BLM Coal Resources

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A brief overview of coal, including history, mining techniques, leasing regulations, the BLM leasing program, and coal resources of the North Fork Valley in Colorado

UNCOMPAHGRE FIELD OFFICE

Contents

1 - INTRODUCTION AND BACKGROUND 2

2 - COAL OVERVIEW 2

2.1 Types of Coal 4

2.2 Types of Coal Mining 6

Surface Mining 6

Underground Mining 7

2.3 Processing and Transporting Coal 10

3 - MANAGEMENT OF FEDERAL COAL RESOURCES 11

3.1 The BLM 11

3.2 The Surface Management Agency 11

Split-Estate Management 11

3.3 The Office of Surface Mining Reclamation and Enforcement 11

3.4 The Mine Safety and Health Administration/Coal Mine Safety and Health 12

3.5 The Environmental Protection Agency 13

3.6 The U.S. Army Corps of Engineers 14

3.7 The U.S. Geological Survey 14

3.8 Colorado Division of Reclamation Mining and Safety 14

4 - THE BLM AND COAL LEASING 15

4.1 Background and Overview 15

The Federal Coal Leasing Amendment Act 16

The Federal Land Policy and Management Act 17

The Surface Mining Control and Reclamation Act 17

Title 43 Code of Federal Regulations, Part 3400 - Coal Management 18

4.2 Coal Leasing Regulations 18

Leasables - Coal and Competitive Leasing 18

Lands Available for Coal Leasing 19

Lands Suitable for Coal Leasing 19

Competitive Coal Leasing Process 19

Lease Terms and Conditions for Coal 20

Coal Leasing Decisions 20

Coal Lease Modification Regulations 21

4.3 BLM Colorado and Coal Leasing 26

North Fork Valley Coal Resources 26

5 - REFERENCES 30

1 - Introduction and Background

Across the United States, the BLM is responsible for coal leasing on approximately 570 million acres of land managed by the Federal Government for the American people. In accordance with the Federal Land Policy and Management Act of 1976 (FLPMA), the Mineral Leasing Act of 1920 (MLA), the Mineral Leasing Act for Acquired Lands of 1947 (MLAAL), the Surface Mining Control and Reclamation Act of 1977 (SMCRA), the National Environmental Policy Act of 1969 (NEPA), and all other applicable laws, rules, regulations, policies, standards, and guidelines, the BLM works to ensure that the development of coal resources is done in an open and environmentally sound manner that, to the fullest extent possible, invites the participation and involvement of the public and that focuses on the goal of benefitting the nation as a whole.
Source: http://www. blm.gov/wo/st/en/prog/energy/coal_and_non-energy.html [Regulations that govern the BLM's coal leasing program may be found in Title 43, Groups 3000 and 3400 of the Code of Federal Regulations (CFR)]

2 - Coal Overview

Coal is a combustible black or brownish-black sedimentary rock composed mostly of carbon and hydrocarbons (see Types of Coal below). Coal, the most abundant "fossil fuel" found in the United States, is formed by the decomposition of organic materials that have been subjected to geologic heat and pressure over millions of years (See Figure 1-1, How Coal Was Formed). This burnable carbonaceous rock also contains various amounts of mineral matter. Coal seams are formed along with other sedimentary rocks, primarily sandstone and shale. Coal is considered a non-renewable resource because it cannot be replenished on a human time frame.
Sources: http://www.epa.gov/cleanenergy/energy-and-you/affect/coal.html
http://www.eia.gov/energyexplained/index.cfm?page=coal_home

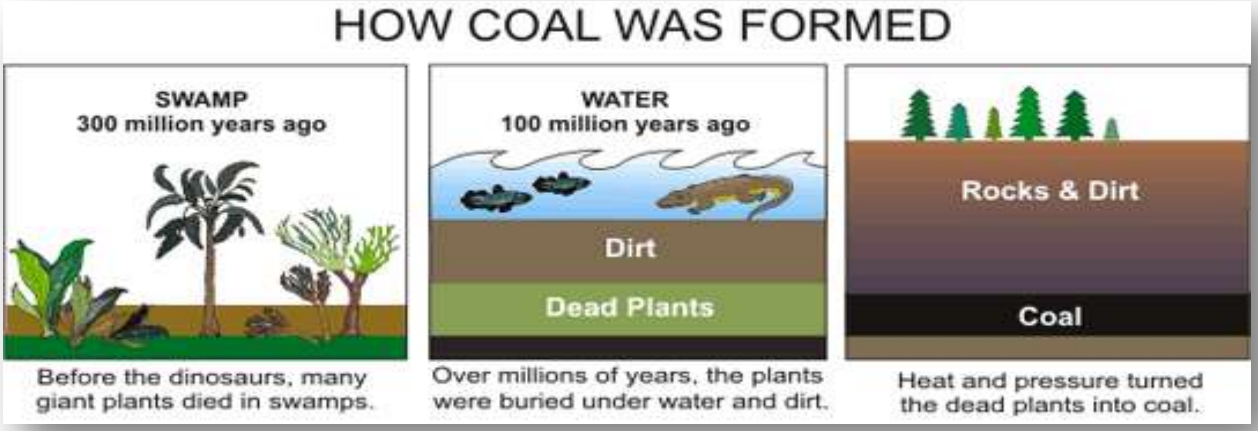


Figure 1 - Diagram depicting coal formation
Source: National Energy Education Development Project (Public Domain)

Coal is the most common fuel for generating electricity in the United States. In 2010, approximately 45 percent of the nation's nearly 4 trillion kilowatt-hours of electricity used coal as its source of energy. In addition to companies in the electric power sector, industries and businesses with their own power plants use coal in order to generate electricity. (See Figure 2 on page 2, U.S. Net Electricity Generation by Fuel, 2010.)
Source: http://www.eia.gov/energyexplained/index.cfm?page=coal_home

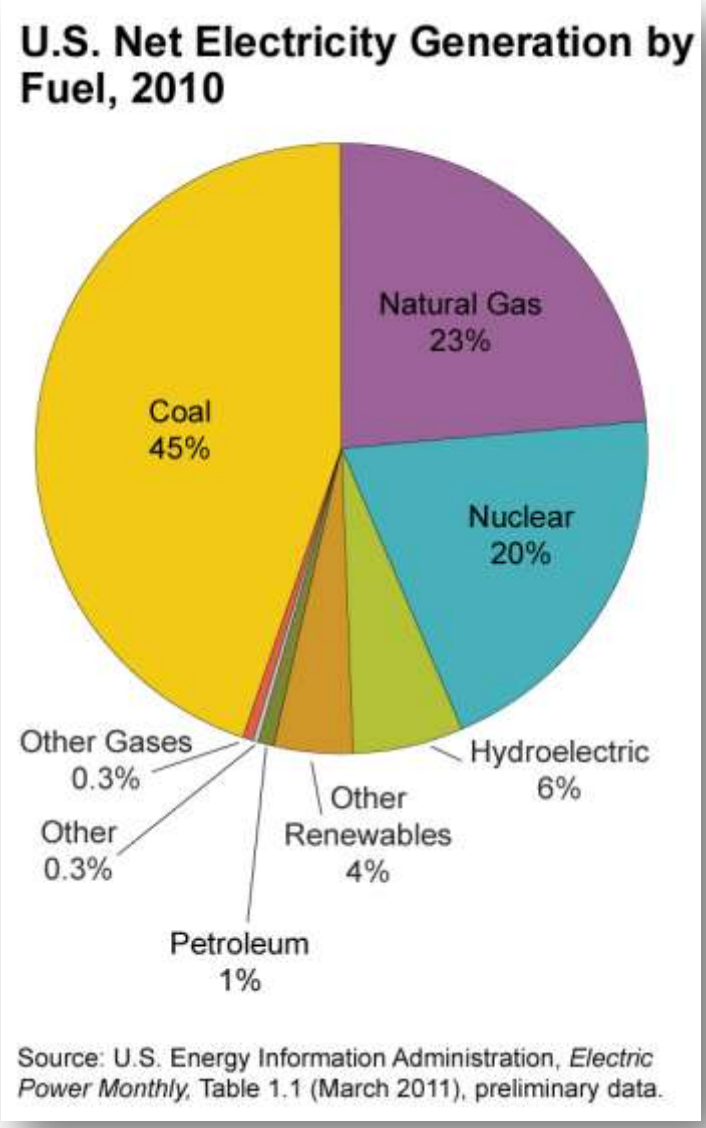


Figure 2 - Pie Chart showing Electricity Generation in the United States by Fuel Type

Activities involved in generating electricity from coal include mining, transport to power plants, and burning of the coal in power plants. Initially, coal is extracted from surface mines or underground mines (see Types of Coal Mining below). The coal is often cleaned or washed at the coal mine in order to remove impurities before it is transported (typically by train, barge, or truck) to the

power plant. (The Processing and Transporting Coal section on page 10 describes the process in greater detail.) Power plants burn coal in order to make steam. The steam turns turbines (machines for generating rotary mechanical power) that generate electricity.

