Offices

GARRISON, N. D.
Location of Mines

Advertising Stevens Bros. "Hard Lignite Coal," 1923. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



Lignite ready for loading after it has been shot down by explosives, Knife River Coal Mining Company, Beulah, North Dakota, 1924. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



Knife River coal ready for delivery, Bismarck, North Dakota, 1924. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.

INCORPORATED UNDER LAWS OF NORTH DAKOTA

NUMBER 49



5 SHARES

Baukol Noonan Lignite, Incorporated

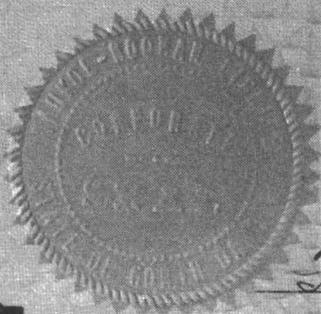
CAPITAL STOCK, \$100,000

Five Certifies that
Five

Sophie Hought is the owner of
Five Shares of One Hundred Dollars each of the Capital Stock of
BAUKOL NOONAN LIGNITE, Inc.

transferable only on the books of the Corporation by the holder hereof in person or by Attorney upon surrender of this Certificate properly endorsed.

In Witness Whereof, the said Corporation has caused this Certificate to be signed by its duly authorized officers and to be sealed with the Seal of the Corporation this 28th day of Oct. 1930



J. M. Baukol

SECRETARY

Harris Baukol

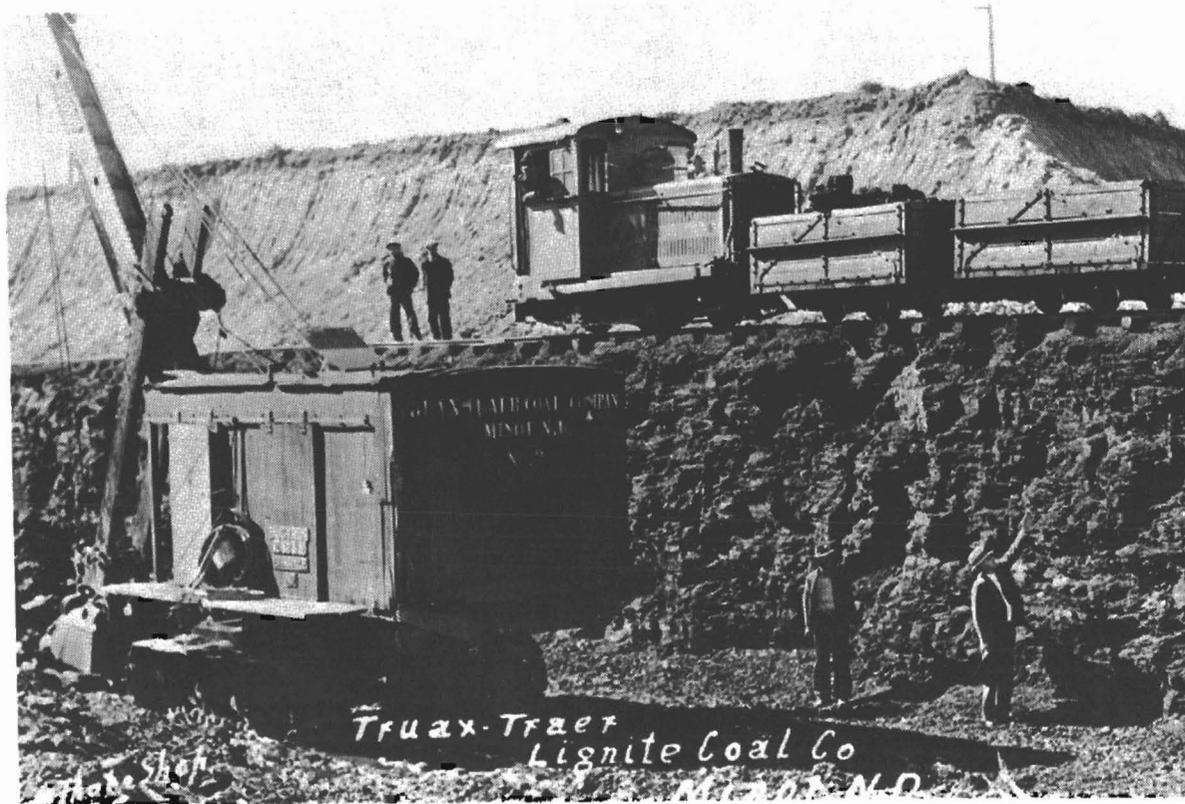
PRESIDENT

SHARES
\$100
EACH

© 00556

72

Five shares of Baukol-Noonan Capital Stock issued to Sophie Hought on October 28, 1930. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



