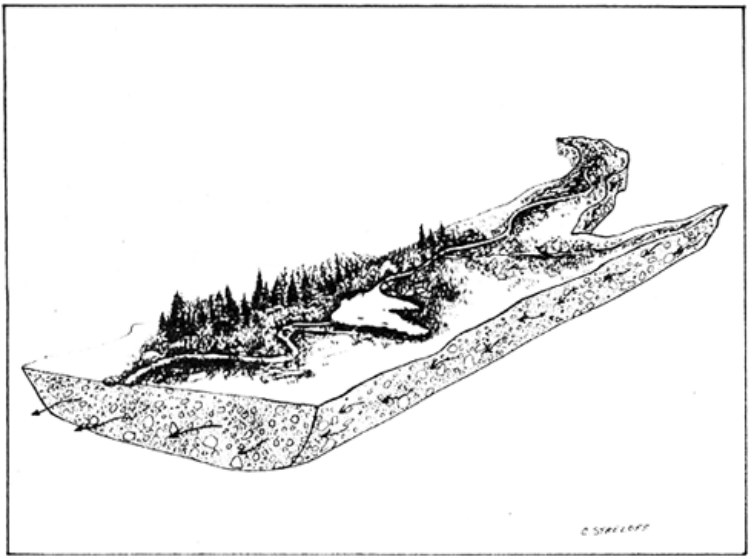
Downwind/ Downstream



Threats to the Mountains and Waters of the American West

Study Guide

by Ava Ferguson

DOWNWIND/ DOWNSTREAM:
THREATS TO THE MOUNTAINS AND WATERS OF THE AMERICAN WEST

58 minutes

The film can be shown in two parts to fit class periods.

Produced by Robert Lewis and Christopher McLeod
In association with Environmental Research Group, Aspen, Colorado
Written & Directed by Christopher McLeod

Contents:

Ava Ferguson is a freelance science writer living in Felton,CA

Study Guide

by

Ava Ferguson

INTRODUCTION

About The Film

High in the Rocky Mountains, winter snow and summer rain give birth to streams and rivers. This high country water sustains countless plants and animals and provides drinking water for more than ten million people downstream. Without this water, modern-day El Paso, Phoenix, Denver and Los Angeles would not exist.

Most people consider this mountain water to be pure and safe, but much of it is not. Abandoned mines—combined with current mining operations—release a steady stream of toxic metals and radioactive waste into the headwaters of the western watershed. Acid rain and snow leach additional metals from the soil, damaging streams, lakes and forests, and endangering wildlife. Together, these pollution sources pose a direct threat to the region's $50 billion tourism industry and to the safety of public drinking water throughout the West.

In **Downwind/Downstream**, Academy-award winning director Christopher McLeod and biologist and filmmaker Robert Lewis document both the historical and present-day causes of these environmental problems. Filmed against the backdrop of the Colorado Rockies, this hour-long film uses Colorado as a case study; the dramatic and alarming story it tells applies to high country regions throughout the world.

Included in the film are interviews with miners and environmentalists, public officials and private citizens, scientists and nature-lovers—each of whom offers a different perspective on the environmental problems facing the region. The issues they raise are on the minds of all Americans: what to do about abandoned toxic waste dumps; how to control degradation from acid rain and air pollution; and how to minimize the damaging effects of urban development on wilderness areas. Although the film offers no single solution

to these problems, it urges us to adopt a more long-term approach to resource use, and underscores the responsibility we all share for preserving the natural environment.

Because of its interdisciplinary approach, **Downwind/ Downstream** is ideally suited for high school and college students, in both science and social studies classes. For science students, the film provides concrete examples of how acid rain affects streams and wildlife, and how toxic substances travel in air and water—often ending up miles from their initial source. For social studies students, the film explores the role that natural resources have played in the development of the American West and the conflicts that have arisen between the need for economic growth and environmental quality.

