COLORADO GEOLOGICAL SURVEY

ROCK TALK

VOLUME ONE, NUMBER THREE JULY, 1998

WHAT CONNECTS COAL AND COFFEE?

What is your morning routine? Turn off the alarm, turn on the lights, plug in the coffeepot, and try to stay awake while that first cup of coffee brews? What if a pollster caught you at just that moment and asked, "Where does the energy come from that powers the clock, the lights, and the coffeepot?" Would you promptly respond, "Colorado coal!"?

Coal brings up images of soot-blackened buildings and granddad up at dawn, stoking a basement furnace. Modern power comes from electricity, right? That's true—and the energy used to generate that electricity, more often than not, comes from coal. In Colorado, almost 95 percent of electricity is produced from coal.

COLORADO'S MINERAL WEALTH INCLUDES COAL

Colorado is renowned for its mineral wealth. Since 1858, when placer gold was discovered near Denver in Cherry Creek, Colorado has produced more than $5 billion worth of metals—gold, silver, molybdenum, lead, zinc, and copper. They are found in the Colorado Mineral Belt—a zone 15–35 miles wide and some 200 miles long in the mountainous middle of the state.

Coal is perhaps a less glamorous commodity, but its economic importance rivals that of gold and silver. 1997 production alone is valued at an estimated $356 million. Coal has been produced in Colorado almost as long as gold—since 1864. It was first mined out on the high plains south of Boulder, in the Boulder-Weld coal field. (See map below for location of places named in this newsletter.) This "flatland" location is typical of the parts of Colorado where coal is found, which are underlain by more or less flat-lying sedimentary rocks. Early production came from coal-bearing regions lying just east of the Front Range, near Walsenberg, Trinidad, Colorado Springs, and Boulder. Today's important coal-bearing regions lie west of the mountains in the Colorado Plateau from Wyoming to the New Mexico border. Nearly 30,000 square miles—28 percent of the state—is underlain by coal.

Coal beds may be "mined" for another combustible material, methane gas. Once considered only a hazard that sometimes caused deadly explosions, methane gas is now pumped out of the ground and marketed as a valuable product.

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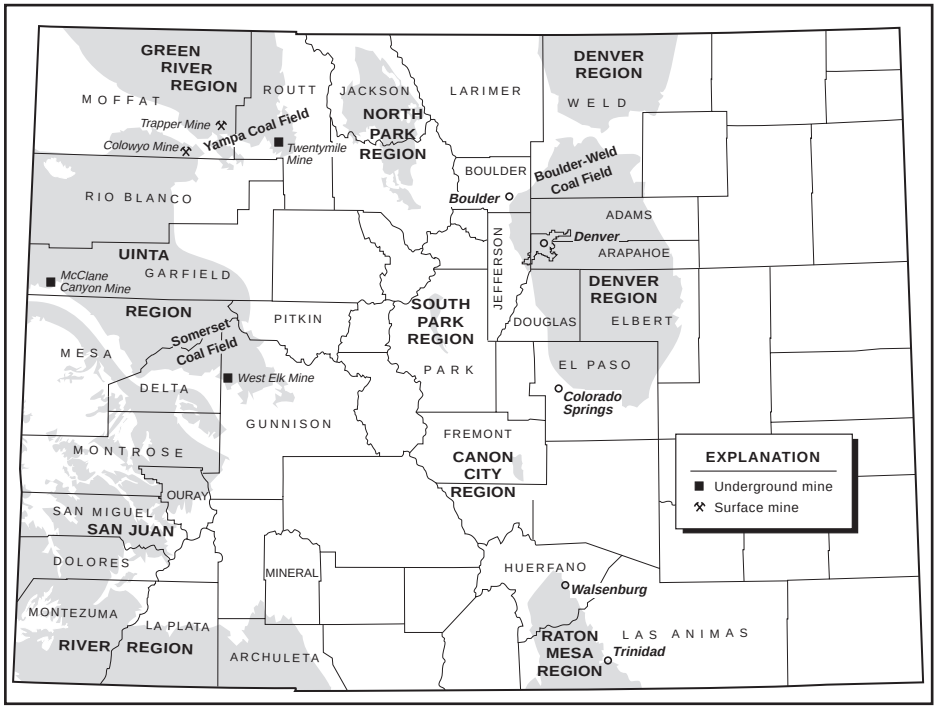

Location of coal mines, coal fields and locales named in this article.

