

Mining

Students will learn that there were once gold and iron mining operations in some Virginia Piedmont parks. They will learn what mineral ores are and how they form. They will come to understand that metal mining was once very important to the economic life of the Piedmont. This activity focuses on two parks. Fairy Stone State Park was once the site of a large iron mining operation and is still famous for the fairstones (staurolite crystals) that can be collected in the park. Lake Anna State Park was once the site of a commercial gold mine. The ruins of the mines at Lake Anna can be visited on guided tours, made in advance with park staff.

Background

When most people think of gold mining, they think of the California Gold Rush, the Klondike or maybe the Black Hills. At the mention of iron ore, they might think of Minnesota's Mesabi Range. Few know that Virginia was once an important producer of gold and iron. Iron was mined in many places throughout the state. A few very early iron mines on the Coastal Plain exploited "bog iron" that is deposited by ground water in swampy areas. Later, iron was mined from sedimentary iron deposits in the mountains. Much of the iron mining in Virginia, however, and almost all of the commercial gold mining occurred in the Piedmont.

There are two types of iron ore in the Piedmont: iron oxides and pyrite. The major iron ores in the Piedmont are the iron oxides, hematite (Fe_2O_3) and magnetic (Fe_3O_4 , also known as magnetic iron oxide). Pyrite (FeS_2), also known as "fools gold," was usually mined for its sulfur content, with iron as a by-product. Pyrite weathers to form a powdery iron oxide deposit called "gossan" that was

mined for iron in a few places. Commercial iron ore typically contains at least 50 percent metallic iron by weight.

Gold ores in Virginia are of two types. Vein gold consists of metallic gold thinly distributed in veins of quartz. Placer gold consists of metallic flakes and nuggets of gold freed from rock by weathering and deposited in gravel banks along streams and rivers. Both types were mined in the Piedmont. Commercial gold ores in Virginia contain about one ounce of gold per ton of ore, or about 10 parts gold in a million parts waste rock.

Procedure

Before the Trip:

1. Discuss mineral resources with the class. Have students give examples of something made of metal; if possible, focus on the metal mined at the park to be visited. Examples of uses of iron include car parts, structural steel, cookware, nails and so on. Examples of uses of gold include jewelry, dental work, electronics and coins.
2. Define "ore" as a rock or mineral from which useful material may be extracted for economic or social benefits. All rocks contain iron, for example, but not all rocks are iron ores. Discuss how changing economic conditions might change whether or not a material is considered an ore.
3. Discuss how different life might be if these metals were unavailable. Have students come up with substitutes for these metals in everyday objects.
4. Discuss environmental costs and benefits of mining.
5. Set up a scenario in which a valuable mineral deposit is discovered in a pristine wilderness in the middle of an economically depressed area.

Grade Levels: K-10

Objectives

Students will learn about mining in Virginia by:

- *Investigating* the uses of natural resources.
- *Exploring* the economics of mining.
- *Discussing* costs and benefits associated with the finite nature of mineral resources and environmental considerations associated with their extraction.

Materials

For the class:

- mineral identification book
- GPS equipment

For each student:

- pen or pencil, notebook
- appropriate clothing
- magnet
- magnifying glass
- boots or waterproof footwear

Where

Mining areas at Lake Anna and Fairy Stone state parks.

When

Spring and fall are best.

Time Required

At least two hours are required at the park.

Mining

Have the class debate whether or not the deposit should be mined. (Choose sides in the debate by lot.)

6. Groups should stay together and closely follow the leader during tours of mines and workings. Never enter an old mine shaft.

At Fairy Stone State Park

1. Visit and examine entrances (closed off by locked iron-bar doors) to one or more old iron mines. A short and easy hike up the Iron Mine Trail leads to the doors. Discuss how ore was extracted.
2. Locate the mine on a topographic map (GPS equipment may be used).
3. Arrange to speak with a park naturalist or interpreter about the history of iron mining in the park.
4. Discuss why the iron mines might have been abandoned.
5. Ask the park for permission to dig or gather surface samples at or near the old mine entrances. Using a magnet, extract magnetite from soil or sand samples. What color is the magnetic iron ore? Look carefully to see if any of the crystals have the characteristic magnetite shape. (Magnetite crystals are octahedron, which looks like two square-sided pyramids base-to-base.)

At Lake Anna State Park

1. Arrange for a tour of the old workings and rock-crushing mill at the Goodwin Gold Mine.
2. Locate the mine on a topographic map (GPS equipment may be used).
3. Take a short hike on a park trail. See if you can find quartz, a common mineral often associated with gold.
4. Discuss why a mine might have been abandoned.

Follow-up

1. Research the history of mining in the park visited. The Virginia Department of Conservation and Recreation and the Virginia Department of Mines, Minerals and Energy have useful websites.
2. Discuss historical and economic factors that contributed to the demise of metal mining in Virginia.
3. Research ore reserves of various metals (there are several with less than a 100-year supply). Discuss ways to make these reserves go as far as possible.
4. Discuss the sources of important metals. What metals are found in the United States? Which metals are mostly imported?

Resources

Nature's Building Blocks: An A to Z Guide to the Elements by John Emsley. This guide provides concise descriptions of all chemical elements including sections on the uses, properties and reserves of metals.

U.S. Geological Survey, www.usgs.gov

Virginia Department of Conservation and Recreation, www.dcr.virginia.gov

Virginia Mines, Minerals and Energy, www.dmme.virginia.gov

Extensions

1. Have students research the history of mining in their own county.
2. The use of GPS equipment to pinpoint study locations would be a useful addition to this exercise.

Variations

For younger students

1. Moving a magnet through the soil will extract iron oxide particles. These particles are the iron ore mined at Fairy Stone.
2. Have students make a list of metal objects in the classroom.

Credits

Map provided by the Virginia Department of Mines, Minerals and Energy.