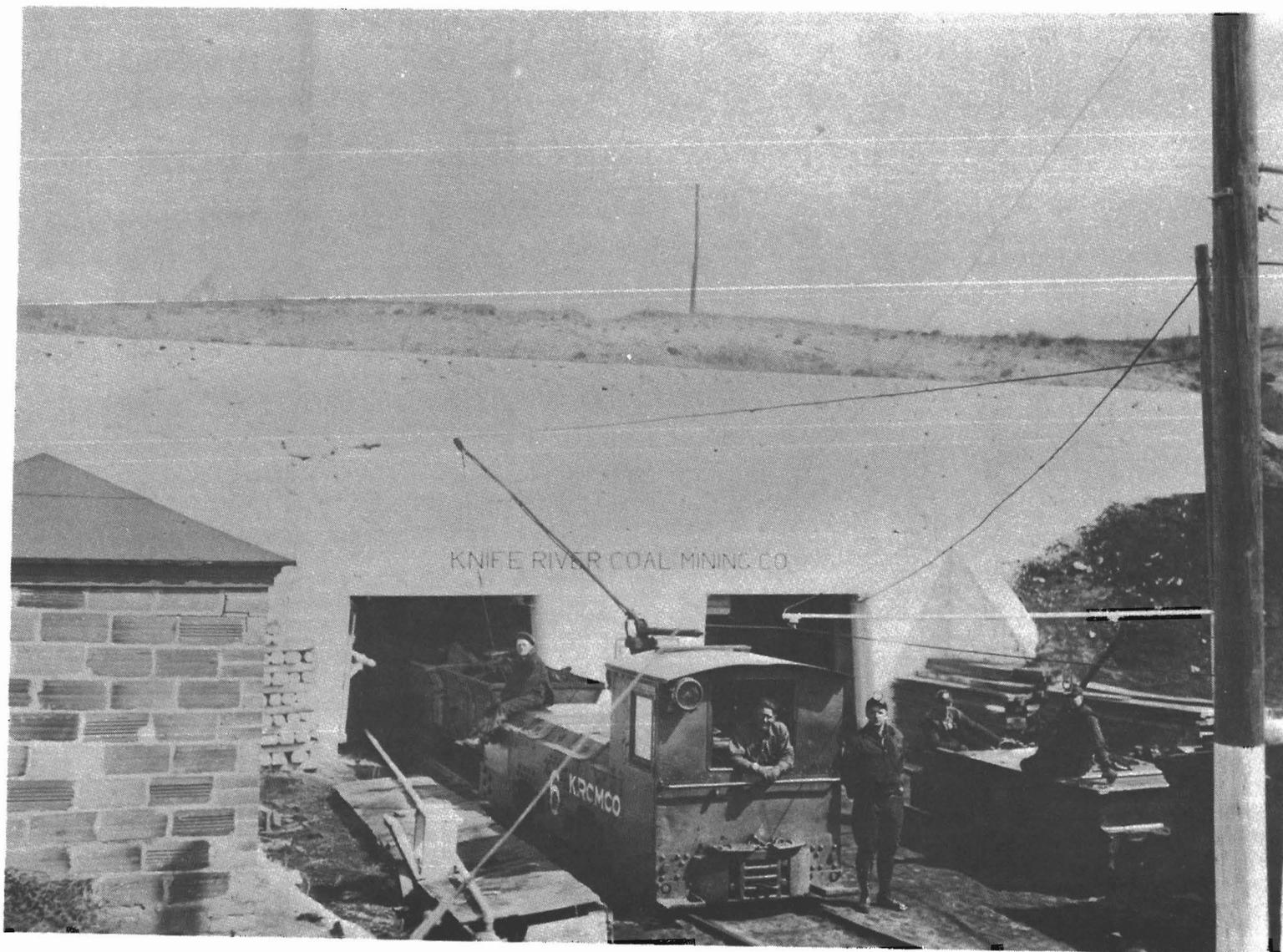
View of Truax-Traer's mine at Minot, North Dakota, ca. 1935. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



A Bucyrus Erie steam shovel owned by Baukol-Noonan Lignite Inc., ca. 1933. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



Harris Baukol, founder of Baukol-Noonan Lignite, Inc. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