Field Notes from the State Geologist

In the last ten years, several state boards and task forces have directed the CGS to promote economic development of the state's minerals through the production and distribution of maps and publications. Groups like the American Institute of Professional Geologists and the Rocky Mountain Association of Geologists have stated that the best way to replace depleted natural resources is to encourage private industry to find and develop new resource locations.

The Governor's Task Force of 1988 attributed Colorado's current coal production to the economic development efforts of the CGS in the early 1970s. According to its report, "[CGS] coal resource investigations resulted in 30 publications and 17 reports that documented the location, quantity and quality of the state's coal resources. These investigations provided basic data leading to coal exploration and development decisions. As a result of these decisions, Colorado's coal production increased from 4 million tons in 1970 to nearly 20 million tons in the early 1980s".

Trouble was, in 1983 the CGS lost the funding to provide the services and publications intended to encourage such development. But that has recently changed.

Legislation from 1996 provides CGS $740,000 annually from the Severance Tax. The mining and oil & gas industries pay this tax. Using these funds, CGS is now providing basic geological

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HOW MUCH COAL DOES COLORADO PRODUCE?

All told, 29 counties have produced coal, of which ten continue today. Coal production fell mid-century, as it was replaced by natural gas for heating and diesel fuel for locomotives. Production rebounded in the 1970s, driven by high-grade coal recovered from large new mines in northwestern Colorado and by the increasing demand for power-plant fuel. In 1971, Colorado produced only 5.3 million tons of coal. In 1997, it produced more than five times as much—27.4 million tons. Mines in Routt, Moffat, and Gunnison counties accounted for more than two-thirds of this total. Within the next few years, annual coal production is expected to top 30 million tons.

Modern—and bigger—mining equipment has boosted production. During 1996, the underground Twentymile Mine used its new longwall mining system (containing three-mile-long panels, the longest in the world) to establish the current world record for one month's coal production—just over 1 million tons. The Colowyo Mine, a surface mine, uses equipment which is among the largest in the state: a dragline bucket that holds 60 cubic yards, 240-ton trucks, and loaders with buckets that hold 35 cubic yards. The overall productivity of Colorado mines was 7.3 tons per worker-hour in 1996, compared with about 0.7 tons per worker-hour 40 years ago. This level of productivity ranked sixth out of 27 coal-producing states—a real feather in Colorado's cap. Most Colorado coal comes from underground mines, which nationally tend to have lower production rates. Colorado's efficient operations largely compensate for mining under more difficult conditions.

Longwall machine at the West Elk Mine. Photo courtesy of Wendell Koontz, Mountain Coal Co.

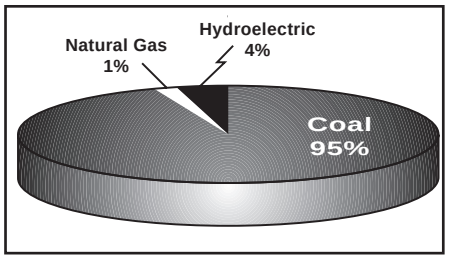
Dragline at Colowyo Mine with 60 cubic yard bucket capacity. Photo courtesy Juan Garcia, Colowyo Coal Co.

COAL HELPS COLORADO'S ECONOMY

The coal industry employs about 1600 miners at an average annual wage of $58,200, nearly double that of the average wage in the state. Mining companies are taxpayers too. During the 1996–1997 fiscal year, coal companies paid the state nearly $32 million in taxes, royalties, and rents. The cost-effective mining of this abundant resource keeps the price of electricity as low as it is, benefitting every business and private individual in the state.

WHO USES COLORADO COAL?

