SYNOPOSIS:

During the late 19th and early 20th centuries, rapid growth in the manufacturing and building industries demanded enormous mineral resources. To meet the demand, miners stripped billions of tons of minerals from the earth. In the process they removed vegetation and topsoil. This often destroyed the land's ability to sustain plant and animal life.

This program looks at the type of damage that was done to the land and how bioremediation and other technologies can help restore the land and its life sustaining qualities. It also explores the steps being taken by mining companies to avoid the ecological mistakes of the past.

CURRICULUM UNITS:

Biology
Biotechnology
Chemistry
Earth Science
Ecology
Environmental Science
Geology
Physical Science

CARREER OPPORTUNITIES:

Biologist
Biotechnologist
Chemist
Ecologist
Environmental Scientist
Geologist
Land/Resources Manager
Mining Engineer

BACKGROUND INFORMATION AND PROGRAM OVERVIEW:

Minerals mined from the earth are important to modern civilization. In earlier times when demand was great and open land was plentiful areas that had been mined were often striped and then abandoned. Little or no attempt was made to restore them to their original states. And, when topsoil and turf were reintroduced to abandoned suites, the plants often failed to thrive.

Scientists discovered that shale brought to the surface during mining, gradually turns to clay. As a result, plant growth decreases and soil erosion increases. Techniques such as reintroducing earthworms and bacteria into the soil help to restore the conditions needed to sustain new vegetation. In turn, plant life helps to hold the soil together and makes it more resistant to erosion. As biodiversity in the sol increases so does its vitality.

Living organisms are also used in bioremediation to clean up the mistakes of the past. It has been found that some plants will absorb the heavy metals often present in the soil at mining sites. Alpine Pennycress for example absorbs zinc from soil and stores it in its leaves. The zinc can then be recovered from the harvested plant. Biotechnologists have also found ways to remove uranium from soil using bacteria.

At mining sites today, bacteria are used to clean contaminated waters produced during mining activities. As water flows through reeds that may harbor various kinds of bacteria, toxic wastes such as arsenic can be absorbed. Researchers are testing the delicacy of this technology in removing other substances like cadmium, copper and acid sulfate.

New and innovative technologies are making it possible for people to obtain the minerals needed from the earth without leaving it scarred and damaged. Furthermore, techniques like bioremediation can prevent long-term damage to the land during mining activities and prevent soil erosion so that mining areas can be returned to their original life sustaining condition.

ISSUES AND CRITICAL THINKING

After viewing the program, ask your students the following:
What is topsoil?
What happens when it rains and there are few plants growing in the ground?
What is bioremediation?
How do organisms like bacteria and earthworms contribute to the reclamation process?
Why do we want to reclaim the land?

Compare soil from a well-trodden pathway to garden soil.

Have students research the mining process and waste products for some of the minerals used by civilization.

Have the class create an erosion comparison between planted and bare soil, similar to the one in the program.

Discuss the creation of topsoil; where it comes from, and how long it takes nature to build it.

Assign projects involving the collection and analysis of soil and vegetation samples.

Discuss the difference between erosion and weathering.

VOCABULARY:

BARREN- Unable to support life.

BIOREMEDIATION- The use of bacteria or plants to remove or neutralize contaminated soil or water.

CONTAMINATE- To make impure by introduction foreign or undesirable material.

CORE SAMPLE- Soil that is extracted by drilling and used for analysis.

DIGESTIVE SYSTEM- The organs associated with the absorption of food.

ECOLOGICAL- The interrelationship between living organisms and their environment.

ECOSYSTEM- An ecological community that functions together with its environment.

EROSION- Natural process in which soil is worn away and moved from one place to another.

ELECTRON MICROSCOPE- An instrument that uses electrons to magnify (up to 1,000,000 times).

HAZARDOUS WASTE- A substance that is potentially damaging to the environment or to living beings.

MICROORGANISM- Any microscopic organism, including algae, bacteria, fungi, protozoa and viruses.

ORGANISM- A living being with different organs or parts, with separate functions.

RECLAIM- To restore to a condition suitable for use.

RESOURCE- A commodity and which can provide help or support.

SEDIMENT- Material that settles to the bottom of a liquid or is deposited by water or wind.

TOPSOIL- The top portion of soil, usually richer in organic matter than the subsoil.

TOXIC- Poisonous.

WEATHERING- Natural process by which wind, rain and temperature casue changes in materials.

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The Wonders of
Ecology & Conservation

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GIVING BACK THE LAND