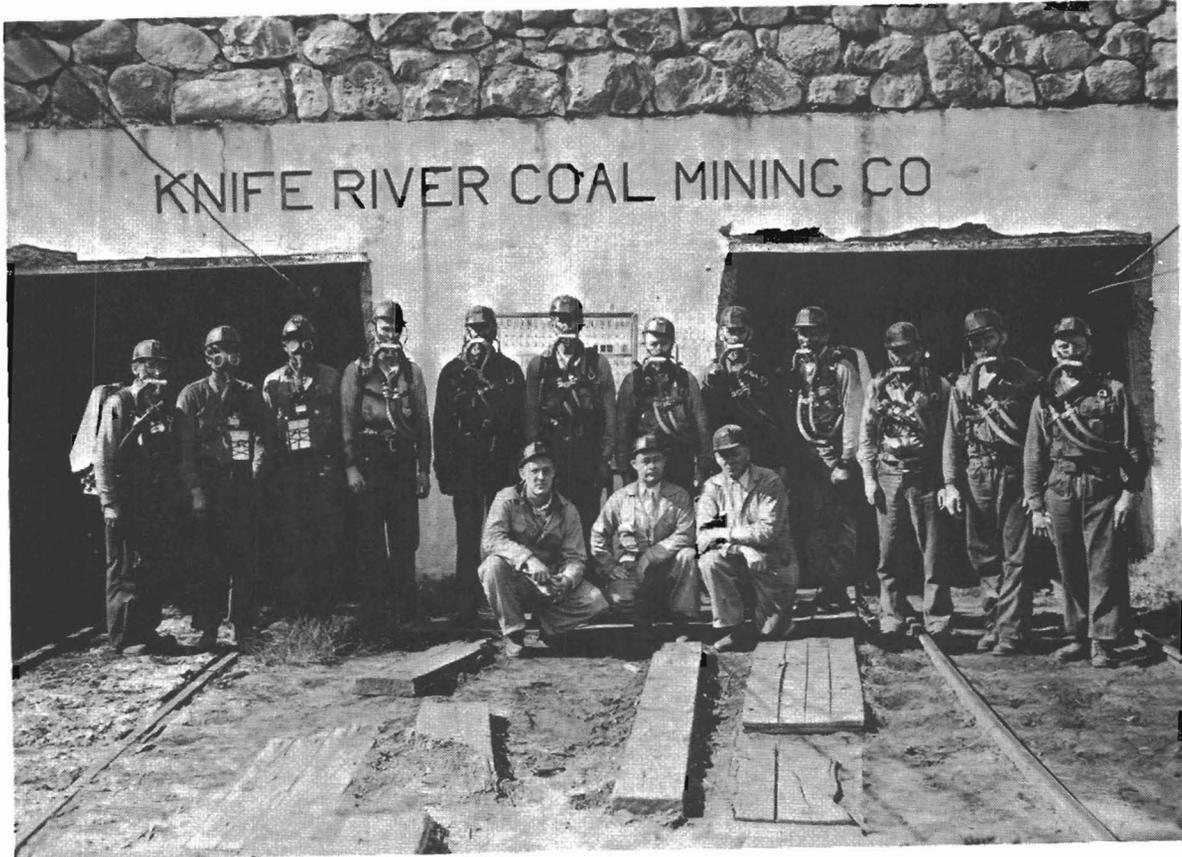
Entrance to the Knife River Coal Mining Company, Beulah, North Dakota, ca. 1935. Photo courtesy of the State Historical Society of North Dakota, Bismarck, North Dakota.



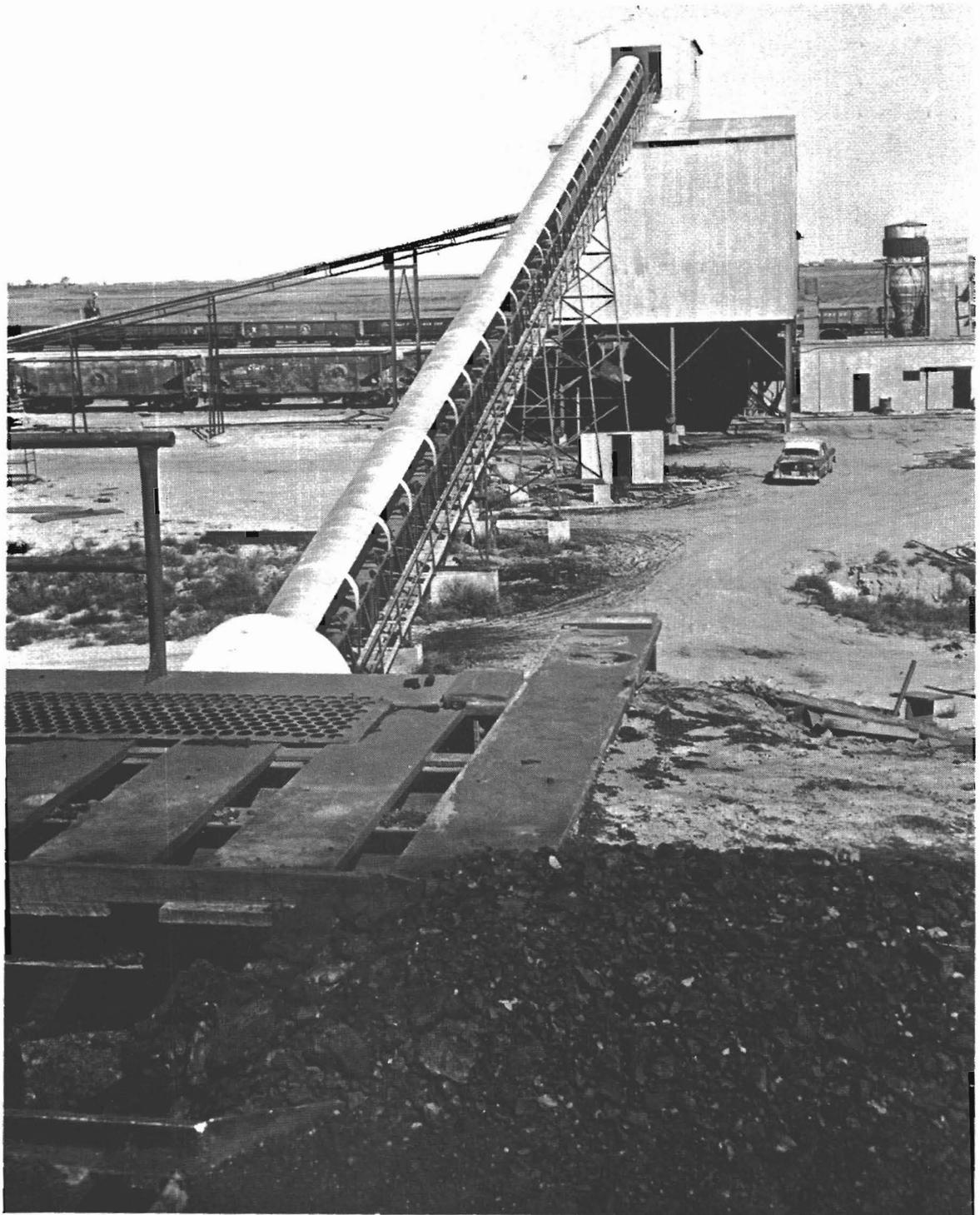
Removing the overburden at the Truax-Traer Coal Company, Minot, North Dakota, ca. 1938. Photo courtesy of the State Historical Society, Bismarck, North Dakota.