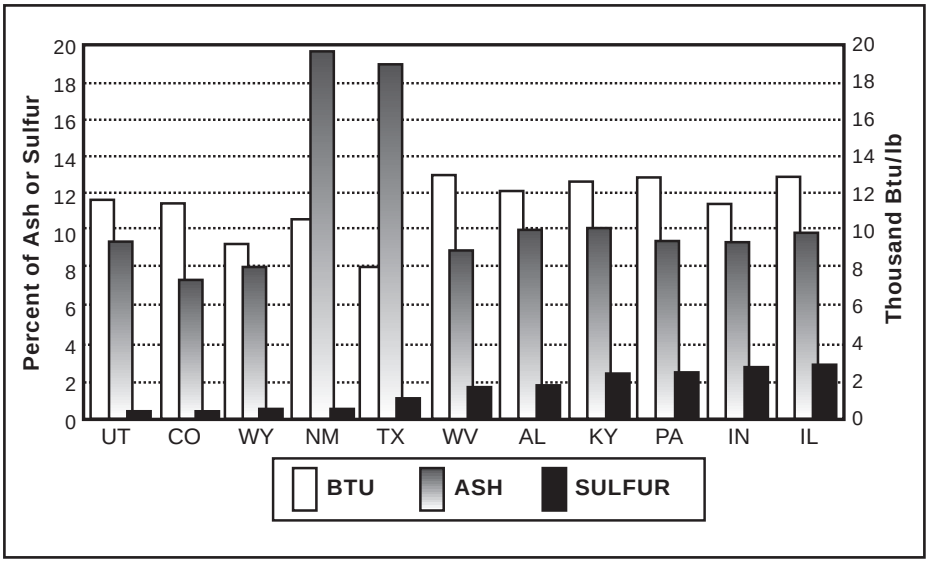
As users of electricity, we all use Colorado coal. About 40 percent—10 million tons—of the coal mined in Colorado stays here, and almost all of that amount is used to generate electricity. (A few percent is used by industrial plants and homeowners.) Some 60 percent goes elsewhere—to 18 other states (see map at right) and to five foreign countries (Mexico, Israel, Japan, Korea, and Taiwan), where it is again used principally to generate electricity. Seven million tons is imported from Wyoming's Powder River Basin coal fields to fuel eastern Colorado power plants.



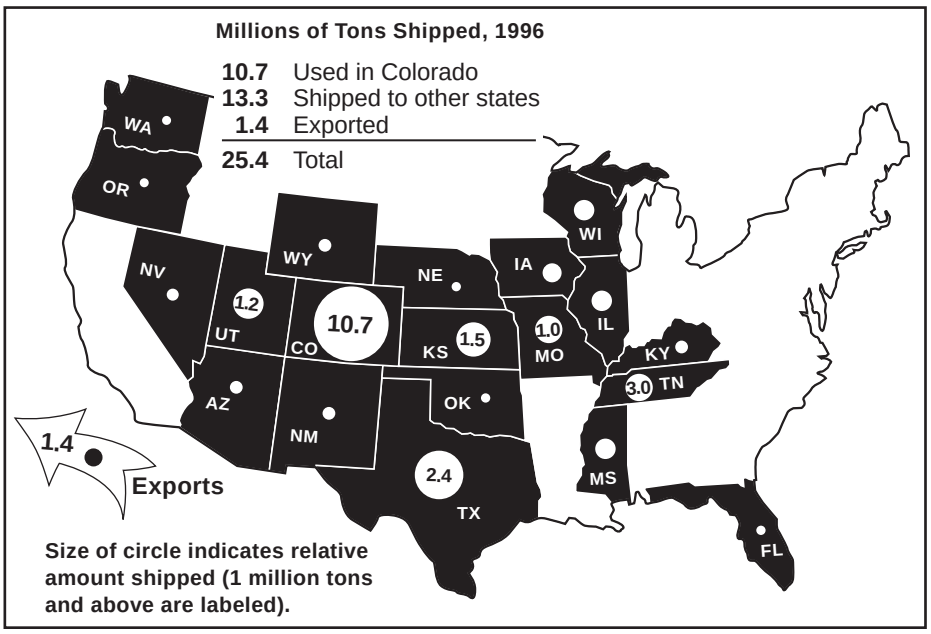
Energy sources at Colorado electric utilities.