A variety of industries use coal's heat and by-products. Separated ingredients of coal (such as methanol and ethylene) are used in making plastics, tar, synthetic fibers, fertilizers, and medicines. Coal is also used to make steel. (Coal is baked in hot furnaces to make coke, which is used to smelt iron ore into iron needed for making steel. It is the very high temperatures created from the use of coke that gives steel the strength and flexibility necessary for bridges, buildings, and automobiles.)
Source: http://www.eia.gov/energyexplained/index.cfm?page=coal_home

2.1 Types of Coal

Coal is classified into four types (known as ***ranks***) according to the amount and type of carbon the coal contains, as well as the amount of heat energy the coal can produce. The rank of a deposit of coal depends upon the pressure and heat acting on the plant debris as it sank deeper over millions of years. For the most part, higher ranks of coal contain more heat-producing energy. Coal quality is measured by British thermal unit (Btu) or energy value, sulfur levels, and ash content. The content of sulfur is significant due to the sulfur dioxide (SO_2) emissions that occur during coal combustion; sulfur dioxide is an air pollutant regulated by the Environmental Protection Agency (EPA) in order to protect health and public safety.

For more information on sulfur dioxide emissions, visit:
http://www.epa.gov/air/sulfurdioxide/index.html

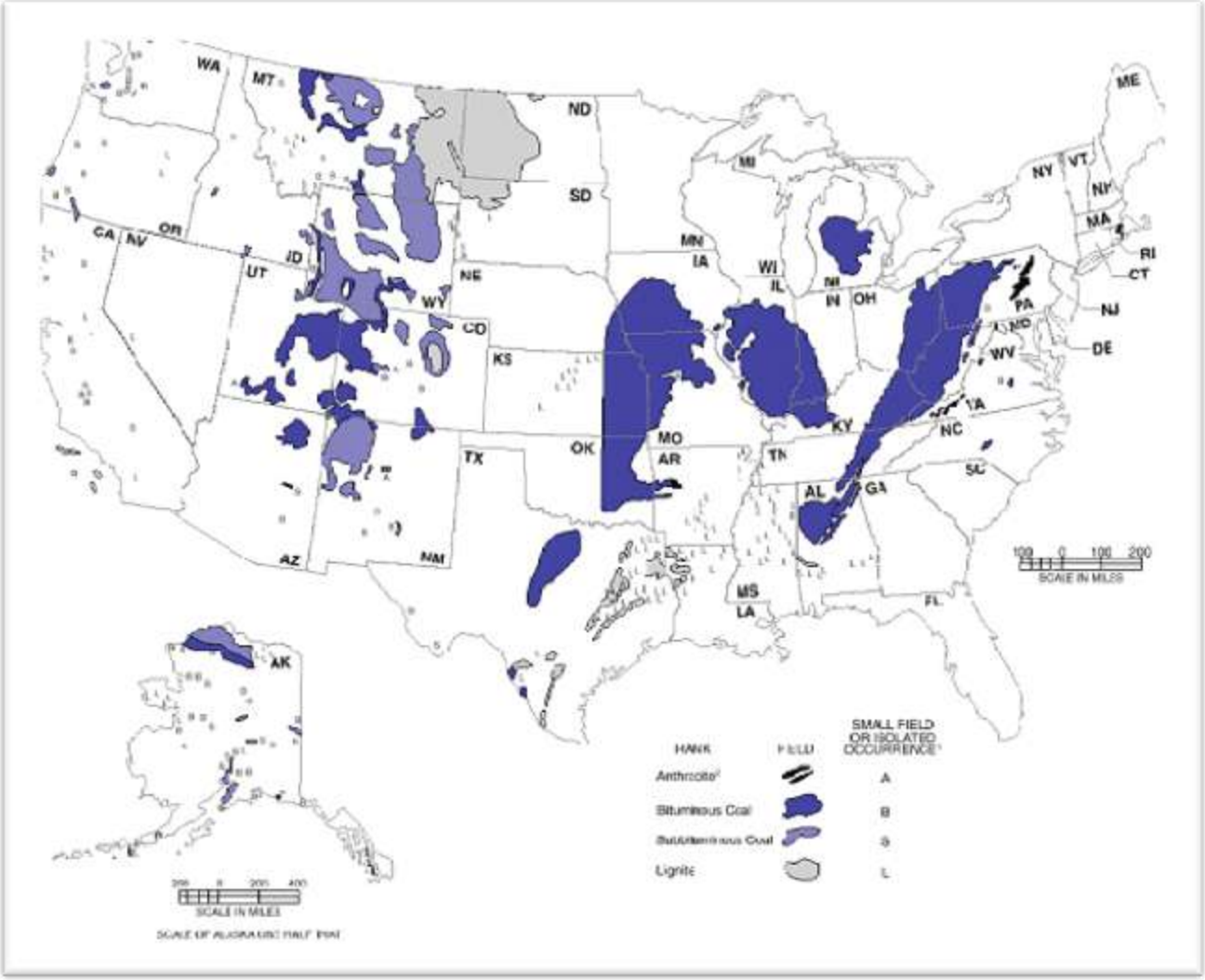
The four coal types are:

- **Anthracite** - Anthracite is the hardest coal, containing approximately 86 percent to 97 percent carbon. In general, it has a heating value slightly higher than bituminous coal. Found primarily in Appalachia and Pennsylvania, anthracite accounts for less than 0.5 percent of the coal mined in the United States.
- **Bituminous** - Sometimes called "soft coal," bituminous coal was formed under high heat and pressure and contains approximately 45 to 86 percent carbon. In the United States, bituminous coal is between 100 million and 300 million years old and is primarily found in Appalachia and the Midwest. It is the most abundant rank of coal in the nation, accounting for approximately 50 percent of U.S. coal production. In addition to being used to generate electricity, bituminous coal is an important fuel and raw material for the steel and iron industries.
- **Sub-bituminous** - Sub-bituminous coal is a dull black coal. It gives off a little more energy (heat) than lignite when burned, but has a lower heating value than bituminous coal. Generally, sub-bituminous coal contains approximately 35 to 45 percent carbon. Most sub-bituminous coal in the United States is at least 100 million years old. Approximately 46 percent of the coal produced in the U.S. is sub-bituminous. It is found primarily in Colorado, Wyoming, New Mexico, Washington, and Alaska.

- **Lignite** - The largest portion of the world's coal reserves is made up of lignite coal. Lignite, a soft brownish-black coal with high moisture content, is the lowest rank of coal with the lowest energy content. Lignite coal deposits tend to be relatively young coal deposits that were not subjected to extreme heat or pressure. Lignite contains approximately 25 percent to 35 percent carbon. It is found primarily in Texas, North Dakota, and Montana.
  Sources: http://www.eia.gov/energy explained/index.cfm?page=coal_home
  http://fossil.energy.gov/education/energylessons/coal/gen_coal.html
  http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

According to the Energy Information Administration, the U.S. has enormous ***coal resources*** (naturally occurring concentrations or deposits of coal in the Earth's crust in forms and amounts that make economic extraction currently or potentially feasible) and ***recoverable reserves*** (coal that is or can be extracted from a coalbed during mining). America's estimated recoverable reserves of coal stand at 275 billion tons (an amount greater than any other nation in the world) and are capable of meeting domestic demand for more than 250 years at the current rate of consumption.
Source: http://www.eia.gov/energyexplained/index.cfm?page=coal_home

Bituminous coal accounts for over half (approximately 53 percent) of the U.S. Demonstrated Reserve Base, referred to by the United States Geological Service (USGS) as reserve base. (See Figure 1-3, U.S. Demonstrated Coal Reserve Base). The Energy Information Administration defines the reserve base as those parts of identified coal resources that meet specified minimum physical and chemical criteria related to current mining and production practices (including those for quality, depth, thickness, rank, and distance from points of measurement). The reserve base is the in-place demonstrated resource from which reserves are estimated. The resource base may include portions that have a reasonable potential for becoming economically recoverable within planning horizons that extend beyond those that assume proven technology and current economics.
Sources: http://www.clean-energy.us/facts/coal/coal_bearing_map.htm
http://www.eia.gov/energyexplained/index.cfm?page=coal_home



Source: U.S. Energy Information Administration

Figure 3 - U.S. Demonstrated Reserve Base

2.2 Types of Coal Mining

Approximately two-thirds of U.S. coal comes from surface mines, while the remaining one-third of coal comes from underground mines.
Source: http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

Surface Mining

Surface mining, also called open-pit or strip mining, entails blasting rock above the coal with explosives. This ***overburden*** (consisting of all of the soil and other materials above the bedrock horizon in a given area) is then removed with huge electric shovels and draglines (in larger mines) or with bulldozers and front-end loaders (in smaller mines) in order to reveal the coal seam. (A dragline casts a wire rope-hung bucket a considerable distance; collects the dug material by pulling the bucket toward itself on the ground with a second wire rope or chain; elevates the bucket; and dumps the material on a spoil bank, in a hopper, or on a pile.) The ratio of overburden excavated

to the amount of coal removed is called the "overburden ratio." The lower the overburden ratio, the more productive the mine is considered. Surface mining can be used when the coal is buried less than 200 feet underground.

Sources: http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf
http://www.umwa.org/?q=content/surface-coal-mining
http://www.eia.gov/energyexplained/index.cfm?page=coal_home

The coal seam in a surface mine is worked in long cuts by uncovering and removing coal, then backfilling and reclaiming land in sequence. Basically, as coal extraction is occurring, reclamation work is also occurring in an adjacent area previously mined. There are several types of surface coal mines:

- **Area Surface Mines** - Area surface mines (typically found in flat terrain) consist of a series of cuts of 100 feet to 200 feet wide. The overburden from one cut is used in order to fill in the mined-out area of the preceding cut.
- **Contour Mines** - Contour mines (typically found in mountainous terrain) follow a coal seam along the side of the hill.
- **Open Pit Mines** - Open pit mines (typically found where coal seams are thick) can reach depths of several hundred feet.