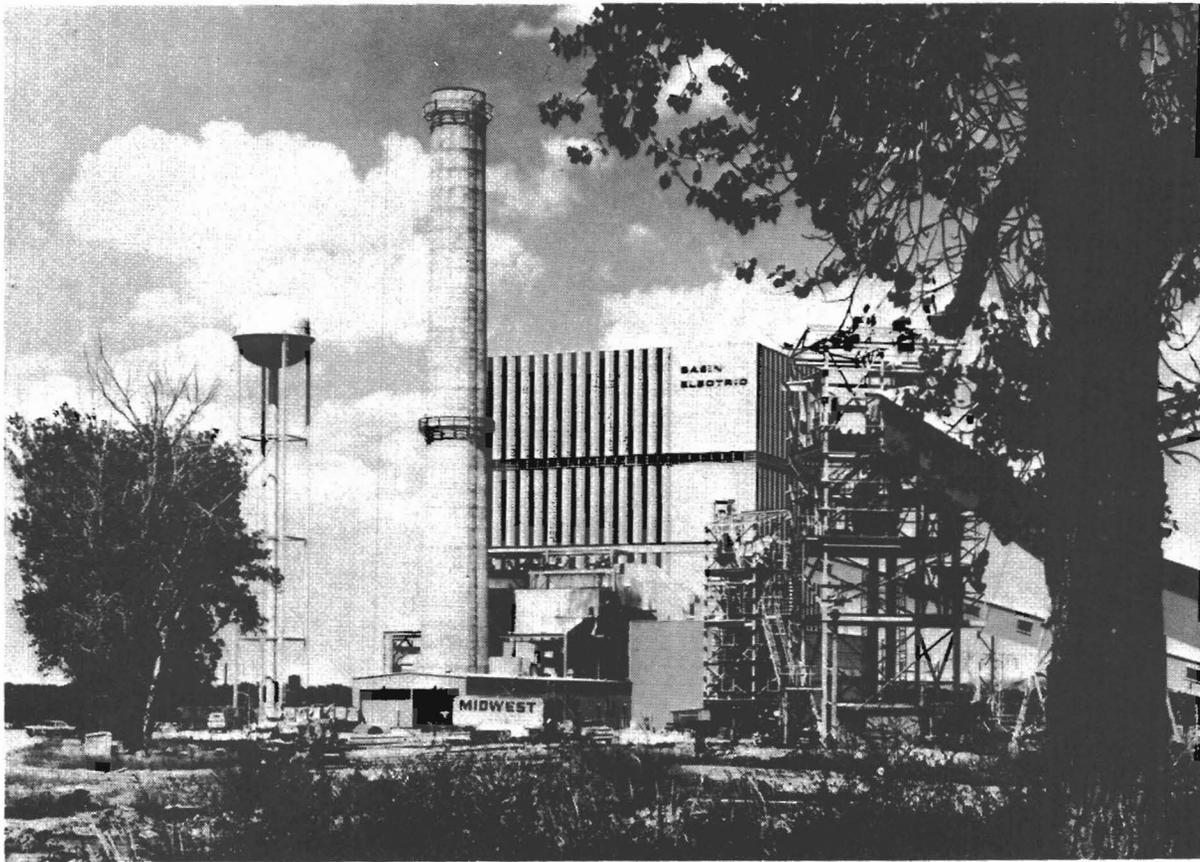
The community coal mine constructed and operated under the Burlington Subsistence Homestead Project, Burlington, North Dakota, 1940. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



The Mine Rescue Crew, Knife River Coal Mining Company, Beulah, North Dakota, 1942. Photo courtesy of the Knife River Coal Mining Company, Bismarck, North Dakota.