COLORADO COAL IS SOME OF THE BEST IN THE WORLD

Colorado coal is in demand because it is recognized as some of the best in the world. About 70 percent of the coal mined in the state is a high-grade bituminous coal, which has a high heat value. The ash content of most of this coal is low, 6–10 percent, so the burned coal leaves little residue needing disposal. Its sulfur content is very low. Virtually all coal mined in the state contains less than 1 percent sulfur and most of it contains less than half of that amount. This is important, because the sulfur in coal can escape in smoke and contribute to acid rain. In addition, coal mined in the state contains only insignificant amounts of toxic or radioactive minerals.



Quality comparison of coal produced in Colorado and selected states.



Destination of Colorado coal.

HOW MUCH COAL IS LEFT?

Because Colorado coal meets important energy needs in Colorado and elsewhere, "How much is left?" is a question worth investigating. A ballpark figure is more than 430 billion tons—more than a tenth of the nation's entire coal resource. However, only a fraction of this amount can be mined economically. More precise answers to this question are needed by government agencies that formulate state and national energy policy, by industry producers and users of coal, and by businesses that provide services to mines and power plants.

Both the Colorado Geological Survey (CGS) and the U.S. Geological Survey (USGS) are working to better define mineable reserves in Colorado. New CGS estimates of coal reserves (based on 1:100,000-scale maps) will be available for the Somerset coal field in mid-1998 and the Yampa coal field in mid-1999. These reserve estimates are used not only for state planning purposes but they also become part of a nationwide database of coal resources. In a second project, the Somerset quadrangle (which covers part of the Somerset coal field) will be mapped at a much larger scale, 1:24,000. Geologists will then be able to map many individual coal seams and make a more detailed estimate of the coal reserves that are practical to mine. Quadrangles in the Yampa coal field are the next to be mapped at this larger scale.

Cumulative coal production of Colorado counties (historic production; rounded to nearest million tons).

75 Million Tons+	1–25 Million Tons	<1 Million Tons
Routt (190)	Delta (21)	Adams
Las Animas (186)	Mesa (18)	Arapahoe
Moffat (145)	Rio Blanco (16)	Dolores
Gunnison (99)	El Paso (15)	Douglas
Huerfano (76)	La Plata (9)	Elbert
25–75 Million Tons	Garfield (8)	Larimer
Weld (69)	Jackson (7)	Montezuma
Fremont (47)	Jefferson (7)	Ouray
Boulder (43)	Montrose (5)	Park
Pitkin (30)	Archuleta (1)	San Miguel

How to Order CGS Publications

Information Series 44
Colorado Mineral and Mineral Fuel Activity, 1997
over the counter—$4.00
mailed—$7.00.

Resource Series 32
Directory and Statistics of Colorado Coal Mines with Distribution and Electric Generation Map, 1995–96
over the counter—$10.00
mailed—$13.50.

Resource Series 33
Spanish Peak Field, Las Animas County, Colorado: Geologic Setting and Early Development of a Coalbed Methane Reservoir in the Central Raton Basin
over the counter —$8.00
mailed—$11.50.

Special Publication 41
1995 Summary of Coal Resources in Colorado
over the counter —$5.00
mailed—$8.00.

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Help Needed for Mining Exhibit at "Taste of Colorado"

Volunteers are needed to staff the mining education exhibit at the Taste of Colorado Festival, Labor Day weekend, September 4–7, 1998. Contact: Guy Johnson, exhibit coordinator, 303-969-0365, FAX 303-716-0503, or e-mail: GPJ222@aol.com

A RETIREMENT OPEN HOUSE will be held for Wm. Pat Rogers on July 29, 1–5 P.M. at CGS, 1313 Sherman St., Rm. 719, Denver. For more information call (303) 866-2811.

Field Notes *continued from p. 2*

information to stimulate exploration. Severance taxes support many of the reports and studies discussed in *RockTalk*, including geological mapping. (A partial list of related CGS publications is above.)

Exploration and development of minerals is cyclic. A stable state geological survey can undertake long-range programs that provide basic data on resources regardless of short-term economic conditions. Reports and maps being created today will be useful and valuable for years to come. Severance taxes paid by the mining and oil and gas industries are providing for these products for the future.

When the going gets tough...