About The Teacher's Guide

This booklet provides information that can help you incorporate the film into your curriculum. Inside, you'll find background information, activities and discussion questions, suggested readings, as well as resources for additional information. The activities and discussion questions are designed for high school students and are divided into two sections: one for science classes and one for social studies classes. Simply select the section and the materials that best suit your needs.

BACKGROUND

The Colorado Rockies

Geography

The Rocky Mountains are the largest mountain chain in North America. They range more than 3,000 miles (4,800 km) from Alaska to New Mexico, rising to heights of more than 14,000 feet along the Continental Divide. In Colorado, the Rockies cut a huge swath through the heart of the state; to the east lie the vast, open stretches of the Great Plains and to the west, the valleys and mesas of the Colorado plateau. Denver, the state's capital and largest city, lies just east of the mountains.

The Colorado Rockies have often been called the "Roof of North America" because the state's peaks are the tallest in the entire Rocky Mountain chain. Rivers draining from these high mountain slopes provide an important source of water for several states, on both the east and west sides of the Divide. The eastern slopes give rise to the Arkansas, Platte and Republican rivers—all of which form major components of the Missouri-Mississippi river system. The western slopes give rise to the Rio Grande, which flows southeast into New Mexico and Texas, and the Colorado, which winds its way through the Southwest to the Gulf of California.

In addition to water, Colorado provides the nation with other important natural resources. The geologic forces of upheaval that formed the state's precipitous peaks also uplifted rich deposits of precious metals, such as copper, gold, lead, silver and zinc. At the height of the mining boom, mineral products provided Colorado with an annual income of about $2.5 billion, although today, a region-wide slump in mining has reduced Colorado's income from mining to $750 million per year. Molybdenum, a metal used to toughen steel, is one of Colorado's most valuable minerals. The state's largest molybdenum deposits lie on the Continental Divide, near the town of Climax—site of the largest molybdenum mine in the world.

History

The United States obtained most of present-day Colorado as part of the Louisiana Purchase of 1803. Eager to explore its new holdings, the government sponsored several expeditions into the region. The first, in 1806, was led by Zebulon Pike, a lieutenant in the United States Army.

At the time, much of eastern Colorado, known only as the Great Plains, was considered too dry for farming; that, combined with the high mountains, discouraged settlement of Colorado for several decades. During the 1820s and 30s, however, hundreds of fur traders and trappers began making their way into the mountains to hunt beaver. Later, as scores of pioneers travelled west toward Oregon and California, many of them ventured into Colorado using trading routes established by these early frontiersmen.

In 1858, the discovery of gold near present-day Denver attracted thousands of prospectors to the area, and small mining towns sprung up. The miners tore into the mountains, at first in search of gold and then silver. When it was discovered that irrigation would make the land productive for farming, settlers, too, flocked to Colorado in increasing numbers, and small towns were built along the streams and rivers. The population of these settlements continued to expand as more and more Americans moved west.

Today, Colorado is becoming increasingly urbanized. Over half of the state's population lives in cities located on the eastern edge of the mountains. Mountain communities, too, are experiencing growth—mostly as a result of increased tourism. Although the growth of these towns has brought wealth and prosperity to the state, it has also caused serious environmental problems, such as air and water pollution, traffic congestion, and the destruction of wilderness areas. These problems have forced many mountain communities to exercise greater control over development in their areas.