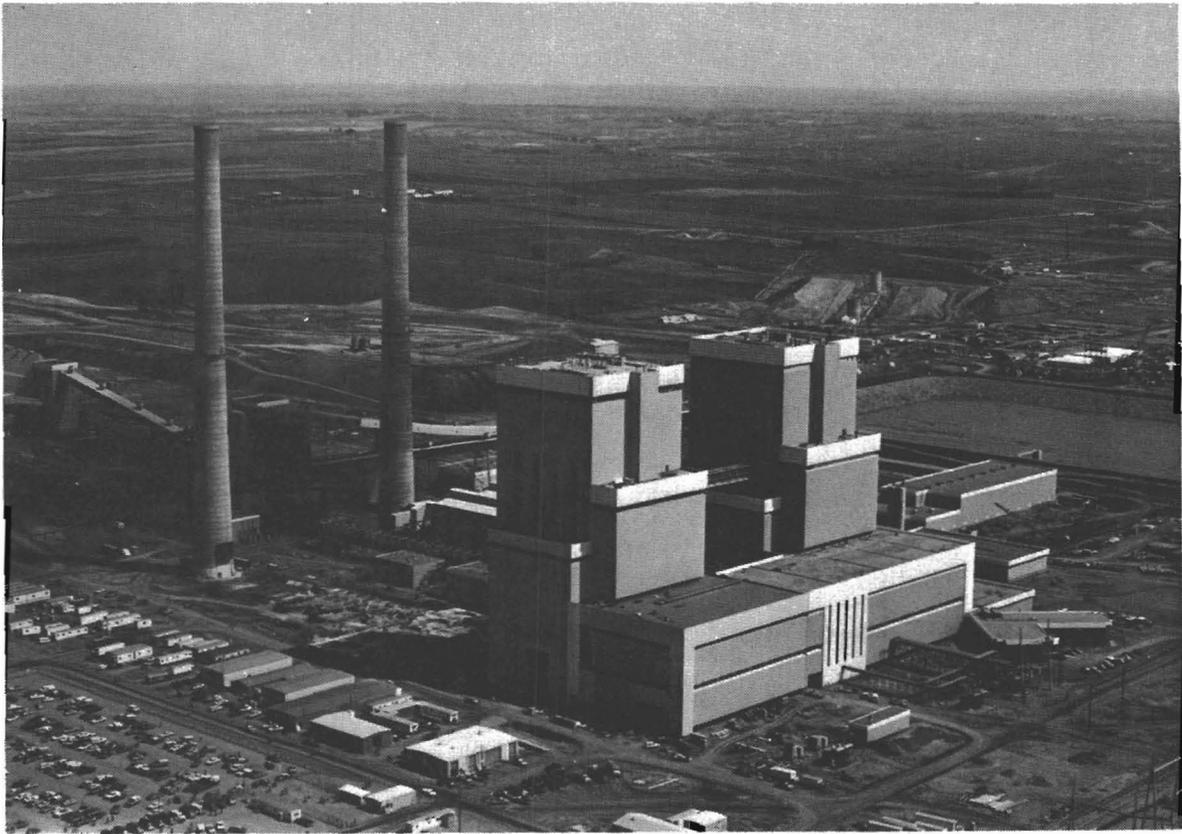
Processing coal at Baukol-Noonan Lignite, Inc. In 1955 the firm had the most modern tipple in North Dakota. Photo courtesy of the Department of Special Collections, Chester Fritz Library, University of North Dakota, Grand Forks, North Dakota.



The Leland Olds Station nearing on-line status, Stanton, North Dakota, 1968. Photo courtesy of the Institute for Regional Studies, North Dakota State University, Fargo, North Dakota



The dragline "Beulah Belle," owned and operated by the Knife River Coal Mining Company, Beulah, North Dakota, ca. 1975. Photo courtesy of the Knife River Coal Mining Company, Bismarck, North Dakota.



Construction of the Antelope Valley Station, Beulah, North Dakota, summer 1982. Photo courtesy of Basin Electric Power Cooperative, Bismarck, North Dakota.

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In researching the history of lignite mining in North Dakota, the author has encountered some difficulty with the quality and the availability of research materials, primarily with the period since 1941. Much of the basic information on lignite production came from federal and state documents, sources that were often inaccurate. Various newspapers gave more detailed information on mining companies and on those events associated with the growth of the lignite industry, but in several instances, information in one newspaper conflicted with that in another. County histories shed light on the number and nature of mines in certain areas, yet information from this source differed from the statistical records found in state documents. Aside from a few published reports, newspaper articles, and one manuscript collection, there is little information available on lignite during the Great Depression. The financial records of coal mining companies, particularly those that have been in operation for a long time, have not been available. Efforts to secure these records were unsuccessful. Information regarding developments in the 1970s has been difficult to obtain.

