

Title: Kentucky Coal, Reclamation and Subsidence

Level: Secondary

Day/Time: One class period or Homework assignment

KERA Goals:1.2, 5.3, 6.3

Background Information:

Every day, Kentuckians benefit from one of the coal industry's most notable, environmentally significant achievements – the successful reclamation of mined lands. And chances are, they do not even know it. That is because most of the reclamation achieved by the coal industry is "invisible." Reclamation means returning the land to its original condition or other productive use. Unless there is a sign or other form of identification nearby, it is difficult to tell that a reclaimed site was once an active coal mine.

Careful mining of our land benefits people in two ways: as a source of plentiful and reasonably priced coal and as reclaimed, productive, attractive and useful areas. Whether turned into a state park, a housing development, wildlife preserves or simply returned to productive farmland, reclaimed sites represent the coal industry's commitment to a sound environment. Even though coal production has increased substantially over the past decade, the impact of this activity on the environment has been minimal.

In Kentucky, coal is mined by one of two methods– surface mining or underground mining. Surface mining is the extraction of coal by first removing the soil, rock and other materials lying above the natural deposits. Underground mining is the extraction of coal by underground excavation of the coal deposits.

For underground mining, special effort is devoted to constructing the mine and the mining plan in such a way that undesirable surface effects are minimized. Attention is focused on the age-old problem of *subsidence* – the gradual movement or sometimes abrupt collapse of the rock and soil layers into an underground coal mine– which can disturb the surface above the mine.

Some of the subsidence that takes place today is the consequence of mining practices of a bygone era. These abandoned deep mines were constructed using the room-and-pillar mining methods, a traditional technique in which "rooms" of coal were extracted and "pillars" of coal were left to support the roof. The occasional collapse of these pillars years later results in random and sometimes serious subsidence.

The room-and-pillar technique is still used in most underground mines today. Modern machinery and an improved understanding of rock and soil layers allow the coal operators to minimize surface subsidence.

Many coal companies today are mining coal by the longwall method. This method utilizes roof support equipment to advance mining equipment through a large area of coal. The roof support equipment holds up the rock and soil over the deposit while the coal is removed. As

the mining advances through the coal deposit, the roof supports are advanced as well, allowing the overlying rock and soil to collapse.

The attractiveness of this method allows for nearly complete removal of the coal without the use of support pillars. When this method is employed, subsidence effects on the surface of the area to be mined can be predetermined. If subsidence is to occur, it occurs quickly under the observation of the coal company operators. Any surface effects can then be mitigated as part of on going mining activities.

Since it is now possible to predict subsidence events during mining operations, steps can be taken by coal operators to lessen potential damage. Most coal companies work with neighboring landowners and homeowners to prepare for mining activities in order to minimize effects of subsidence.

Each day, companies are working hard to mine coal needed to supply electricity to Kentucky's homes and industries. In addition, these same companies are applying an equal effort to restore the land they have disturbed, leaving an important environmental legacy for generations to come.

Community Concerns About Coal Mining

Subsidence: Mine subsidence is the depressions, sags and cracks in the surface above an underground mine. Subsidence happens after the coal is removed and the ceiling or roof of the mine collapses, allowing the surface to crack, sag or collapse.

Efforts have been made to prevent subsidence by drilling deep holes in the soil, rock and mine voids and filling them with different types of materials such as sand, fly ash and mine refuse material to stabilize the surface. Roof-bolting is a method that helps support the roof of the mine by inserting long steel bolts into holes bored into the earth that makes up the roof. Roof-bolting protects the miners and may reduce subsidence.

Advanced planning is the key to minimizing damage. Subsidence in urban areas may cause damage to electric, gas, water and sewer lines. Roads and sidewalks may require some type of flexible couplings or joints. In longwall mining applications, planned subsidence and surface repairs are an integral part of the mining operation.

Reclamation: Mine reclamation is the restoration of mined land to its original state or some type of equally useful, productive alternative after mining is completed. Reclamation begins once it has been decided to mine the area. Soil, vegetation, water, wildlife and layers of the earth at the mine site are all examined prior to any mining. All of this information is evaluated to determine how the land will be reclaimed or for what use it will be reclaimed.

Kentucky is considered a national leader in the area of mined land reclamation. For many years, our state has had laws regulating the reclamation process. As a result, mined lands have been successfully reclaimed for ball diamonds, parks, lakes, trails, golf courses, pasture and productive farmland.

Both surface and underground mining operations require reclamation. In a surface mine operation, reclamation is an integral part of coal extraction. The valuable topsoil is removed first during mining and replaced last during reclamation. The rock and subsoils (overburden) are carefully replaced after the coal is removed to ensure that the best materials end up on top and the original contour of the land is maintained. Finally, mine operators are required to meet certain standards for plant growth and crop production on the site to ensure that the land will be as productive after reclamation as it was before mining.

Surface areas affected by an underground mine, such as coarse and fine refuse disposal sites, processing facilities, hoisting shafts, ventilation shafts, and storage facilities must be covered and stabilized when the mine closes. In addition, mine operators must address any damage from subsidence.

Government Programs Regulating the Kentucky Coal Industry

There are approximately 16 federal regulatory acts (laws) and numerous state laws to regulate the coal industry. The Kentucky Department for Surface Mining Reclamation and Enforcement is responsible for enforcing the state's mining regulations. The two main laws governing coal mining in Kentucky are described below.

Kentucky Surface Mining Law (KRS Chapter 350) and Laws Governing the Mining of Coal and Clay (KRS 351-352) Conservation and Reclamation Act

Regulation of the coal mining industry in Kentucky is by the Kentucky Department for Surface Mining Reclamation and Enforcement. Mining *regulations* have been developed to ensure that mining is conducted in a way that protects the environment, the public and the land. *Permits* must be obtained by mining companies prior to any mining activities to ensure that the mining will follow proper rules. *Performance bonds* hold the mine operator responsible if the mining standards are not met. *Inspection and enforcement* allow the government inspectors to check for any violations during mining activities.

The Kentucky Department for Surface Mining Reclamation and Enforcement may declare some lands as "unsuitable for mining" due to possible damage to unique cultural areas or natural resources. This program ensures that coal mining is safe and productive.

Abandoned Mined Lands Reclamation Program

The purpose of this program is to reclaim abandoned mines that were closed prior to the existence of state and federal laws governing reclamation standards and not restored properly. The Abandoned Mined Lands Reclamation Program is a state program managed under the Kentucky Department for Surface Mining Reclamation and Enforcement. Coal companies pay fees on all active mines. This money is then used to help pay reclamation costs of previously mined lands.

Emergency projects are another part of the program. This ensures that any dangerous situations encountered at abandoned mines are taken care of as quickly as possible. High

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priority projects are those that potentially threaten the public health, safety, general welfare and property.

Activity 2– Kentucky Coal, Reclamation and Subsidence (Discussion worksheet)

1. What is subsidence?

2. What can be done to prevent subsidence?

3. What is reclamation?

4. Name three uses of reclaimed land:
 - a.
 - b.
 - c.

5. What natural resources must be considered when mining and reclamation are considered?

6. List the five areas related to the Surface Mining Conservation and Reclamation Act:
 - a.
 - b.
 - c.
 - d.
 - e.

7. Give an example of a successful reclamation project.

8. Give two facts about the Abandoned Mined Lands Program:
 - a.
 - b.

9. Give an example of a mining problem being corrected.

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Adapted from materials developed by the Illinois
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