

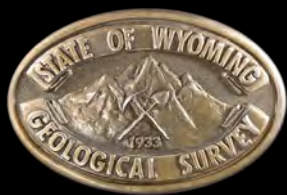
Wyoming's Coal Resources

Summary Report

By Chris Carroll

Wyoming State Geological Survey

Thomas A. Drean, Director and State Geologist



www.wsgs.uwyo.edu

Editing and layout by Chamois Andersen



Introduction

Wyoming is the largest producer of coal in the United States. Coal resources are abundant in many of Wyoming's geologic basins, particularly in the Powder River Basin (PRB) with its 13 surface mines and up to 100 feet thick coal seams.

Between 50 and 70 coal trains per day leave the PRB loaded with coal to destinations mostly south and east of Wyoming. Coal is mined in the PRB at a rate of 12 tons per second, supplying the nation with 400 million tons of coal annually. Nine of the nation's 10 largest coal mines operate in the PRB. With the state's mines combined, Wyoming produces as much coal as the next top six coal-mining states combined (West Virginia, Kentucky, Pennsylvania, Illinois, Texas, and Montana).

Coal Production

In 2011, there were 18 active coal mines in Wyoming that produced nearly 440 million tons of coal (Table 1). This represents more than 40 percent of the entire nation's coal production. Most of this coal is burned as "steam" coal used in power plants to make steam for

generating electricity. All of the mines in the PRB (surface mines) are located in Campbell County. Wyoming has one underground mine, the Bridger Mine in Sweetwater County.

Wyoming has nine of the nation's 10 largest coal mines. The largest U.S. coal mine in Wyoming, the Peabody Energy-Powder River Mining's North Antelope Rochelle Complex, produced nearly 110 million tons of coal in 2011. The nation's second largest coal mine in Wyoming, the Arch Coal Black Thunder Mine (Black Thunder/Jacobs Ranch combined), produced nearly 105 million tons in 2011. Together these two mines produce

Estimates for 2012 indicate that all of Wyoming's coal mines will have produced 400 million tons of coal, down 9 percent from 2011. The spot market price for Powder River Basin coal also dropped considerably to \$10 per ton in 2012, with the estimated value of Wyoming coal produced at \$4 billion.

Table 1. List of Wyoming coal production by county. Figures in tons of coal. (State Inspector of Mines of Wyoming Annual Report, 2011.)

County	2011 Production	Mining Methods	
		Underground	Surface
Campbell/Converse (PRB)	426,076,897		426,076,897
Hot Springs	28,738		28,738
Lincoln	4,541,084		4,541,084
Sweetwater	7,733,293	3,043,110	4,690,183
Total	438,380,012	3,043,110	435,336,902

19 percent of the entire nation’s coal.

Coal Distribution and Consumption

The majority of PRB coal is exported out-of-state to power plants in 34 states. In 2011, the five states that imported the most Wyoming coal included (in order): Texas (62 million tons (MT)), Illinois (61 MT), Iowa (24 MT), Kansas (20 MT), and Wisconsin (20 MT). Also in 2011, approximately 407 million tons, or 94 percent of Wyoming’s coal production was hauled by railroad to other states.

Wyoming power plants consume about 26 million tons annually, which is about 6 percent of the total production. Wyoming has the lowest price for electricity in the nation, averaging 6.2 cents per kilowatt hour (kWh).

Value of Wyoming Coal

In 2011, the spot price for all Wyoming coal sales averaged \$13.56 per ton. This is considered very high for PRB coal. For the 438 million tons produced in 2011, the total value of all coal produced in the state was nearly \$6 billion.

Coal is the second largest source of tax revenue in Wyoming, with revenues exceeding \$1 billion annually. Wyoming’s coal mines also provide more than 7,000 jobs annually.

Resources and Reserves

As of Jan. 1, 2013, the U.S. Energy Information Administration estimated that the Demonstrated Reserve Base for coal remaining to be mined in Wyoming was 60 billion tons. However, this amount is slightly outdated as the U.S. Geological Survey in their most recent study of coal reserves in the PRB have estimated 127 billion tons of recoverable coal remaining (2010). Since 1994, more than 7 billion tons of coal has been mined in Wyoming.

For the coal that will be mined within the next 10 years, there is nearly 7 billion tons of coal reserve currently under lease at active Wyoming coal mines, a figure that represents about one-third of the nation’s “mineable” coal supply.