Complex geology can make mining coal in Colorado more of a challenge than it is in some other states. Mining steeply dipping coal seams (10-percent to more than 15-percent grades) slowed operations at the Twentymile Mine in 1997. Even so, the year's production of 7.2 million tons topped 1996 production by more than a million tons. The West Elk Mine first had to close down one newly opened section because water flowed in through a bedrock fault. Later, separating out a coal layer very high in ash increased the number of steps required by the mine's longwall process. As a result of these problems and of insufficient rail transport, West Elk's 1997 production fell about 4 percent below 1996 production.

Rail merger slows movement of coal

Railroad cars move almost all coal from mines to markets. When trains don't run, mined coal can be stockpiled—for a while. In the aftermath of the 1996 merger of the Union Pacific and Southern Pacific railroads, many coal train schedules were in limbo. When stockpile capacity was exceeded, mines were forced to cut production. Limited rail service in 1997 again forced several mines to cut production, and rail limitations will continue to slow Colorado production in 1998.

ARCO Coal bought by Arch Coal, Inc.

ARCO Coal, which operated the West Elk Mine on Colorado's western slope and had a staff of 65 in its Denver office, was sold in early 1998. Because the new owner, Arch Coal, is headquartered in St. Louis, it is anticipated that the Denver office will be closed by the end of the year.

Four mines win awards

Ensuring safe working conditions is a priority at the mines. The Colowyo and the Trapper Mines were recognized by the Colorado Mining Association and the Colorado Division of Minerals and Geology as exceptionally safe places to work. At the end of 1997 the Colowyo Mine had completed almost 2.5 million worker-hours without a lost-time injury.

The McClane Canyon, Twentymile, and Trapper Mines received reclamation awards from the Colorado Division of Minerals and Geology for preserving the environment and reclaiming mined lands. Colorado's strict mined-land reclamation laws agree with at least some of the intended beneficiaries. During hunting season, about 200 canny elk use reclaimed land at the Trapper Mine as a "wildlife refuge"—the living is easy and hunting is not allowed on mine property.

Upcoming Events Involving CGS

July 10
CGSAC-sponsored open forum on CGS and severance tax programs, Anissa Olguin, 866-3520

August 12–14
Colorado Oil and Gas Assoc. 10th Annual Meeting, Tom Hemborg, 866-3470

October 11–17
CGS Open House/Earth Science Week, 1313 Sherman St., Rm 715, Denver, 866-2611

October 29–30
Geologic Hazards and Engineering Practices in Western Colorado, Anissa Olguin, 866-3520

Reclaimed land at the Trapper Mine
Photo courtesy of Forrest Luke, Trapper Coal Co.

In Memoriam

Orletta Fairchild died suddenly April 18 of a stroke and aneurysm. Orletta worked at the CGS for five years selling publications and staffing outreach booths. Many of you have had an opportunity to speak with her and experience her willingness to help people with their requests for information about CGS publications. Cards to her family can be sent to Aspen Mortuary, 1350 Simms, Lakewood, CO 80216 and donations in her memory to Children's Hospital, 1129 E. 17th Ave., Denver, CO 80218.

BAKED POTATOES AND OTHER HAZARDS

Most of us expect to cook our vegetables after they are harvested. If you live in certain parts of Colorado, however, nature might cook them for you. Coal can be ignited by lightning strikes or grassfires, or it can burn spontaneously when the coal is exposed to air, even in underground mines. Once started, coal fires can be difficult to put out. In 1996, the Deserado underground mine lost $32 million of equipment, including a longwall system, to a coal fire. Over 3 million tons of coal reserves were also lost. Such fires are dangerous because the heated ground over a fire may weaken, and the fires can vent hot, toxic gases. Fortunately, only about seven hundred acres of land in the entire state are affected.

Of more concern, because it is much more widespread, is subsidence over old underground mine workings. As Colorado's population—and need for housing—grows, new subdivisions push into some regions underlain by these old mines. In the Front Range urban corridor alone, the Colorado Geological Survey estimates that abandoned underground coal mines pose a hazard to as many as 5,000 houses. CGS maintains a Mine Subsidence Information Center, which contains valuable information for evaluating subsidence potential.

Coal mine subsidence near a Colorado Springs subdivision.

CGS MISSION STATEMENT

The CGS mission is to serve and inform the people of Colorado by providing sound geologic information and evaluation and to educate the public about the important role of earth sciences in everyday life in Colorado.

ROCK TALK

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