Underground Mining

In general, the type of underground mine depends upon such variables as the depth of the coal seam and the surrounding terrain. There are three major types of underground mines:

- **Drift Mines** - Drift mines have horizontal "entries" into the coal seam from a hillside.
- **Slope Mines** - Slope mines (which are, typically, not very deep) are inclined from the surface to the coal seam.
- **Shaft Mines** - Shaft mines (which are, typically, the deepest type of mines) have vertical access to the coal seam via elevators that carry workers and equipment into the mine.

Most underground mines are less than 1,000 feet deep; however, some mines may reach depths of almost 2,000 feet.

Sources: http://www.eia.gov/energyexplained/index.cfm?page=coal_home
http://www.umwa.org/?q=content/types-underground-coal-mines

There are two major types of underground mining: room-and-pillar mining and longwall mining. Both methods are well-suited to extracting the relatively flat coal beds (or seams) typical of the United States.

Room-and-Pillar Mining

In room-and-pillar mining, "rooms" are cut into the coalbed leaving a series of "pillars" (or columns) of coal in place in order to help support the mine roof and to control the flow of air. The rooms are typically 20 to 30 feet wide, while the pillars are up to 100 feet wide. As mining advances, a grid-like pattern of rooms and pillars is formed. Bolts up to 8-feet long are driven into the roof in order to keep the rock above the coal seam from collapsing.

As mining progresses toward the end of a panel, ***retreat mining*** begins (where as much coal as possible is mined from the remaining pillars until the roof collapses). When retreat mining is completed, the mined area is abandoned. Room-and-pillar mining is typically limited to depths of approximately 1,000 feet, because the large pillars necessary at greater depths would result in smaller coal recovery.

Sources: http://www.eia.gov/energyexplained/index.cfm?page=coal_home
http://mining.state.co.us/pdfFiles/SubsidenceOverview.pdf
http://www.umwa.org/?q=content/types-underground-coal-mines

There are two major types of room-and-pillar mining:

- **Conventional** - Conventional mining is the oldest method of underground mining. In conventional mining, the coal seam is cut, drilled, blasted, and then loaded into cars. In this method, production occurs in five steps: 1) mechanical undercutting of the coalbed; 2) drilling holes into the bed for explosives; 3) blasting the coal; 4) loading the broken coal into shuttle cars for delivery to a conveyor; and 5) bolting the mine roof in the excavated area.
- **Continuous** - Continuous mining is the most prevalent method of underground mining. In continuous mining, a machine known as a "continuous miner" cuts the coal from the mining face and loads it onto a conveyor or shuttle car in a single step. (In spite of the term "continuous," the machine is withdrawn from the face after mining advances approximately 20 feet in order for roof bolts to be installed to prevent caving.)

Longwall Mining

In longwall mining, a coalbed is blocked out into a panel averaging approximately 800 feet in width, 7,000 feet in length, and 7 feet in height, by excavating passageways around its perimeter. Basically, a panel of coal in the form of a large continuous room is removed, leaving the roof unsupported (except along the face of coal being mined) as a cutting head moves back-and-forth across the panel. The coal then falls onto a flexible conveyor for removal. A panel of this size may contain more than one million short tons of coal, most of which is recovered. In the extraction process, numerous pillars of coal are left untouched in certain parts of the mine in order to support the overlying strata. The mined-out area is then allowed to collapse.

In this type of mining, extraction is an almost continuous operation involving the use of self-advancing hydraulic roof supports known as ***shields***, a coal-shearing machine, and an armored conveyor that runs parallel to the coal face. A shield consists of a canopy, a caving shield that prevents rock fragments from getting into the working area, and two to four hydraulically operated legs set on a base capable of supporting 600 to 800 tons of rock and providing 10 to 15 feet of space for employees and equipment to work. More than 100 shields, set side by side, are required for a single longwall panel. As the coal is removed and the face advances, a system of controls and hydraulic cylinders snake the shields and the conveyor forward. The roof of a mined-out section is then allowed to collapse behind the shields, forming loose mining waste known as ***gob***.

Operating under the movable roof supports, the shearing machine rides along the conveyor as it cuts and drops coal onto the conveyor for transport out of the mine. When the shearer has traveled the full length of the coal face, it reverses direction (without turning) and travels back along

the face, taking the next cut. As the shearer passes each roof support, the support is moved closer to the newly cut face. The steel canopies of the roof supports protect the workers and the equipment located along the face as the roof collapses when the supports are advanced. Extraction continues until the entire panel of coal is removed.

Initially, the development of a panel of coal for longwall mining involves the use of continuous mining machines in order to dig entries, or passageways, on three sides of a panel, starting from the main entries of the mine. Generally, development work requires nine months to one year (depending upon the size of the panel). Only a small amount of coal is produced at this stage because the entries are excavated following the room-and-pillar technique.

In coal mines using the longwall mining method, a set of entries called ***panel entries*** (or gate entries) on each side of the panel of coal to be mined, are driven from the main mine entries to the end of the panel. [The Federal Coal Mine Health and Safety Act of 1969 requires that mine entries consist of at least three parallel passageways (3-entry systems), so that if one passageway becomes blocked, the others offer a means of escape, as well as an airway for mine ventilation. However, the Act allows a mining company to use two passageways (2-entry systems) if the safety of its Mining Plan is approved by the U.S. Mine Safety and Health Administration (MSHA). In several western coal mines, 2-entry systems have been approved for use because they provide better ground stability (Source: USDI Bureau of Mines 1994).] The panel entries are then connected at the back of the panel by another set of entries. Each entry is approximately 20 feet wide and 6 feet high.

Entries are connected at regular intervals by crosscuts. These crosscuts are dug in order to allow the passage of workers and equipment between adjacent entries. Entries next to the panel that are used in order to move employees, supplies, and equipment are "headgate" entries (or "head entry"). On the opposite side of the panel are the "tailgate" entries ("tail entry"), which are used mainly as airways for ventilating the mine. Due to the parallel layout of longwall panels, the headgate entries become the tailgate entries of the next panel to be mined. The entries at the back of the panel (where extraction begins) are "bleeder entries," which provide continuity in the mine ventilation system.

Within the entries are unmined parts of the coalbed called "chain pillars" that are left in order to support the overlying strata. They measure approximately 20 to 150 feet in width and approximately 40 to 200 feet in length (depending upon mining conditions). Additional support is provided by roof bolting. In addition to the chain pillars in the entries, large "barrier pillars" (which are approximately 200 to 500 feet on a side) are left at both ends of the panel in order to provide roof support as well as to separate unmined and mined-out panels. A "setup room" is excavated next to the barrier pillar at the rear of the panel in order to provide space for assembling the longwall equipment.

After a longwall panel has been blocked out by entries, it is mined on "retreat" (with extraction beginning from the farthest end of the panel and proceeding toward the main entries). In longwall mining, development of the entries on each side of the panel must continue simultaneously with the advance of the longwall face. Following extraction of all of the coal in a panel, a major operation

called a "longwall face move" is performed (typically requiring at least two weeks). During this time, all of the equipment is disassembled in a "recovery room" and then moved for setup at a new panel. Generally, one to two longwall panels are extracted in a mine annually.

Longwall mining is a mining technique where "subsidence" is expected. Subsidence is the "sinking" of the ground surface as a result of the removal of underground coal. Gravity, and the weight of the overlaying rock, causes the layers of rock to shift and sink downward into the void left by the removal of coal. In longwall mining, subsidence begins as coal extraction progresses. (By contrast, in room-and-pillar mining, the supporting pillars deteriorate at a later time.) The amount of subsidence depends upon such factors as the passage of time, the depth of the mining, the thickness of the coalbed extracted, the thickness and strength of the overlying rock, and any previous mining of overlying coal beds.
Sources: ftp://ftp.eia.doe.gov/coal/tr0588.pdf
http://www.umwa.org/?q= content/types-underground-coal-mines
http://mining.state.co.us/pdfFiles/Subsidence Overview.pdf (Turney 1985)

2.3 Processing and Transporting Coal

Once coal is removed, whether by surface or underground mining techniques, it is then moved out of the mine with conveyor belts or shuttle cars. After being mined, some coal goes through a cleaning facility, where it is cleaned and separated by grades. Coal cleaning is a process by which impurities such as sulfur, ash, and rock are removed from the coal in order to upgrade its value. Once cleaned and separated (if necessary), the coal is stockpiled and shipped to the customer by rail, barge, truck, or conveyor (often requiring more than one mode of transport to reach its final destination).
Source: http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

For at least part of its trip to market, approximately 71 percent of coal in the United States is transported by train. Coal can also be transported by barge, ship, truck, and even by pipeline. If for use near a coal mine, coal can be moved by trucks and conveyors. Coal can also be crushed, mixed with water, and sent through a "slurry" pipeline.
Source: http://www.eia.gov/energyexplained/index.cfm?page=coal_home

Utilities burn pulverized coal in order to produce high-pressure steam that powers an electric generator. Burned at approximately 1,400 degrees centigrade (depending upon the boiler design), pulverized coal has a higher rate of combustion than non-pulverized coal. This high heat converts water into steam within tubes lining the boiler. The high-pressure steam then passes through a turbine, causing the turbine shaft to rotate at high speed and turn an electric generator. The electricity is transformed into high voltages for long-distance transmission, then converted back to a lower, safer voltage near the point of consumption. Approximately 500 out of the 3,000 power plants in the United States burn coal.
Source: http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

3 - Management of Federal Coal Resources

In conjunction with the State in which coal is mined, various federal agencies (described below) play a major role in regulating coal mining in the United States, as well as in implementing environmental laws that impact coal resources. Several of these agencies are described below.