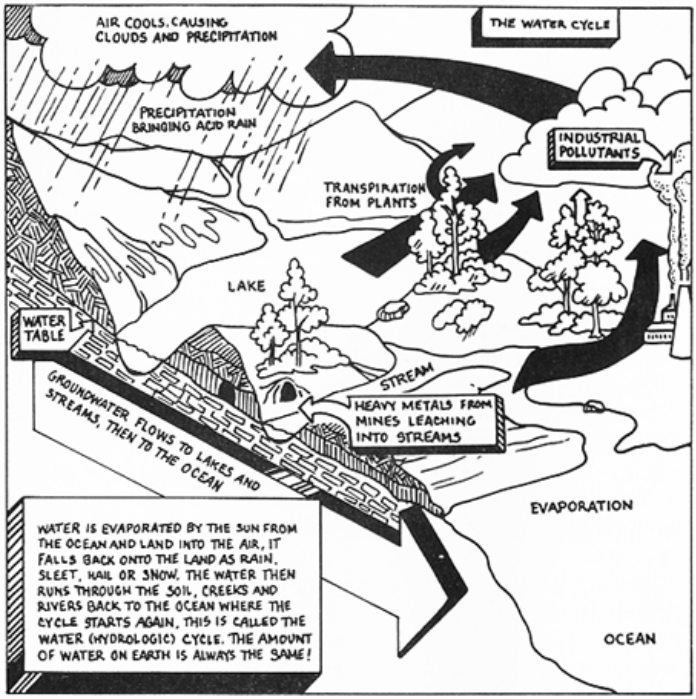
Economy

Like many areas of the West, Colorado has experienced a recurring cycle of economic boom and bust. The famous gold rush of the 1850s lasted only a few years before miners had stripped the mountains of most of the gold. In the 1880s, discovery of huge silver deposits spurred another boom in the state's economy; the mining town of Leadville, for instance, became one of the leading centers of silver production in the U.S.

In the 1890s, however, the market for silver experienced a major slump; many silver mines in Colorado closed as agriculture replaced mining as the state's most important industry. In the early 1900s, the development of the automobile caused rapid growth in two other industries: oil and tourism. All these industries, however, suffered a major decline during the Great Depression, when oil and farm prices dropped sharply and few people had money to travel.

During WWII, the state's economy boomed once again, largely because of the great demand for the state's precious metals and oil. Following the war, Colorado became a major center for energy-related businesses. However, this energy boom later collapsed, and by the early 1980s, Colorado's economy had once again fallen on hard times.

Today, the old economy based on mining and other heavy industries is slowly giving way to an economy based largely on recreation and tourism. Each year millions of visitors travel to Colorado's mountain resorts, making tourism the fastest growing industry in the state. Some officials and residents hope that tourism will provide a more stable base for the economy and help stem the boom-and-bust periods that have characterized so much of the state's development.



Water Sources

The presence of water in the Rockies results from the interplay between the area's climate, geology and topography. Much of the rain or snow that falls to the ground evaporates quickly in the arid climate; the rest runs off to form drainages and streams or percolates through the soil until it reaches a layer of impervious clay or rock. Water that seeps through the soil collects in underground reservoirs, called aquifers, that can be tapped by drilling wells and pumping the water to the surface.

Although the southwestern states cover more than half of the nation's total land area, they receive only about fourteen percent of its total stream flow. Groundwater from aquifers, then, represents an especially important source of water for these states. In Colorado, for instance, more than three-quarters of the state's public water system and about 150,000 private wells draw on groundwater for their drinking water supplies. In Arizona and New Mexico, over half of the population receives their drinking water from aquifers.

Water Pollution

Rivers and streams that originate in the Rockies pick up numerous contaminants as they flow downstream, including metals, radioactive particles and other toxic substances. In addition, these pollutants may seep through soil and rock and contaminate aquifers. Water and chemicals move easily through most aquifers, which are generally composed of sand and porous rock, such as ground granite. Once an aquifer becomes contaminated, it can be extremely expensive, if not impossible, to clean it up. Not only is the soil around the aquifer contaminated, but the water flowing from it carries contaminants as well.

Pollution of aquifers in the Rockies and others areas of the Southwest is of special concern, since there isn't enough surface water to satisfy demand. In addition, underground water in mountainous regions moves faster and farther than does the water in flatter regions, largely because it travels downhill. As a result, contamination of Rocky Mountain aquifers can spread far and wide, making it difficult to contain.

