

Operating a Surface Mine

What to do

During this activity, you will “operate” a surface mine model. You will investigate how mining companies extract valuable minerals that are close to the surface of the Earth and then reclaim the land after the process.

- 1** Draw a picture of your model before any mining starts.
- 2** Make a list of the steps that you will follow to mine and reclaim your surface mine.
- 3**
 - a) Mine the rock containing the minerals and place it on the table in front of you.
 - b) Separate the mineral from the rock. Keep the mineral in a paper cup.
 - c) Draw a picture of what your surface mine looks like during mining. Remember to include the pile of rock that you took out of the mine.
- 4** Answer the questions:
How has mining changed the land?
How could we use the pile of mined-out rock that you took from your surface mine?
- 5**
 - a) Reclaim your mine. As much as possible, make the model look the way it did before mining, but without the minerals.
 - b) Draw a picture of the land after mining.

Even though it's against the law, in many countries children work in mines.

Diamonds are often mined from surface mines.

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Background

Two common procedures used to separate minerals from rocks take advantage of the physical properties of the sought materials. When mixed with liquid, heavier or denser minerals sink, and therefore can be separated from lighter minerals. This procedure is called **Heavy Media Separation**. This process could be used to separate heavier chalcopyrite from lighter quartz when mining for copper and nickel. If the valuable minerals are magnetic, they can be separated from other rock and minerals by passing the crushed ore under a powerful magnet. This procedure is called **Magnetic Separation**.

When reclaiming a surface mine, even if all the remaining rock (called “waste” rock, meaning rock devoid of valuable mineralization) were replaced into the surface mine, the depression formed by mining would not be refilled completely. However, the wall of the depression can be contoured to gentle slopes, the surface can be covered with topsoil, and grass and trees can be planted to create a naturalized landscape or environment. In some cases, mined-out surface mines and rock quarries have been made into recreational lakes, public parks, rock gardens, farmland, and housing sub-divisions.

Mining companies use grass to stabilize slopes and reduce soil erosion, and they plant seeds and seedlings to encourage the establishment of plant and tree communities. As the plants and trees mature, animal species diversity increases in the area. The habitat reclamation process is highly monitored by scientists from many disciplines.

Instructions

Before the Activity

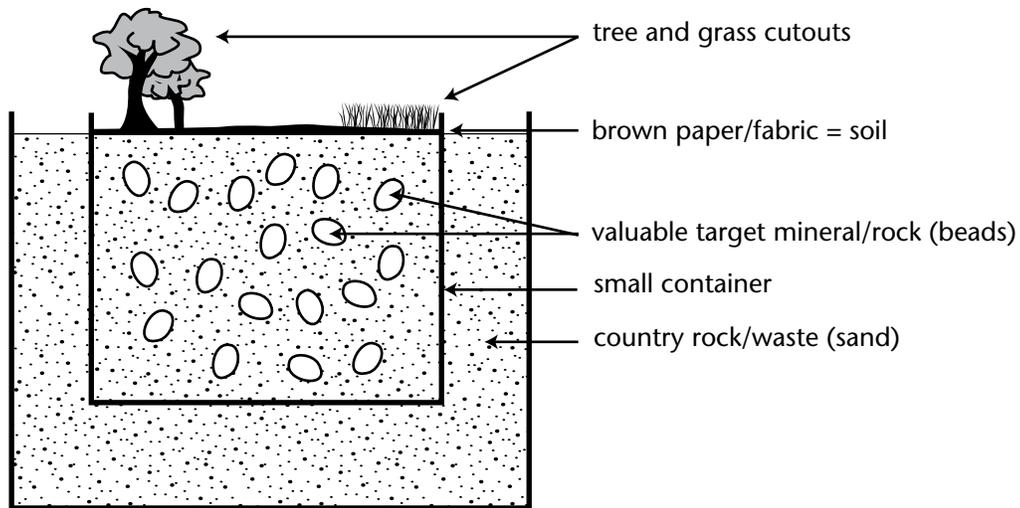
1. Create one model of a surface mine. There is considerable flexibility in the materials that may be used: the general principle being to have a valuable mineral or rock that must be separated from a waste or country rock component. Look at the suggestions in the table below; you can substitute the different valuable target minerals/rocks into alternate country rock.
2. Build the target rock body or mineral ore.
 - a) In a small container (~250 ml), mix a 4:1 ratio (200 ml: 50 ml) of country rock/waste material and valuable target rock/mineral.

Valuable Target Rock/Mineral	Separation Process	Country Rock/Waste
Magnetic beads	Using a magnet	Sand or gravel
Paper clips	Using a magnet	Potting soil
Dried beans	Physical picking with fingers or tweezers	Pasta
Large sunflower seeds	Sieving, physical picking with fingers or tweezers	Small-grain bird seed
Coloured beads	Sieving, physical picking with fingers or tweezers	Rice
Peanuts in shells	Crushing and sieving	Peanut shells

- b) Lay brown construction paper or fabric on top of the rock to represent soil.
- c) Place tree and grass cut-outs or magazine pictures of natural habitats on top of the soil.