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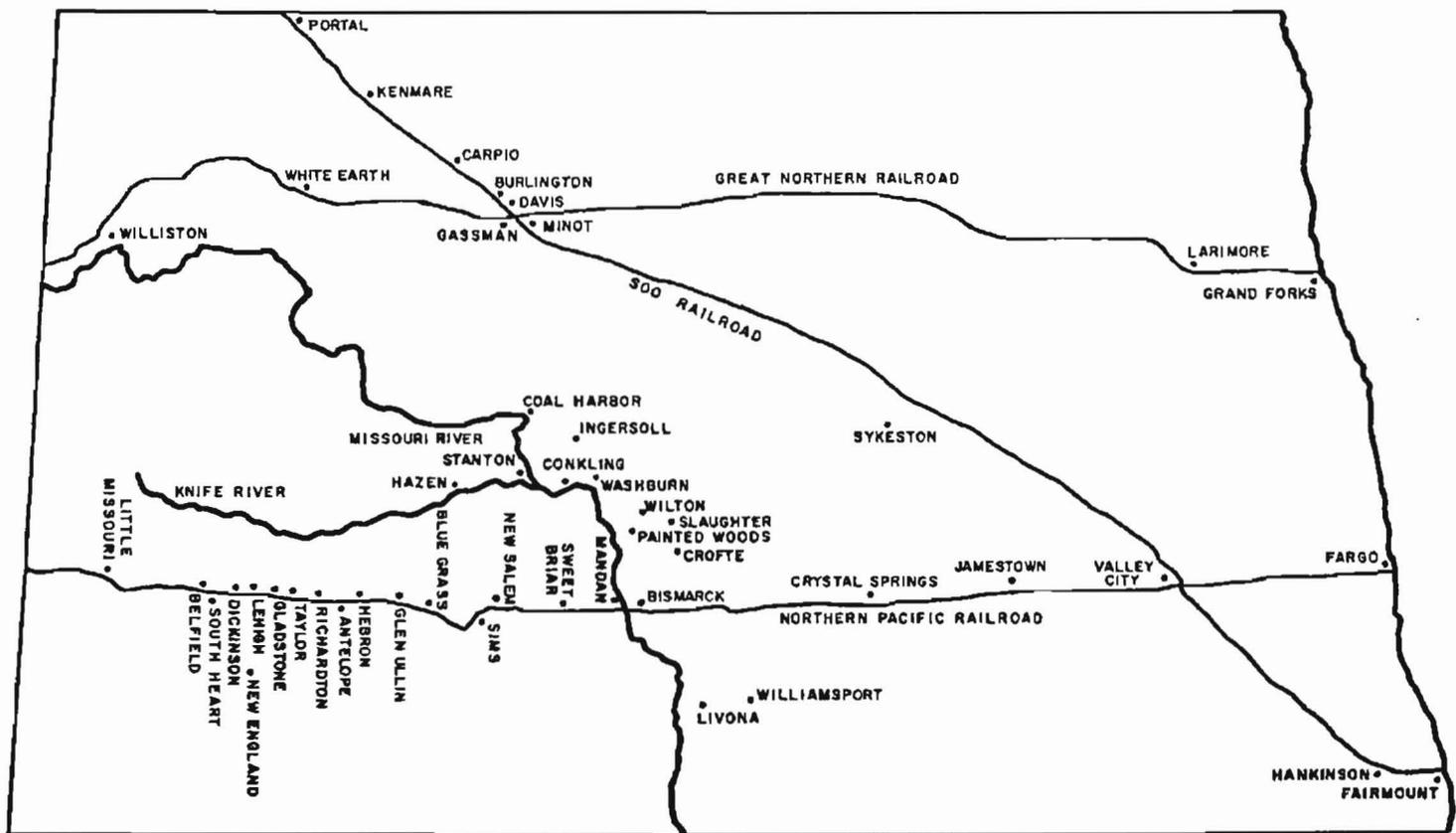
