

Mining in Maryland Research Answer Key

Note, in their research students will not be able to find all the environmental problems and solutions included in the answer key, so be sure to cover in the review discussion on Day 4.

Resource	Mining Method used to Mine Resource (underground, surface, quarrying, etc.)	Economics – How is the resource used?	Environmental Impact - How does mining impact the environment?
Coal	Surface and Underground	Electricity	<ul style="list-style-type: none"> ○ Acid Mine drainage affects entire watershed – ○ Effects the waterways, life within that waterway, and ultimately effects the health of the entire Chesapeake Bay. ○ Can affect drinking water
Aggregate Sand/ Gravel, Crushed Stone	Quarrying / Surface	Golf courses, baseball fields, used to make concrete (transportation and building structures, etc.)	<ul style="list-style-type: none"> ○ Dust from excavating quarries ○ Uses a lot of energy to extract and transport materials ○ Damage of land surface ○ Erosion problems (inland) affects all aspects of watershed –water pollution; flooding, stream channel damage, decreased groundwater storage, slope failures, damage to adjacent and/or downstream properties
Cement Production	Quarrying	Used to make concrete (transportation building structures, etc.)	<ul style="list-style-type: none"> ○ Sediment Runoff (Sedimentation) ○ Erosion problems on coast from sand mining <ul style="list-style-type: none"> ○ Sand mining disturbs plant and animal life in inner continental shelf ○ many animals in Bay area depend on plants that live near coast ○ coastal shelves used as a foraging and spawning ground

Mining and the Economy

Look at the **Facts About Maryland's Mining Industry** handout. Looking at the Annual Production Values for each resource, rank their order of production value

- #1 Crushed Stone
- #2 Cement Production
- #3 Coal
- #4 Sand and Gravel

Additional Notes

What are some ways that mining these materials helps to improve/ maintain your quality of life?

Why and how are the resources important to the economy?

- Mining industry creates jobs in mining and related industries such as transportation, engineering, environmental and geology
 - Nearly 300,000 people work directly in mining in US
 - Nearly 3 million work in related industries
- US exports a significant amount of mined materials

1979 – Largest commodity produced: sand and gravel

2004 – Largest commodity produced: crushed stone

Mining and the Environment

What are some of the solutions to the environmental problems associated with mining?

- Federal and State laws and regulations have been established that require mining companies to develop operation and **reclamation plans** to eliminate or minimize impact on environment.
- Acid Mine drainage is treated with chemicals: Federal and state standards currently exist requiring acidic water to be treated before it can be released into the environment. Treatment involves chemical neutralization of the acidic water. The chemicals often used are limestone, hydrated lime, soda ash, caustic soda and ammonia.
- During mining, companies try to mitigate damage by diverting streams, providing drainage areas and placing native vegetation in greenhouses to use in reclamation.

- Erosion and Sediment control
 - settling basins are used at mining sites to control sediments in the runoff -- water quietly moves from one end to the other, allowing the heavy materials to settle out. Periodically, the basin is drained, cleaned out, and reused.
 - emergency overflow into man-made ponds
 - concrete drainage channels
 - concrete structures to slow the flow of water
 - Temporary and Permanent Seeding: Exposed soil is highly subject to erosion. Seeding the area to develop a vegetative cover can significantly reduce erosion.
 - Protect Areas of Exposed Soil: Divert runoff from exposed soils. Dike or ditch the runoff, place a berm around the exposed area, or convey drainage through pipes or culverts. Runoff can be directed to a grass lined swale for infiltration.
 - Control Runoff Velocity: Slow down runoff to minimize its erosive capacity. Vegetative buffers, slope management, check dams, and filter fabric fences are a few of the ways that you can impact runoff velocity.
 - Minimize Channel Erosion: Use grass lined channels to convey water through the site. If grass alone cannot control erosion, consider the use of riprap. A pipe slope drain may also be used to move water down a steep slope.
 - Trap Sediment: Barriers and temporary ponds may be used to trap sediment. Straw bales, brush, and silt fences may be used as barriers to intercept sheet flow or low level, low energy channel flow and reduce the sediment load. Temporary ponds may also be used to trap sediment. These measures do not typically provide adequate control of turbidity and should not discharge directly to surface water.

Erosion Demonstration

1. What happens to the sand as the water is poured over the slope? Sand is carried away by the flowing water to the lower end of the pan
2. Thinking about what you saw in the demonstration, what other materials could be carried by water flowing at a mine site? chemicals could cause acid drainage which would harm the environment
3. What possible impact could this kind of erosion have on the environment surrounding the mine? acid can kill plants and animals, sediments could clog streams
4. What are some possible solutions or plans of action that can be taken to prevent or control erosion? filter water as it leaves the mine, add chemicals to clean the water

Students are asked to create two Cause/ Effect relationships, of which there are many.

Mine Reclamation

(1) What is disrupted at sites where surface mining is done?

rock formations, soil, plants, wildlife, water tables and drainage patterns, and possibly archaeological research.

(2) What happens to a mining site after mining operation is complete?

Laws now require it to be reclaimed – restored to original or better form

(3) What are the main objectives of reclamation efforts

- Eliminate threats to public safety, including threats to people, property, livestock or wildlife
- Protect land and water from erosion, sedimentation, or contamination
- Return the mined land to beneficial use or the pre-mining condition

(4) What are some uses of the land after it's been reclaimed?

Golf courses, open space, recreation, buildings, wildlife habitat, etc.

(5) How does mine reclamation help the environment?

Preservation; reclaimed mine land has productive use, etc.

Laws and Regulations

(1) How does the government regulate the mining industry?

Both federal and state government establish laws; various departments and states establish regulations to provide details, clarify and implement them

Federal and State laws and regulations have been established that require mining companies to develop operation and reclamation plans to eliminate or minimize environmental impacts.

(2) What is the mission and role of Maryland Department of the Environment?

- mission of the Mining Program is to protect the public and the environment from the potential impacts of active mining; and to promote the restoration and enhancement of active and abandoned mine land and water resources.
- oversees the reclamation of mine sites to ensure that no adverse environmental/public impacts occur.
- requires a permit prior to the start of any mining operation because of the potential impact mining can have on the environment.
- honors industries and gives awards to companies that make an effort to return a mine site to productive use.

Gob Piles in Western Maryland
Baltimore Sun, December 2006 Article

(1) What is the environmental problem associated with coal mining in Western Maryland?

Gob piles...refuse from abandoned coal mines; eroding into streams -- sulfuric acid pollution has killed all life

Especially bad when it rains - sludge flushes down from the mountain and across the road.

(2) What does gob stand for and why is it toxic?

Garbage of bituminous...made up of shale, iron, pyrite and other minerals mixed with coal...when exposed to water and oxygen, creates sulfuric acid.

a. What is the proposed solution?

Burn the coal waste to generate electricity

b. Why is the solution controversial?

Some environmentalists say it creates mercury air pollution and ash containing heavy metals

(3) In your opinion, which is worse for the environment, the current situation or the proposed solution? Support your response.

Answers will vary