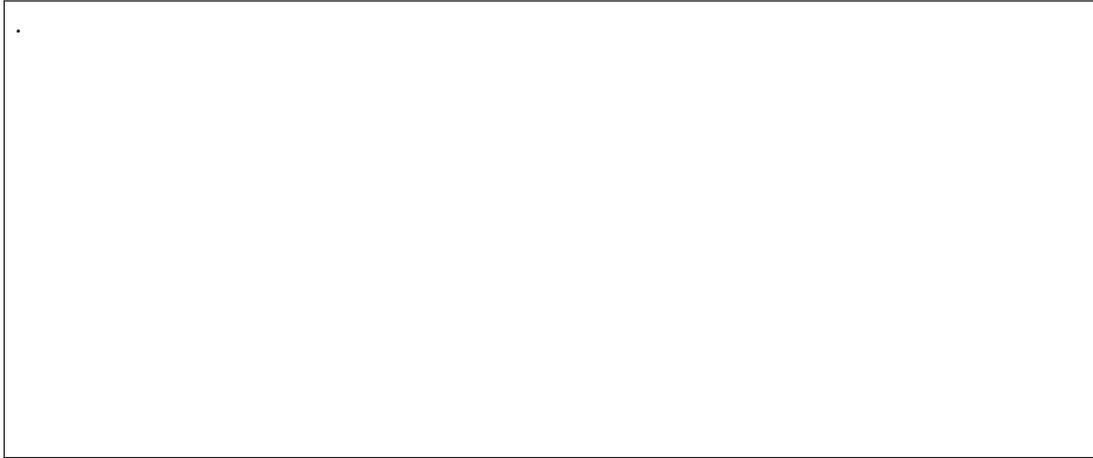
3. (Optional) Put the target rock body or ore in a wider environment.

- Either
- a) Rest the smaller container inside a larger container (750 ml or 1 litre). Fill the area around the inner container with the same country rock material as it contains, making sure that the rim of the inner container can be seen after filling.
- Or
- b) Submerge the small containers in a sand table, making sure the rims can be seen.



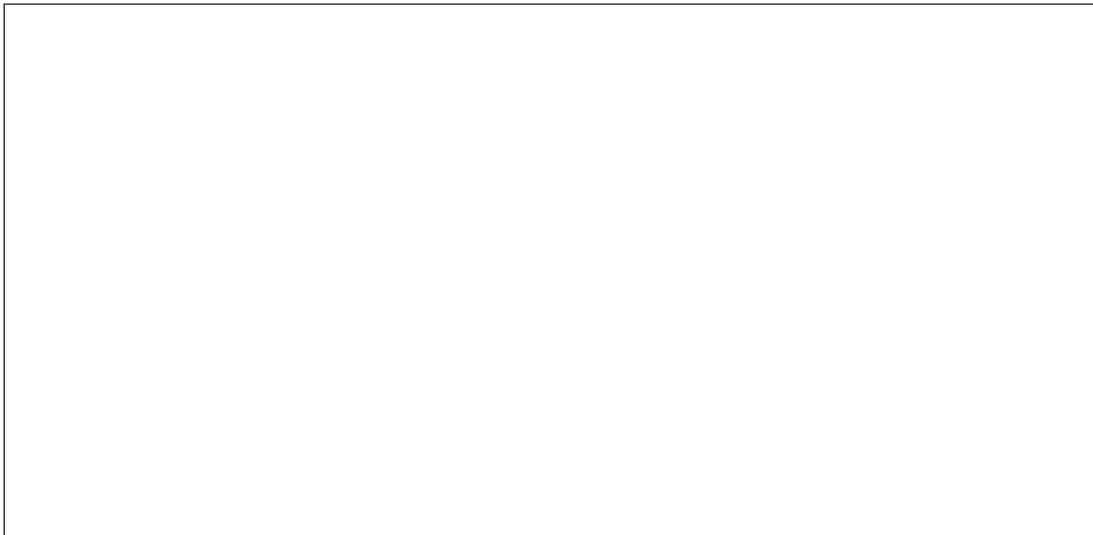
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1. Draw a picture of your model before any mining starts.



2. Make a list of the steps that you will follow to mine and reclaim your surface mine.

3. Draw a picture of what your surface mine looks like during mining.

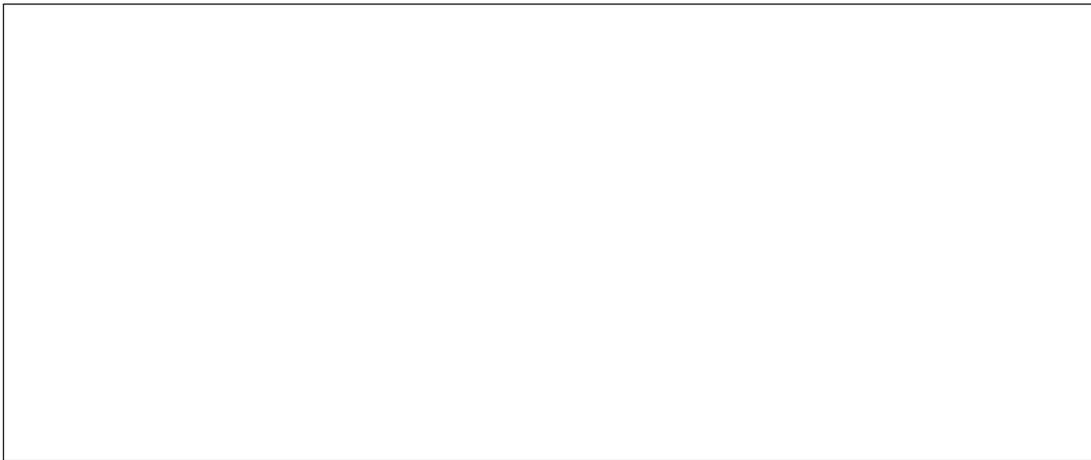


4. Examine your surface mine model and answer the following questions:

How has mining changed the land?

How could we use the pile of mined-out rock that you took from your surface mine?

5. Reclaim your mine. As much as possible, make the model look the way it did before mining, but without the minerals. Draw a picture of the land after mining.



6. Look at the Mine Site Reclamation photographs of mine sites during mining and the land after it has been reclaimed. Write three things that have been done to reclaim the land used for mining.