3.1 The BLM

The Mineral Leasing Act of 1920 (MLA) (30 USC 181 et seq.) and the Mineral Leasing Act for Acquired Lands of 1947 (MLAAL) (30 USC 351 et seq.) give the BLM responsibility for coal leasing on approximately 570 million acres of the 700 million acres of mineral estate that is owned by the federal government, where coal development is permissible.

3.2 The Surface Management Agency

A vast majority of American coal resources are associated with lands managed by the federal government. The ***surface estate*** of these lands could be managed by the BLM, or by other federal land management agencies, such as the United States Forest Service (USFS), the National Park Service, the U.S. Fish and Wildlife Service (USFWS), or by other federal agencies. They could also be managed by state agencies or even by private landowners. The surface management agency (SMA) is responsible for conducting the required level of environmental analysis in order to determine the potential environmental consequences (impacts) that could result from coal mining, in accordance with the National Environmental Policy Act (NEPA) (42 USC 4321 et seq.), as well as other applicable laws, rules, regulations, policies, standards, and guidelines.

Split-Estate Management

The Mineral Leasing Act of 1920 (MLA) (30 USC 181 et seq.) and the Mineral Leasing Act for Acquired Lands of 1947 (MLAAL) (30 USC 351 et seq.) give the BLM responsibility for coal leasing on approximately 570 million acres of the 700 million acres of mineral estate that is owned by the federal government, where coal development is permissible. When the surface estate of these lands is in private ownership, this is referred to as "split estate." In this case, the BLM is responsible for conducting environmental analysis for the leasing decision. (See The BLM and Coal Leasing below.) When an SMA other than the BLM manages the surface, that SMA is responsible for conducting analysis for the affected surface environment, including resources (such as vegetation, wildlife, wetlands, riparian areas, and cultural resources) and resource uses (such as recreation, transportation, and travel management). The SMA uses that analysis to make a decision regarding "consent" pertaining to BLM leasing decisions.

3.3 The Office of Surface Mining Reclamation and Enforcement

The Office of Surface Mining Reclamation and Enforcement (OSM), an agency within the U.S. Department of the Interior (DOI), was created in 1977 with the passage of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 USC 1201 et seq.). The SMCRA, as amended, gives the OSM primary responsibility for administering programs that regulate surface coal mining

operations and the surface impacts of underground coal mining operations in the United States. The SMCRA requires state or federal permits for surface mines and for the surface operations of underground mines, as well as a process for determining areas not suitable for coal mining. In accordance with the SMCRA, the OSM works to balance the need to protect the environment from the adverse impacts resulting from surface coal mining with the nation's need for coal as an essential energy source. The OSM also works to ensure that coal mining operations are conducted in an environmentally responsible manner and that the land is adequately reclaimed during, and following, the mining process. Most coal-mining states now have the primary responsibility to regulate surface coal mining on lands within their jurisdiction, with the OSM performing an oversight role. The OSM also partners with states and Native American tribes in order to regulate mining on federal lands and to support state regulatory programs with grants and technical assistance.

Sources: http://www.osmre.gov/rcm/rcm.shtm
http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

3.4 The Mine Safety and Health Administration/Coal Mine Safety and Health

The Mine Health and Safety Administration (MSHA) is the primary regulatory agency within the U.S. Department of Labor under the Federal Mine Safety and Health Act of 1977 (the Mine Act) (30 USC 801 et seq.). The Mine Act amended the 1969 Coal Act and consolidated all federal health and safety regulations of the mining industry into a single statutory system. The Mine Act transferred responsibilities from the Department of the Interior to the Department of Labor and established MSHA. The Mine Act also established an independent Federal Mine Safety and Health Review Commission in order to review MSHA's enforcement actions. The 1977 Mine Safety and Health Act included provisions of the 1969 Coal Act that prescribed mandatory health and safety standards and provided Black Lung benefits. MSHA's purpose is to "prevent death, disease, and injury from mining and to promote safe and healthful workplaces for the Nation's miners." In 2006, the Mine Improvement and New Emergency Response Act (MINER) (30 USC 801 et seq.) amended Section 316 of the Mine Act in order to improve safety and health in mines through improved accident preparedness.

Sources: http://www.msha.gov/About MSHA.HTM
http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf

Coal Mine Safety and Health is responsible for enforcing the Mine Act at all coal mines in the United States. This includes conducting inspections (including four annual inspections of underground coal mines and two annual inspections of surface coal mines); investigating fatal and serious non-fatal accidents; issuing citations and orders for any observed violations; and conducting safety and health conferences with mine operators on citations and orders that are issued. For each violation cited, operators may be assessed civil money penalties. In addition, Coal Mine Safety and Health approves roof control, ventilation, and training plans required to be submitted by mine operators; directs various mine safety and health assistance programs; and trains and certifies instructors. If coal mine inspectors find violations or other conditions that pose an immediate threat to the miners' safety or

health, they have the authority to issue a withdrawal order for the affected area, remove the related equipment from service, and have the miners withdrawn until the conditions are corrected.
Source: http://www.msha.gov/PROGRAMS/COAL.HTM

3.5 The Environmental Protection Agency

The Environmental Protection Agency (EPA) administers the Clean Air Act of 1990 (CAA) (42 USC 7401, 7642), the Clean Water Act of 1987 (33 USC 1251), the Resource Conservation and Recovery Act of 1976 (RCRA) (42 USC 6901-6992), and other major environmental laws that affect coal production and use.

Under the CAA, the EPA sets and enforces performance standards for large new or modified stationary sources (such as power plants) in order to ensure air quality standards. When coal is burned, carbon dioxide, sulfur dioxide, nitrogen oxides, and mercury compounds are released. For that reason, coal-fired boilers are required to have control devices in order to reduce the amount of emissions that are released. According to the EPA, the average emission rates in the U.S. resulting from coal-fired generation are: 2,249 pounds (lbs)/megawatt hour (MWh) of carbon dioxide, 13 lbs/MWh of sulfur dioxide, and 6 lbs/MWh of nitrogen oxides (USEPA 2000). Mining, cleaning, and transporting coal to the power plant generate additional emissions. Methane, for example, a potent greenhouse gas that is trapped in the coal, is often vented during these processes in order to increase safety.
Source: http://www.epa.gov/cleanenergy/energy-and-you/ affect/coal.html

Under the Clean Water Act, each State must develop and implement a comprehensive Water Quality Management Plan, subject to approval of the EPA. This is required due to the fact that large quantities of water are often needed in order to remove impurities from the coal. In addition, coal-fired power plants use large quantities of water for producing steam and for cooling. When coal-fired power plants remove water from a lake or river, fish and other aquatic life can be affected, as well as animals and people who depend upon these aquatic resources. In addition, pollutants can build up in the water used in the power plant boiler and cooling system. If the water used in the power plant is discharged to a lake or river, the pollutants in the water can harm fish and plants. Further, if rain falls on coal stored in piles outside the power plant, the water that runs off these piles can flush heavy metals from the coal (such as arsenic and lead) into nearby bodies of water. Coal mining can also contaminate bodies of water with heavy metals when the water used to clean the coal is discharged back into the environment. Generally, this discharge requires a permit and is monitored. For more information about these EPA water-related regulations, visit the EPA's Office of Water website at: http://water.epa.gov/
Source: http://www. epa.gov/cleanenergy/energy-and-you/affect/coal.html

The RCRA is the nation's primary law governing the disposal of solid and hazardous waste. Congress passed the RCRA on October 21, 1976. The RCRA amended the Solid Waste Disposal Act of 1965, setting national goals for protecting human health and the environment from the potential hazards of waste disposal; conserving energy and natural resources; reducing the amount of waste generated; and ensuring that wastes are managed in an environmentally sound manner.

Source: http://www.policy archive.org/handle/10207/bitstreams/1666.pdf

3.6 The U.S. Army Corps of Engineers

Federal laws require government approval prior to beginning any work in, or over, waters of the United States that affects the course, location, condition, or capacity of such waters, or prior to discharging dredged or fill material into U.S. waters. Regulatory programs that implement these laws are administered through permits issued by the U.S. Army Corps of Engineers (USACE), which shares responsibility with the EPA, under the authority of the Clean Water Act, the Rivers and Harbors Act of 1899 (R&HA) (33 USC 401-403), and the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) (33 USC 1401-1445).