Acid Mine Drainage

Water pollution from abandoned mines, as well as current mining operations, poses a serious problem throughout the United States. The federal government estimates that over 6,000 miles (9,661 km) of streams in this country, together with at least 40 square miles (64 sq. km) of reservoirs and lakes, have been seriously affected by acids and metals that have drained from mining sites. Officials estimate that 25 major watersheds in Colorado alone have been adversely affected from pollutants that have drained from the state's 15,000 abandoned mines. This figure includes over 450 miles (725 km) of streams that are devoid of all life as a result of acid mine drainage.

Acid mine drainage begins when underground water seeps into abandoned mine shafts or when surface water flows over mill wastes called "tailings"; the water reacts with oxygen and sulfide minerals to form sulfuric acid, which dissolves exposed metals in the mines. This toxic "soup" flows out of the mines and into streams, rivers, aquifers and soil. The metals accumulate in soil, water and fish, and may pose significant health effects to humans. Many experts consider acid mine drainage to be a particularly serious form of pollution, because once started, it never ends.

Acid Rain

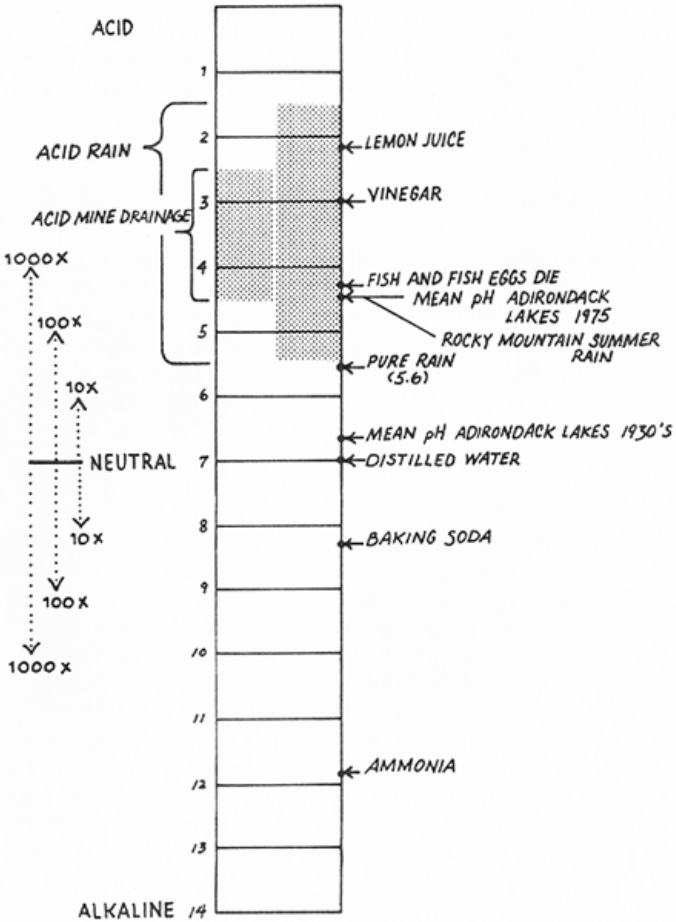
Acid deposition falls to earth in a variety of forms—as rain, snow, fog and as dry particulate matter. However, it is generally referred to as acid rain. As its name implies, acid rain contains acids formed from two kinds of pollutants: sulfur dioxide (SO_2) and nitrogen oxides (NO_x). In the Rocky Mountains, the major sources of sulfur dioxide include emissions from copper smelters in Arizona and New Mexico and from copper smelters and coal-fired power plants in Colorado. Nitrogen oxides are emitted primarily in the exhaust of cars and trucks from large cities, such as Los Angeles. These pollutants ride on the prevailing winds and may travel hundreds of miles from their original source. Sometimes they react with oxygen in the air and become heavy aerosols that fall to earth in a dry form. More often, though, they float high into the atmosphere where they react with water vapor to form sulfuric and nitric acids.

Scientists measure acid rain using the pH scale; the scale ranges from one to fourteen, with a pH of seven considered neutral. Solutions with a pH of less than seven are acidic, while those with a pH of greater than seven are alkaline, or basic. The scale is designed so that every one-unit drop in pH represents a tenfold increase in acidity.