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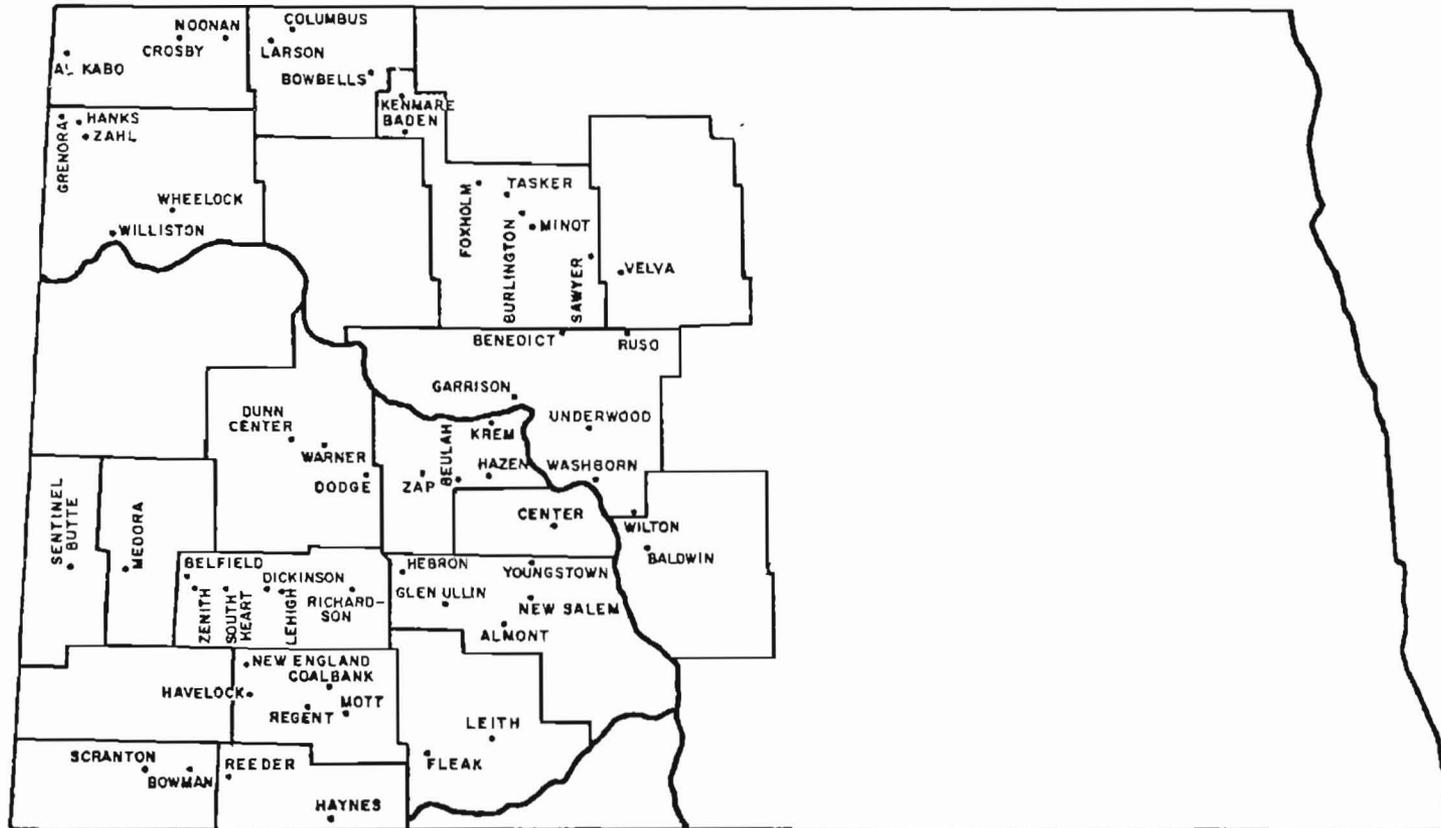
APPENDIX