The USACE's regulatory process involves 2 types of permits: general permits for actions by private landowners that are similar in nature and will likely result in a minor impact to wetlands, and individual permits (IP) for more significant action. A nationwide permit (NWP) is a form of general permit that authorizes a category of activities throughout the nation which, and is valid only if the conditions applicable to the permit are met. (For example, NWP 50 authorizes a number of different activities associated with underground coal mining, such as excavating rock and soil on the surface in order to expose coal seams; providing road access for people and equipment to a site; and constructing acid mine drainage impoundments or sedimentation ponds.) These permits are issued under authority of Section 404(e) of the Clean Water Act and Section 10 of the R&HA. Under Section 404, permits are required for discharges of dredged or fill material into waters of the United States. Under Section 10, permits are required for any structures or other work that affect the course, location, or condition of navigable waters of the United States.
Source: http://assets.opencrs.com/rpts/97-223_20080821.pdf

3.7 The U.S. Geological Survey

The U.S. Geological Survey (USGS) conducts coal resource assessments throughout the United States. The USGS Energy Resources Program (ERP) conducts basic and applied research on geologic energy resources and on the environmental, economic, and human health impacts of their production and use. The ERP provides reliable and impartial scientific information on geologically based energy resources, including coal and coalbed methane (CBM). The results of USGS research and USGS data are used to inform policymakers regarding domestic and foreign energy resources, and to manage energy resources on Federal lands.
Sources: http://www.policyarchive.org/handle/10207/bitstreams/1666.pdf
http://energy.usgs.gov/GeneralInfo/AbouttheEnergy Program.aspx

3.8 Colorado Division of Reclamation Mining and Safety

The Colorado Division of Reclamation Mining and Safety (DRMS) is responsible for mineral and energy development, policy, regulation, and planning. The division is comprised of the Office of Mined Land Reclamation and the Office of Active and Inactive Mines. The Office of Mined Land Reclamation issues reclamation permits from either the Minerals Program or the Coal Program.

Together, these two programs regulate mining and reclamation activities at coal, metal, aggregate and other minerals mines. Their primary objective is to review mining and reclamation permit applications and to inspect mining operations in order to ensure that reclamation plans are being followed. The Office of Active and Inactive Mines reclaims and safeguards abandoned mine sites that are dangerous and create environmental hazards. The program also provides safety training for mine operators and employees.
Source: http://mining.state.co.us/About%20DMG.htm

Pursuant to Section 503 of the SMCRA, the DRMS developed (and the Secretary of the Interior approved) Colorado's permanent regulatory program authorizing DRMS to regulate surface coal mining operations and the surface impacts of underground coal mining on private and state lands within the State of Colorado. In September of 1982, under Section 523(c) of the SMCRA, the DRMS entered into a Cooperative Agreement with the Secretary of the Interior. The Cooperative Agreement authorized the DRMS to regulate surface coal mining operations, and the surface impacts associated with underground coal mining on Federal lands within the state. Based upon the Cooperative Agreement, federal coal lease holders in Colorado must submit a permit application package to the OSM and to the DRMS for proposed mining and reclamation operations on federal lands in Colorado.

The DRMS reviews a package in order to ensure that the permit application complies with permitting requirements, and that the coal mining operation will meet the approved permanent program's performance standards. If an action complies, the DRMS issues the applicant a permit to conduct coal mining operations. At that time, the OSM, the BLM, and the USFS (and all other federal agencies with jurisdictional requirements) review the permit application package in order to ensure that it contains the necessary information for compliance with all applicable laws, rules, regulations, policies, standards, and guidelines. Prior to the approval of a Mining Plan of Operation, the OSM consults with the BLM and, if applicable, the SMA (such as the USFS). The OSM then recommends the approval, approval with conditions, or disapproval of the Mining Plan of Operation to the Assistant Secretary of the Interior, Land and Minerals Management. The DRMS enforces the performance standards and permit requirements during the mine's operation, and has the primary authority in environmental emergencies. The OSM retains oversight responsibility for this enforcement. The BLM and, if applicable, the SMA (such as the USFS) have the authority in emergency situations in which DRMS or OSM Inspectors cannot act before environmental harm or damage occurs.

4 - The BLM and Coal Leasing

4.1 Background and Overview

Until the early 1900s, federal land and mineral policy was to dispose of the public domain lands "fee simple." That is, in accordance with the Mining Law of 1872, the lands were patented to private parties and included all mineral interest. However, several retention statutes enacted in the

homesteading era of the 1900s and 1910s required that coal (and, later, other minerals) be retained by the U.S. when the public domain was patented.

Prior to 1920, in accordance with the Coal Lands Act of 1873, federal lands with coal resources were sold. Individuals could purchase up to 160 acres, and an "association" could purchase up to 320 acres. In 1920, the MLA was enacted. As a result, coal was no longer subject to mineral location (mining claims). Coal became a leased commodity, with development conducted by a Federal coal lessee in compliance with the terms and conditions of the lease. The enactment of the MLA changed the policy from selling lands with coal resources to a policy of leasing rights to explore, develop, and remove coal and other fuel minerals. The MLA authorizes the Secretary of the Interior to lease virtually all onshore lands owned by the United States that contain fossil fuel deposits, with the federal government retaining title to the lands. The BLM is the agency tasked with leasing these subsurface mineral rights in relation to BLM-managed public lands as well as lands controlled by other federal agencies, including National Forest System Lands managed by the USFS.

Under the MLA, coal was leased both competitively and non-competitively. Competitive leasing occurred in areas identified as "known coal leasing areas" (KCLAs) based upon knowledge that minable coal was present within these areas. Non-competitive leasing was allowed outside KCLAs, based upon a party obtaining a prospecting permit. Through prospecting activities, the party then established a "preference right" to a lease by proving that the lease area contained coal in commercial quantities. (Commercial quantities are defined as being equal to the production of 1 percent of the recoverable coal reserve.)

From 1920 to 1970, Federal coal was leased "upon demand." That is, wherever and whenever a lease sale or permit was requested. At the time, there was no program to enforce the MLA requirement for diligent development. In 1970, a report issued by the BLM stated that from 1945 to 1970 there was a ten-fold increase in coal leases; however, there was a 75 percent decrease in production. This was taken as evidence of speculation in holding coal leases. As a result, in 1971, a coal leasing moratorium was declared and Congressional hearings began regarding amending the MLA to include provisions limiting the holding of coal leases without production.

During the time that Congress was debating the issue, the BLM introduced a new leasing program: the Energy Minerals Activity Recommendation System (EMARS). The program was short-lived, however, due to both Congressional action as well as to numerous law suits. In 1976 and 1977, several new laws and two Supreme Court decisions (*Sierra Club v. Kleppe* and *NRDC v. Hughes)* mandated a new coal leasing program. In addition, the National Energy Plan was established in 1977, calling for correction of the imbalance between leased coal reserves and coal production. The news laws requiring a new focus in relation to America's coal leasing program included the Federal Coal Leasing Amendment Act, the Federal Land Policy and Management Act, and the Surface Mining Control and Reclamation Act, described below.

The Federal Coal Leasing Amendment Act

In 1976, the Federal Coal Leasing Amendment Act (FCLAA) (30 USC 181 et seq.) amended the MLA. The FCLAA eliminated new non-competitive coal leasing on the basis that it did not provide the public a "fair return." The FCLAA required:

- **Diligent Development -** Commercial quantities of coal must be produced with 10 years after lease issuance.
- **Continued Operations -** Production of commercial quantities of coal was required each year on coal leases.
- **Fair Market Value (FMV) -** The BLM must receive FMV for use of the public's resources. [Prior to a lease sale, the BLM must prepare an estimate of the FMV of the coal lease. The estimate is prepared in accordance with standard appraisal methods and is strictly confidential. This term is defined as the amount of cash, or on terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable owner who is willing, but not obligated, to sell to a knowledgeable purchaser who desires, but is not obligated, to buy. FMV is the sum of future royalties plus a bonus paid at the time of lease issuance. As royalty rates are fixed in terms of the lease, success in a competitive lease sale is contingent on a bonus bid. The BLM must accept the highest bid submitted at a competitive lease sale that meets or exceeds BLM's estimate of FMV.]
- **Maximum Economic Recovery (MER) -** Under the supervision of the BLM, an operator must extract all profitable portions of the coal reserve (within their existing mining capabilities or reasonably prospective mining capabilities). [MER is attained when an operator has mined any portion of a coal reserve where actual revenues from the sale of coal produced will meet or exceed the actual direct costs of mining the coal reserve. Profitability can be determined on an incremental basis. MER determinations can consider, but are not limited to, commercially available and economically feasible equipment and technology; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws, rules, regulations, policies, standards, and guidelines. The requirement of MER does not restrict the authority of the BLM to ensure the conservation of coal reserves and other resources and to prevent the wasting of coal.]

The Federal Land Policy and Management Act

In 1976, the Federal Land Policy and Management Act (FLPMA) (43 USC 1701 et seq.) was passed by Congress. FLPMA was a comprehensive "Organic Act" mandating that the BLM (which had previously operated under numerous and often conflicting orders and guidelines) manage public lands and associated resources, as well as the mineral estate underlying other public and private surface, within a framework of land use planning. The BLM was required to manage lands in a "multiple-use" and "sustained-yield" manner in relation to all resources. FLPMA guaranteed public participation in the planning process; a process that considered present as well as future uses of American public lands. FLPMA also reinforced the BLM's environmental analysis obligations and processes under NEPA (passed in 1969).

The Surface Mining Control and Reclamation Act

In 1977, the Surface Mining Control and Reclamation Act (SMCRA) (30 USC 1201-1328) was passed by Congress. The SMCRA established standards for permitting surface coal mining on Federal leases, and certain criteria for determining lands unsuitable for coal mining operations. The SMCRA created the OSM in order to establish, and oversee, programs for regulating active coal

mines on Federal and State lands as well as for the reclamation of abandoned mine lands. The regulation of active mines was intended to prevent environmental degradation resulting from coal mining; and includes environmental performance standards, permit requirements, reclamation bond requirements, inspection and enforcement authority, and restrictions on mining on certain lands. The reclamation program consists of an Abandoned Mine Land Reclamation Fund designed to pay for the clean-up of abandoned mine sites through both State and federal programs and to address issues associated with landslides, land subsidence, and fires associated with coal mining.