Coal Geology and Quality

Wyoming coal ranges in age from the Cretaceous to the Eocene. Bituminous and subbituminous coal has been mined from the Cretaceous Mesaverde Group and Almond Formation in the past, but today it is mined from the Paleocene Fort Union Formation. In the PRB, the most prolific coal unit is the Tongue River Member. The quality of coal mined in the PRB today is considered “clean coal.” It is a low sulfur and ash subbituminous coal resource. Coal quality in the Wyodak-Anderson coal

Table 2. Coal chemistry averages for the Wyodak/Anderson coal zone in the Powder River Basin. (USGS coal quality database (USCHEM), 1994.)

Variable	Analyses	Number of Samples
Heat Value	8,200 Btu/lb.	277
Ash	6.44%	279
Sulfur	0.48%	279
Moisture	27.66%	300
Lbs. of SO ₂ / million Btu	1.24	277
Mercury	0.13 (ppm)	162
Uranium	1.3 (ppm)	157

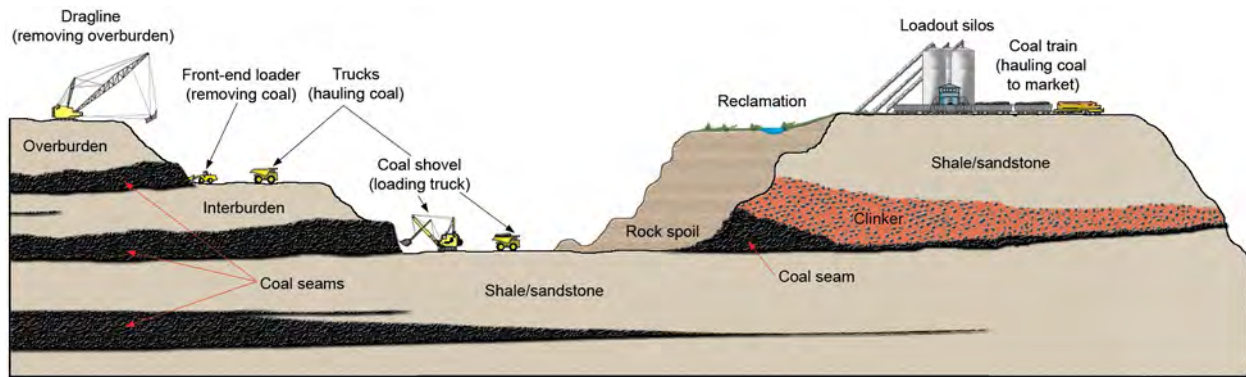


Figure 1. Surface mining methods used by coal mines today. (Illustration by James R. Rodgers, WSGS.)

zone of the Powder River Basin, according to the U.S. Geological Survey, includes the following chemistry averages (Table 2).

Reclamation

Reclamation is an important issue for coal mining and for surface mines in Wyoming (Figure 1). These large excavations of the earth must be reclaimed to original contour, grade, and re-vegetated when mining is completed. The Land Quality Division of the Wyoming Department of Environmental Quality provides enforcement and administration for state and federal statutes regarding coal mining and regulations in Wyoming.

Future of Coal Mining

Nationally, it is projected that coal production will remain relatively the same in 2013. International exports of Wyoming coal could have a significant impact on future production and price. If natural gas prices increase in 2013, then less expensive coal will be in relatively higher demand. The U.S. Energy Information Administration projects that the value of coal produced

will grow by 1 percent. Environmental regulations and CO₂ requirements for coal-fired power plants will affect the burning of coal in the future. U.S. coal-fired power plants may be augmented by renewable energy generated electricity for short-term peak demand times, but the demand for base load coal for electricity will continue to be a need in the future.

Sources

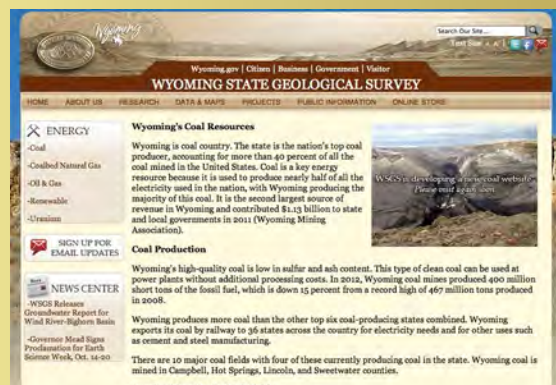
- Wyoming Department of Environmental Quality
- Wyoming Mining Association
- Wyoming State Inspector of Mines
- U.S. Energy Information Administration
- U.S. Geological Survey
- Office of Surface Mining Reclamation and Enforcement
- Mineral Information Institute



For additional information, click this QR code to access the WSGS coal website.