Cities and Towns of North Dakota Engaged in the Production and Consumption of Lignite Coal, 1873-1900.



SOURCE: Clement A. Lounsberry, "Map of North Dakota--1901," *The Record* (April 1901): 36; Lewis F. Crawford, *History of North Dakota*, 3 vols. (New York: American Historical Society, Inc., 1931), vol. 1, p. 256.

Coal Mining Towns, 1920



SOURCE: Second Annual Report of the State Mine Inspector to the Governor of North Dakota for the Period Ending October 31, 1920 (Bismarck: Tribune, State Printers, 1920), pp. 7-8; Clement A. Lounsberry, "Map of North Dakota--1901," The Record (April 1901): 36.

Statement of Operations of Mines Under State
Control for Period November 14th to December 5, 1919

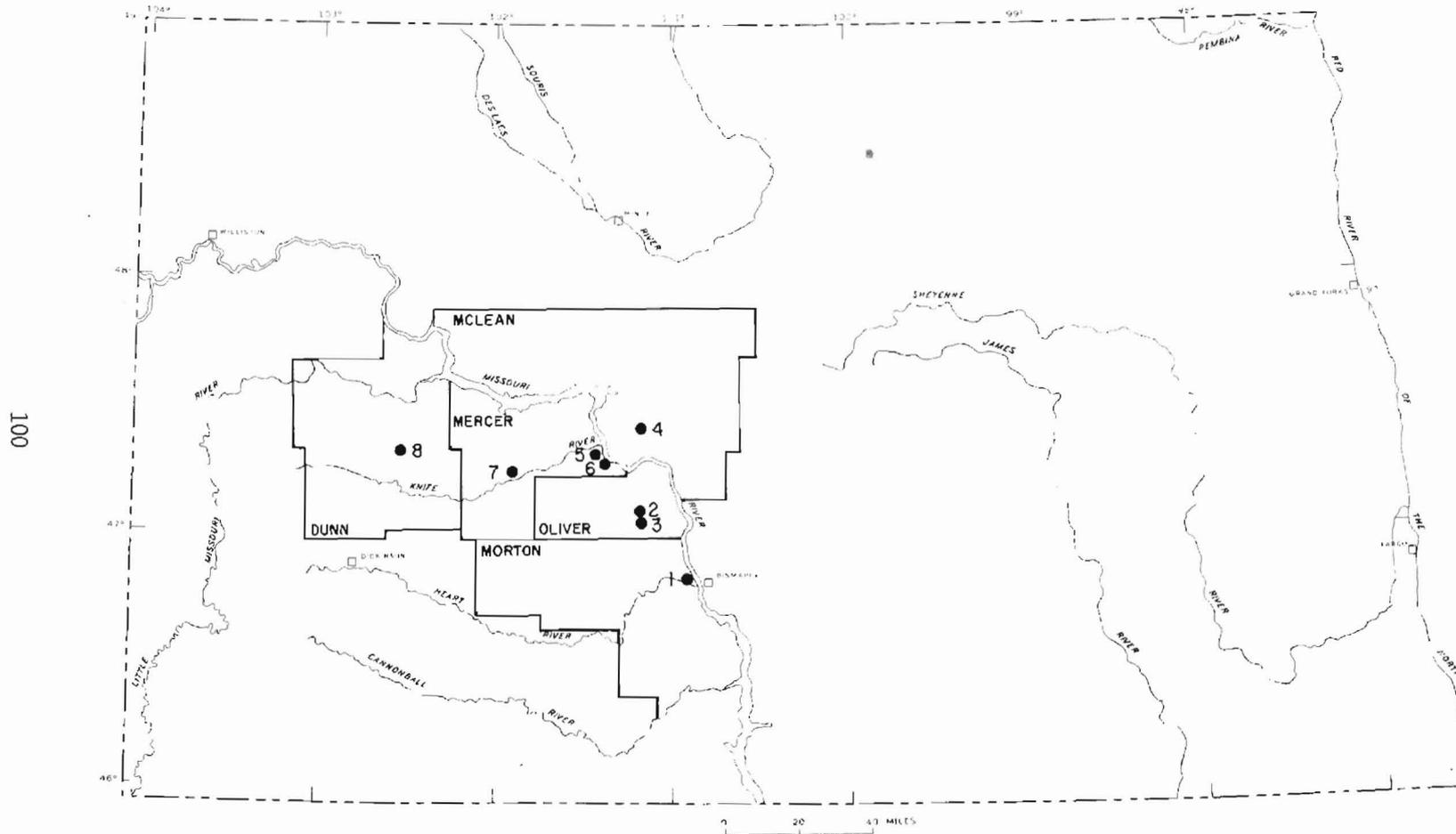
Name of Mines	Coal Mined (tons)
<u>Burlington District</u>	
1. Burlington City Mine	
2. Colton Mine	
3. Midway Coal Company	
4. Conan Mine	
5. Davis Mine	
6. Hunnewell Mine	
7. Lloyd Coal Mine	
8. Superior Coal Mine	
9. Wallace Mine	
10. Dakota Coal Mine	
11. Foxholm Mine	
Total Productivity Burlington District	7,025
<u>Kenmare District</u>	
1. National Mine	
2. Crosby Mine	
3. Diamond Mine	
4. Farmer's Mine	
5. Mellon Mine	
6. Rich Mine	
7. Vadnais Mine	
8. Johnson Mine	
Total Productivity Kenmare District	1,843
<u>Medora District</u>	
1. Red Trail Coal Company	
2. Little Missouri Coal Company	
Total Productivity Medora District	1,718
<u>Noonan District</u>	
1. Tandberg Coal Company	
2. Hought Coal Company	
3. Lorbeski Coal Company	
Total Productivity Noonan District	3,056
<u>Wilton District</u>	
1. Washburn Lignite Coal Company	
Total Productivity Wilton District	9,348
<u>Williston District</u>	
1. Black Diamond Coal Company	
2. Star Coal Company	
3. Carbon Coal Company	
4. Williston Coal & Ice Company	
5. Williston Coal & Ice Company #a	
6. Lovejoy Mine	

Statement of Operations of Mines Under State Control
for Period November 14th to December 5, 1919--Continued

<u>Name of Mines</u>	<u>Coal Mined (tons)</u>
7. Elliothorpe East Mine	
8. Bryne Mine	
9. Head Coal Company	
Total Productivity Williston District	4,494
Grand Total	27,494

SOURCE: Lynn J. Frazier Correspondence, "Statements of Operations of Mines Under State Control for Period November 14th to December 5, 1919," Box 1, Folder 4, Correspondence October 1919-February 1920, Lynn J. Frazier Papers, University of North Dakota, Grand Forks, North Dakota.

Electrical Generating Stations in North Dakota, 1982



MAJOR ELECTRICAL GENERATING STATIONS

- | | | |
|--|---|---|
| 1. R. M. Heskett Station, Units #1 and #2 | 4. Coal Creek Station, Units #1 and #2 | 7. Coyote Station |
| 2. Milton R. Young Station | 5. Stanton Station | 8. Antelope Valley Station, Units #1 and #2 |
| 3. Square Butte Creek Station
(also know as Milton R. Young #2) | 6. Lelond Olds Station, Units #1 and #2 | |