Title 43 Code of Federal Regulations, Part 3400 - Coal Management

In line with the new laws and programs, as well as with several court cases, the Federal Coal Management Program was adopted in 1979. It adopted the 43 Code of Federal Regulations (CFR) 3400 regulations, which now guide the BLM's coal program. The coal program regulations provided for a process of addressing coal in land use planning; established coal regions and regional leasing; required closing pending non-competitive leasing cases; and established requirements for sales procedures, diligence, maximum economic recovery (MER), regional coal teams, and public participation.

Sources:

http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/history.print.html

http://www.fas.org/ota/reports/8103.pdf

http://www.fas.org/sgp/crs/misc/R40806.pdf

4.2 Coal Leasing Regulations

In accordance with the applicable laws, rules, regulations, policies, standards, and guidelines, as well as 43 CFR 3400 regulations, mineral production on public lands involves three distinct categories:

- **Locatable** - Locatable mineral production involves minerals like gold and silver. Under the general mining laws, such as the Mining Law of 1872, miners "locate" claims in order to acquire mineral rights.
- **Leasable** - Leasable mineral production involves coal, oil and gas, geothermal, sodium, and other similar minerals. Leases are issued for specific periods of time, and the lessee pays a rental fee and royalties on the minerals produced.
- **Salable** - Salable mineral production involves common sand, gravel, and other construction and landscaping materials. These materials are available through material sales at FMV or through free use permits issued to government agencies and non-profit organizations.

Leasables - Coal and Competitive Leasing

The FCLAA, which amended Section 2 of the MLA, requires that all public lands available for coal leasing be leased competitively. There are two notable exceptions to this requirement:

- Preference right lease applications, where a lease may be issued on a non-competitive basis to owners of pre-FCLAA prospecting permits
- Modifications of existing leases, where contiguous lands of as much as 960 acres are added non-competitively to an existing lease.

Lands Available for Coal Leasing

Public lands are available for coal leasing only after the lands have been evaluated through the BLM's multiple-use and sustained-yield planning process, in accordance with FLPMA. In areas where development of coal resources may conflict with the protection and management of other resources, or with public land uses, the BLM may identify mitigating measures that may appear on leases as either stipulations to uses or restrictions on operations. {NOTE: *Lease* means a federal lease, issued under the coal leasing provisions of the MLA and the MLAAL, which grants the exclusive right to explore for and extract coal. In provisions of this group that also refer to Federal leases for minerals other than coal, the term *federal coal lease* may apply [43 CFR 3400.0-5(r)(y)].}

Lands Suitable for Coal Leasing

Not all public lands are available for coal exploration or leasing. There is a rigorous land use planning process through which all public lands are reviewed for potential coal leasing. There are four specific land use screening steps related to coal leasing:

1. identification of coal with potential for development
2. determination as to whether the lands are unsuitable for coal development
3. consideration of multiple use and sustained-yield conflicts
4. surface-owner consultation (43 CFR 3420.1-4)

The BLM may issue coal leases on all federal lands, with the following exceptions:

- Lands in:
    - the National Park System
    - the National Wildlife Refuge System
    - the National Wilderness Preservation System
    - the National System of Trails
    - the National Wild and Scenic Rivers System, including study rivers designated under Section 5(a) of the Wild and Scenic Rivers Act
    - incorporated cities, towns, and villages
    - the Naval Petroleum Reserves, the National Petroleum Reserve in Alaska, and oil shale reserves
    - National Recreation Areas designated by law
- Tide lands or submerged coastal lands within the continental shelf adjacent or littoral to any part of land within the jurisdiction of the United States
- Land acquired by the United States for the development of mineral deposits, by foreclosure or otherwise for resale, or reported as surplus property pursuant to the provisions of the Surplus Property Act of 1944 (50 USC App. 1622).

Competitive Coal Leasing Process

There are two distinct procedures for competitive coal leasing:

1. **Regional leasing** - The BLM selects tracts within a region for competitive sale; Regional coal leasing requires the BLM to select potential coal leasing tracts based upon multiple-land use and sustained-yield planning, expected coal demand, and potential environmental and economic impacts. However, due to the fact that demand for new coal leasing in recent years has been

associated with the extension of existing mining operations on authorized federal coal leases, all current leasing is done by application.

2. **Leasing by application** - The public nominates a particular tract of coal for competitive sale. Leasing by application begins with BLM review of an application to lease a coal tract in order to ensure that it conforms to existing resource management plans (RMPs) for the area, and contains sufficient geologic data to determine the FMV of the coal. Upon review of the application and consideration of public comments, the BLM will reject, modify, or continue to process the application.

NOTE: ***Fair market value*** is defined as "that amount in cash, or on terms reasonably equivalent to cash, for which in all probability the coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease." [43 CFR 3400.0-5(n)]

Once the BLM accepts an application, the agency begins either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) in accordance with NEPA. When a Draft EA or a Draft EIS has been prepared, the BLM seeks public comment on the proposed lease sale. At the same time, the BLM must consult with appropriate local, State, Native American Tribal, and other federal agencies.

Lease Terms and Conditions for Coal

A federal coal lease grants the right to explore for, extract, remove, and dispose of some or all of the coal deposits that may be found on the leased lands. Coal leases are granted on the condition that the lessee will obtain the appropriate permits and licenses from the BLM, the OSM, and any affected local and State governments (as required by the SMCRA). {NOTE: *Coal deposits* mean all federally owned coal deposits, except those held in trust for Native Americans [43 CFR 3400.0-5(g)].}

Length of Coal Lease

While a federal coal lease has an initial term of 20 years, it may be terminated in as few as ten years if the coal resources are not diligently developed. A federal coal lease can also terminate if a lessee fails to pay any of the deferred bonus bid payments. In addition, if the lessee fails to comply with the provisions of the MLA or fails to comply with any applicable regulations, lease terms, or stipulations, the BLM may take legal steps to cancel the lease.

Coal Leasing Decisions

The BLM addresses four types of coal decisions:

- lands suitable and available for leasing allocation decisions (as addressed in a RMP)
- lease by application
- lease modification (see below)
- lease adjustment

Decisions related to coal lease modifications are subject to the appropriate level of environmental analysis; generally, in the form of an EA initially (depending upon the scope of the modification and

the level of impacts associated with the Proposed Action). Coal lease modification regulations are discussed below.

Coal Lease Modification Regulations

In accordance with 43 CFR 3432.1(a), a lessee may apply for a modification of a lease in order to include coal lands or coal deposits contiguous to those embraced in a lease. Originally, CFR 3432.1(a) stated that "In no event shall the acreage in the application, when combined with the total area added by all modifications made after August 4, 1976, exceed 160 acres or the number of acres in the original lease, whichever is less." However, the Energy Policy Act of 2005 (EPA) (42 USC 16501) increased the limitation for lease modifications from 160 acres to 960 acres.

The lessee must file the application for modification in the BLM State Office having jurisdiction over the lands involved. The application must describe:

- the additional lands desired
- the lessee's needs or reasons for such modification
- the reasons why the modification would be to the advantage of the United States [43 CFR 3432.1(b)]

The BLM may modify the lease in order to include all or part of the lands applied for *if* it is determined that:

- the modification serves the interests of the United States
- there is no competitive interest in the lands or deposits
- the additional lands or deposits cannot be developed as part of another potential or existing independent operation [43 CFR 3432.2(a)]

Coal deposits underlying land the surface of which is held by a qualified surface owner, and which would be mined by other than underground mining techniques, may not be added to a lease by modification [43 CFR 3432.2(b)]. The lands applied for shall be added to the existing lease without competitive bidding; however, the United States shall receive the FMV of the lease of the added lands, either by cash payment or adjustment of the royalty applicable to the lands added to the lease by the modification [43 CFR 3432.2(c)].

The terms and conditions of the original lease shall be made consistent with the laws, regulations, and lease terms applicable at the time of modification except that if the original lease was issued prior to August 4, 1976, the minimum royalty provisions of section 6 of the FCLAA shall not apply to any lands covered by the lease prior to its modification until the lease is readjusted [43 CFR 3432.2(a)].

Before a lease is modified, the lessee shall file a written acceptance of the conditions imposed in the modified lease and a written consent of the surety under the bond covering the original lease to the modification of the lease and to extension of the bond to cover the additional land [43 CFR 3432.2(b)]. Before modifying a lease, the BLM is required to prepare an EA or an EIS covering the proposed lease area in accordance with 40 CFR parts 1500 through 1508 [43 CFR 3432.2(c)].

For coal lease modification applications involving managed by the USFS, the BLM must submit the lease modification application to the Secretary of Agriculture for consent, for completion or

consideration of an EA, for the attachment of appropriate lease stipulations, and for making any other findings prerequisite to lease issuance [43 CFR 3432.2(d)]. {NOTE: *Split estate* means land in which the ownership of the surface is held by persons, including *governmental bodies other than the Federal government* and the ownership of underlying coal is, in whole or in part, reserved to the Federal government. [43 CFR 3400.0-5(kk)]. *Split estate* **does not apply** to the relationship between the USFS and BLM since ownership is entirely Federal government.} (See Table 1, Process to Modify a Federal Coal Lease Involving USFS Lands.)