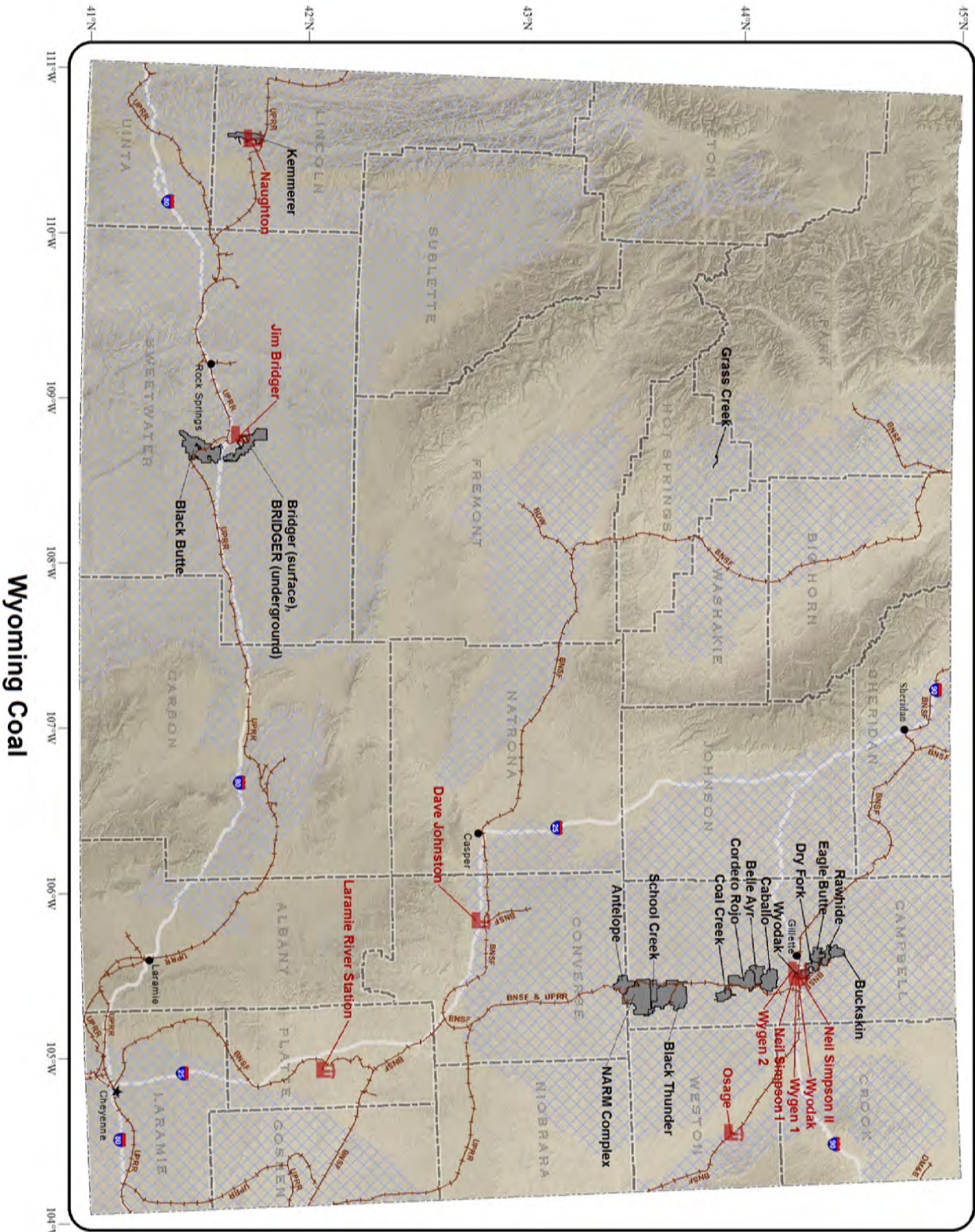
Photo by Meg Ewald.





Geology - Interpreting the past - Providing for the future

WYOMING STATE GEOLOGICAL SURVEY
 Thomas A. Dyeon
 Director and State Geologist
 Laramie, Wyoming



Wyoming Coal

41°N 42°N 43°N 44°N 45°N
 111°W 110°W 109°W 108°W 107°W 106°W 105°W 104°W

EXPLANATION

- Active coal permit boundary (2012)
- Coal regions
- Coal regions
- Power plants (coal)
- City or town
- Interstate highway
- County boundary
- Railroads
 - UPRR - Union Pacific Railroad
 - BNSF - Burlington Northern Santa Fe Railway
 - DDW - Bad Water Railway
 - DM&E - Dakota, Minnesota and Eastern Railroad (subsidiary of Canadian Pacific Railway)