Table 1 - Process to Modify a Federal Coal Lease Involving USFS Lands

Leasing Step	Entity Responsible	Reference/Authority
The coal lease application is submitted to the BLM. An application involving lands within the National Forest System (managed by the USFS) are submitted by the BLM to the Secretary of Agriculture (USDA) for: • consent • completion or consideration of an EA • the attachment of appropriate lease stipulations • for making any other findings prerequisite to lease issuance	The Proponent (Mining Company)	The FCLAA, the Energy Policy Act, 43 CFR 3432.3(d), and the National BLM/USFS Memorandum of Understanding (MOU) and Interagency Agreement for Mineral Leasing
Notification is submitted to the National Forest with jurisdiction for nominated lands.	BLM (State Office)	43 CFR 3461 and the National BLM/USFS MOU for Coordination of Activities Pursuant to the Federal Coal Program
The USFS reviews the lands in question and determines whether or not the lands applied for are unsuitable for mining	USFS (National Forest level)	The Mineral Leasing Act, the FLPMA, the FCLAA, the Energy Policy Act, 43 CFR 3432.3(d), and 40 CFR Parts 1500–1508
The USFS analyzes the potential environmental impacts of the Proposed Action and alternatives. The	USFS (National Forest level)	The Mineral Leasing Act, the FLPMA, the FCLAA, the SMCRA, the Energy Policy Act, the National Environmental

Leasing Step	Entity Responsible	Reference/Authority
USFS also determines whether or not to consent to the BLM to lease lands, and prescribes stipulations for the protection of surface resources (generally, those that apply to the parent lease).		Policy Act (NEPA), and 43 CFR 3432
The BLM considers the USFS consent, and makes a determination whether or not to modify the leases based upon the USFS environmental analysis and Decision Record.	BLM (Field Office/State Office)	43 CFR 3432
The BLM evaluates the environmental impacts of the Proposed Action in order to modify lease, and documents the decision with a Decision Record.	BLM (Field Office/State Office)	40 CFR Parts 1500 through 1508
The BLM may modify the lease in order to include all or part of the lands applied for, if the following are determined: • the modification serves the interests of the United States • there is no competitive interest in the lands or deposits • the additional lands or deposits cannot be developed as part of another potential or existing independent operation	BLM (State Office)	43 CFR 3432.2
The modified lease acreage is added to the lease.	BLM (State Office)	43 CFR 3432

Federal Land Policy Management Act

In 1976, Congress enacted the Federal Land Policy and Management Act (FLPMA) (43 USC 1701 et seq.), giving the BLM a unified legislative mandate or "Organic Act." FLPMA identifies the BLM as responsible for the balanced management of public lands and resources and their various values, so that they are considered in a manner and combination that best serves the needs of present and future generations of Americans. Management is based upon the principles of:

- **Multiple use -** the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some, or all, of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but not limited to: recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and the harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output
- **Sustained yield -** the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use (103 USC 1702).

The FLPMA also specifies that:

> *...public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.*

In short, the BLM is responsible for the balanced management of public lands and resources, and their various values, so that they are considered in a combination that will best serve the *long-term* needs of current and *future* generations of Americans. All coal leasing decisions, therefore, must meet these FLMPA requirements.

National Environmental Policy Act

When a coal leasing action is proposed (such as a request for a coal lease modification), the environmental analysis required by the National Environmental Policy Act (NEPA) of 1969 begins (42 USC 4321 et seq.). This environmental analysis process (or "NEPA process") is triggered when a proposal (known as a proposed action) has been developed by or submitted to the BLM. This proposed action may be described as a proposal for the BLM to authorize, recommend, or implement an action in order to address a specific purpose and need.

In enacting the NEPA, Congress recognized that nearly all federal activities affect the environment in some way; therefore it was mandated that federal agencies consider the potential impacts of their proposed actions on the quality of the human environment before they take action. The BLM, as well as other land management agencies, must consider how the proposed action may impact the lands and resources (such as air and atmospheric values, water quality, and wildlife and vegetation resources), the multiple-use and sustained-yield values of those lands and resources (such as those related to recreation, energy, and transportation), as well as how the proposed action may impact lands set aside for special management [such as Wilderness Study Areas (WSAs) and Areas of Critical Environmental Concern (ACECs)]. In accordance with NEPA, the BLM is required to use an interdisciplinary approach that considers how the environment may be impacted by the proposed action, as well as alternatives to the proposed action.

Congress also created the Council on Environmental Quality (CEQ), which issued Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500–1508) in 1978 (revised in 1986). The CEQ works to balance environmental, economic, and social objectives in pursuit of the goal of "productive harmony" between humans and the human environment [42 USC 4331(a)]. Current CEQ regulations are available at: http://ceq.hss.doe.gov/nepa/regs/ceq/toc_ceq.htm

The NEPA process is designed to move land management agencies, including the BLM, from proposing a federal action on public lands to implementing that federal action. NEPA and CEQ guidelines require land management agencies to follow a three-step review process:

1. Conduct a preliminary screening for NEPA's applicability.
2. If required, prepare an Environmental Assessment (EA) in order to analyze the potential environmental impacts associated with the proposed action and:
    - if it is determined that there will be no significant impacts associated with the proposed action, present the analysis in a Finding of No Significant Impact (FONSI) and document the decision in the related Decision Record (DR).
    - if it is determined that there will be significant impacts associated with the proposed action, begin the analysis for an Environmental Impact Statement (EIS).
3. If required, prepare an EIS and document the decision in the Record of Decision (ROD).

This "NEPA process is intended to help public officials make decisions that are based upon understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" [40 CFR 1500.1(c)]. Analysis and disclosure of the potential impacts of a proposed action, as well as keeping the public informed and involved, are the main underlying NEPA principles that move agencies toward achieving this goal. As a federal agency, the BLM must engage in the NEPA process (and meet NEPA requirements) whenever it is the BLM's decision that would result in an impact to the human environment, even when the impact would be beneficial, and regardless of who proposes the action or where it would take place (40 CFR 1508.18).

In accordance with the MLA and the MLAAL, the BLM is responsible for analyzing coal leasing. In addition, if the BLM is the SMA responsible for managing the surface lands and resources that may be impacted by the implementation of a coal leasing decision, they must immediately begin the NEPA process. However, when the surface estate of these lands is managed by another agency,

such as the USFS, the BLM is responsible for conducting the environmental analysis only for those aspects related to the leasing decision (such as the affected environment/environmental consequences related to air quality, climate, socioeconomics, and environmental justice). The SMA is responsible for conducting the analysis for the affected surface environment (including in relation to such resources as vegetation, wildlife, wetlands and riparian areas, and cultural resources, and to such resources uses as recreation and transportation and travel management). The SMA considers the results from their analysis to make a decision regarding "consent" for the BLM's leasing decision. (See Table 1, Process to Modify a Federal Coal Lease Involving USFS Lands.)

4.3 BLM Colorado and Coal Leasing

In Colorado, the BLM manages 36 percent of the State's 66 million surface acres and more than 41 percent of the mineral estate. Twenty-seven million acres of federal minerals are managed by the BLM in Colorado, and approximately 20,000 acres are presently occupied by active mineral operations. As of 2007, federal coal leases provide over 80 percent of the total coal produced within the State. Most of the coal reserves in Colorado are sub-bituminous [with the lowest sulfur content (less than 0.39 percent), and an average Btu of 9,900 to 13,100]. Currently, there are nine coal-producing mines (seven underground and two surface) encompassing approximately 75,000 acres in Colorado. Two-thirds of Colorado's coal production comes from underground mining operations.
Source: http://www.blm.gov/co/st/en/BLM_Programs/minerals/coal.html

North Fork Valley Coal Resources

Originally, coal was discovered along the North Fork of the Gunnison River in the late 1880s when Geologist Ira Quimby Sanborn discovered coal in the Somerset area of the upper North Fork Valley. He staked the first claims and set up a small-scale mine, supplying local blacksmiths. Eventually, numerous coal mining operations began operating among the burgeoning fruit orchards in the Somerset coal field. Some of the coal operations were small, operating only during the winter, with miners working the orchards during the summer. Other operations were large (on a relative scale for their day). Originally, most coal produced from the mines in the region was used for domestic heating in local towns and communities. Other coal production was shipped to electric utilities, cement plants, and miscellaneous industrial users (Carroll and Bauer 2002; Schultz et al. 2000).

In 1902, the Denver and Rio Grande Railroad constructed a spur from Delta to Somerset, and established the town of Somerset. Volcanic dikes, sills, and laccoliths of the Elk and West Elk intrusive complexes (to the south and southeast of the Somerset coal field) increased the rank of the bituminous coals in the southern portion of the field to coking coals, which made them very desirable for metallurgical uses (Murray et al. 1977; Schultz et al. 2000). Three commercial mines began operation as early as 1903: the Cooperative Mine (operated until 1910 by the Paonia Coal Company); the King Mine (operated until 1974 by the Adolph Coors Company); and the Somerset Mine (operated until 1985 by the U.S. Steel Corporation).

Many of the mines were very productive and operated for 10 to 50 years. Most of the mines were concentrated in the Somerset area; however, they also extended to the west towards Cedaredge and the Grand Mesa Coal Field (at an elevation of approximately 7,000 feet). Historic mines were also found to the southwest and southeast of Somerset in the Little Coal Creek, Minnesota Creek, and Coal Creek drainages. There was a steady expansion of population in the Somerset and Paonia area due to the coal mining and orchard activities. Constructed to ship coal, the railroad brought ranchers and farmers into contact with distant markets. From the late 1970s to the present, there has always been at least three active mines at any given time; among them the West Elk Mine, the Elk Creek Mine, the Bowie #2 Mine, the Sanborn Creek Mine, the Bear #3 Mine, the Bear #2 Mine, the Hawks Nest East Mine, the Somerset Mine, the Blue Ribbon Mine, the Bowie Mine, the and the Cyprus Orchard Valley Mine (later called the Bowie No. 1 Mine).

Currently the BLM Colorado Uncompahgre Field Office (UFO) manages active federal coal leases related to three coal mines operating in the North Fork Valley (shown in Map 1-1, Operating Coal Mines in the North Fork Valley): the West Elk Mine (operated by Mountain Coal Company, Inc.), the Elk Creek Mine (operated by Oxbow Mining, LLC), and the Bowie #2 Mine (operated by Bowie Resources, LLC). These mines are actively-producing longwall coal mines, with a total annual output of just under 15 million tons.
Sources: http://games.historycolorado.org/RIPsigns/show_markertext. asp?id=816 (History Colorado 2011; BLM 2000; BLM 2009; BLM 2010.)

In 2009, the Elk Creek Mine produced 5,702,879 tons of coal, the Bowie #2 Mine produced 1,212,977 tons of coal, and the West Elk Mine produced 4,885,581 tons of coal (BLM 2010; CDRMS 2010b). This is a total of 11,801,437 short tons of coal, which was 41.3 percent of Colorado's coal production in 2009. The West Elk Mine is the seventh largest underground coal mine in the U.S. and the second largest underground mine in Colorado, based upon production (Carroll 2005). The Elk Creek Mine is the 18th largest underground coal mine in the United States. The permitted acreages for Somerset Coal Field mines are:

- Bowie #1 Mine - 8,670 acres
- Bowie #2 Mine - 5,864 acres
- Elk Creek Mine - 13,429 acres
- West Elk Mine - 17,155 acres (CDRMS 2010b)

While each of these mining operations controls coal reserves with a mix of federal and fee and/or State coal, approximately 90 percent of local production is federal. As mining progresses, only federal coal will be available in the reserve base. Some federal coal leases have a 5 percent royalty (due to difficult geologic and engineering conditions); however, most of the coal is mined at an 8 percent royalty rate. The resulting revenue to the federal treasury from coal production within the UFO approaches $35 million each year. Half of that revenue is returned to the State of Colorado.

The three active mines in the Somerset Coal Field are mining coal from the Paonia Shale Member of the Mesaverde. The West Elk Mine mined the F-Seam of the Mesaverde Formation until 1991 and, until recently, mined the B-Seam. Currently, it is mining the 10-foot-thick to 11-foot-thick E-Seam (Carroll 2005; Cappa et al. 2007). Average interburden between the B-Seam and the E-Seam is 120

feet to 130 feet. The average overburden depth of the B-Seam is 1,200 feet; however, the West Elk Mine has the maximum mining depth in Colorado at 2,300 feet (Carroll 2010). According to Cappa et al. (2007), the average energy value of coal shipped from these three mines was 11,650 Btu for Bowie #2 Mine; 12,375 Btu for Elk Creek Mine; and 11,650 Btu for West Elk Mine.

The existing coal production from mines operating on federal leases within the North Fork Valley produce compliant and super-compliant coal. This means that coal quality meets or exceeds Clean Air Act standards for clean-burning coal (compliant coal contains between 1.0 and 1.2 pounds of sulfur dioxide per million Btu; super-compliant coal contains less than 1.0 pound of sulfur dioxide per million Btu). Colorado is second only to Illinois in bituminous coal reserves; however, it is the leader in bituminous compliant coal reserves (Cappa et al. 2007).

According to the EIA's 2010 Annual Energy Outlook with Projections from 2008 to 2035, the demand for low-sulfur bituminous and sub-bituminous coal from the Rocky Mountain Region is likely to increase annually by 0.2 percent and 0.7 percent, respectively [U.S. Department of Energy (DOE) 2010b]. This is the type of coal produced in the Somerset coal field. The DOE projects that, on a Btu basis, 60 percent of domestic coal production will originate from states west of the Mississippi River in 2035, which is up from 50 percent in 2008. This is due to lower prices for western mining operations and the low sulfur content of western coals (BLM 2010).

Forecasts predict that 5 percent to 10 percent of coal reserves in the Somerset coal field will be recovered over the next 10 years to 15 years. According to a report written by the USFS, even though demand for coal is projected to increase, yearly production at the mines in the Somerset coal field is likely to remain close to the existing rate of approximately 14 million to 16 million tons per year due to several limiting factors (USDA FS 2006). One limiting factor to the amount of coal produced is the capacity of the railway line or spur off of the main line in Delta, operated by Union Pacific, which hauls the coal. This spur's sole purpose is to support the three mines in the Somerset area; however, mine production is directly related to the number of coal trains that can move in and out of the one-way valley (Cappa et al. 2007). Currently, due to train availability, it is unlikely that the rail line could support an increase in mine production. [Typically, each train set contains 105 cars, each carrying roughly 108 tons per car, which is a total of 11,400 tons of coal per train (Kiger 2010). This is an average of 2.84 trains per day leaving the valley.] Other limiting factors to production include physical bottlenecks at the mine facilities (such as conveyor and train load-out capacities), as well as the amount of coal that can be stockpiled at the individual mine sites. Sources: http://games. historycolorado.org/RIPsigns/show_markertext.asp?id=816

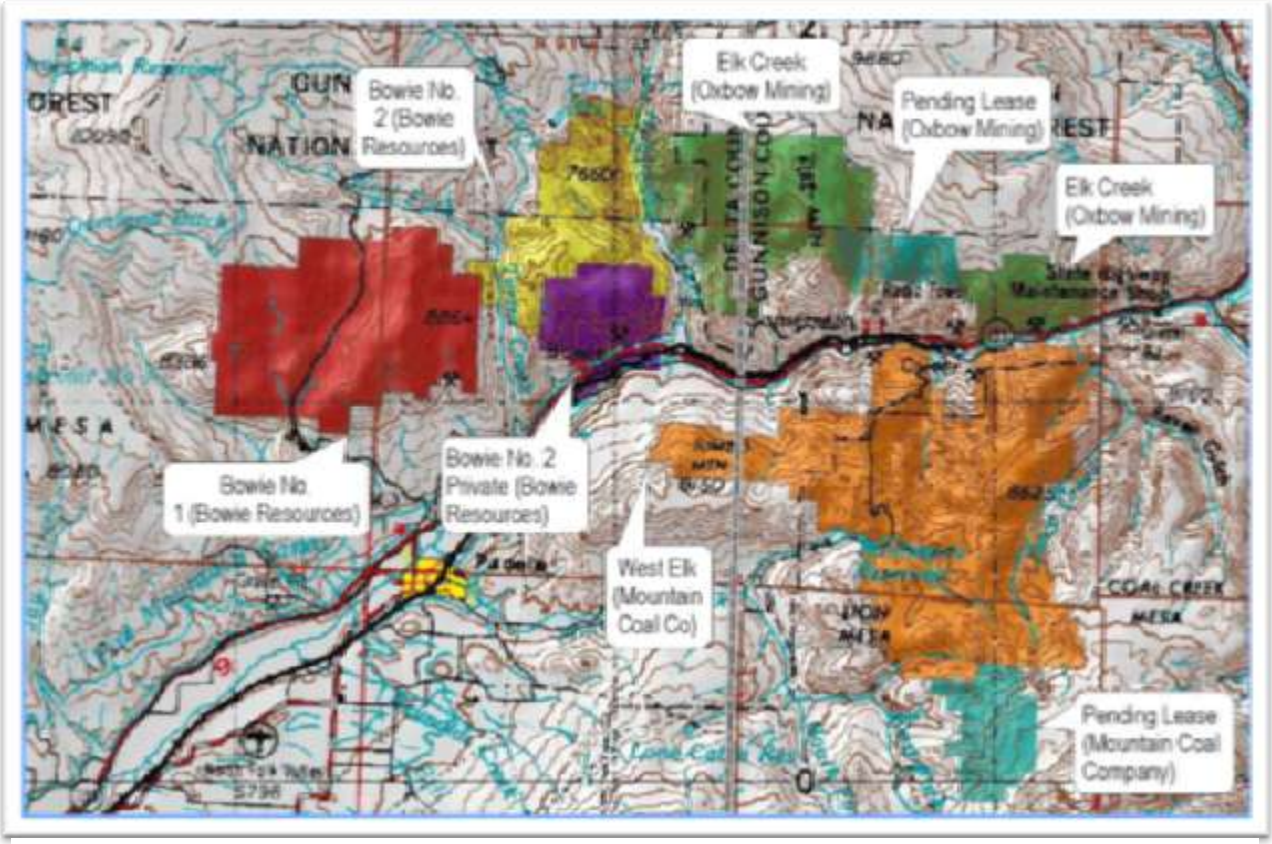


Figure 4 - Operating Coal Mines in the North Fork Valley

Source: BLM 2011f.

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