Normal rainfall generally has a pH value between 6 and 7; it is slightly acidic because water naturally reacts with carbon dioxide in the atmosphere to form carbonic acid. Yet rain and snowfall in portions of the Colorado Rockies has been measured at a pH of 4.9—nearly 70 times more acidic than normal. The problem is especially severe during the onset of the spring snowmelt, when up to 70 percent of the pollutants stored in the snow are released in a single pulse of acidic water.

Acid rain is harmful because it increases the acidity of rivers, lakes and streams. It also washes out aluminum and other toxic metals which are normally trapped in soil and rock. The high acidity of the water, combined with the high concentrations of metals, can spell death to fish and other aquatic organisms. Acid rain may also hinder the growth of plants and harm organisms in the soil. The toxic metals released by acid rain may ultimately end up in public drinking water, posing a threat to human health.

pH SCALE


ACID
1
2
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ALKALINE 14
ACID RAIN
ACID MINE DRAINAGE
1000X
100X
10X
NEUTRAL
10X
100X
1000X
LEMON JUICE
VINEGAR
FISH AND FISH EGGS DIE
MEAN pH ADIRONDACK LAKES 1975
ROCKY MOUNTAIN SUMMER RAIN
PURE RAIN (5.6)
MEAN pH ADIRONDACK LAKES 1930'S
DISTILLED WATER
BAKING SODA
AMMONIA

Although eastern lakes affected by acid rain have received most of the public's attention, scientists have found that some lakes in the West may be even more vulnerable to the effects of acid rain. Unlike many eastern lakes, for instance, high mountain lakes in the West typically lack muddy bottoms and extensive vegetation, which can help absorb and neutralize excess acids. Also, these mountain lakes tend to have a bedrock of granite, rather than of neutralizing limestone, as is the case with many eastern lakes. In addition, scientists have found that high mountain lakes in the West contain certain animals that are especially sensitive to changes in acidity and chemical balance; these animals could be easily killed by acid rain.

Heavy Metals

Heavy metals, like zinc and lead, occur naturally in the environment, either in trace amounts or in large deposits of mineral ores. Heavy metals are also produced by industrial processes. Today, nearly every major industry releases heavy metals into the environment. Ore smelters, for instance, spew arsenic and lead into the air, while coal and oil furnaces emit cadmium and nickel.

Unlike organic pollutants, heavy metals are not biodegradable; they become concentrated in air, soil and water where they are ultimately taken up by plants and animals. Nearly all living organisms require some metals as part of their normal diet. Plants, for instance, take up metals directly from the soil, while animals ingest metals in their food and water. At high concentrations, however, these same metals are highly toxic and may cause poisoning or even death. Studies have shown that excess lead can damage our brains, kidneys and nervous systems, and that high levels of cadmium may cause high blood pressure, heart and kidney disease, as well as cancer. Some scientists now estimate that the toxicity of trace metals released into the environment each year exceeds that of all radioactive and organic pollutants combined.

KEY CONCEPTS

• The elements in air, water and soil are recycled on a global scale.

• Human activities may have far-reaching effects on an ecosystem that are difficult to predict or control.

• Contaminants released into the environment may become increasingly concentrated in animals at the top end of the food chain.

• Contaminants released into the environment may undergo chemical changes and be transformed into new substances.

• Elements that occur naturally in the environment may be harmful in high concentrations.

• Not all forms of pollution are clearly visible.

• Diluting wastes in streams and rivers is not a viable long-term solution to waste disposal.

• Decisions regarding resource use and the application of technology involve ethical considerations for both individuals and society.

LEARNING OBJECTIVES

After viewing this film, your students will be able to:

• describe the natural forces that have shaped the Rocky Mountains;

• describe the process of ecological succession in mountain ecosystems;

• explain how aquifers are formed;

• explain the importance of the Rocky Mountains in providing water to the
southwestern United States;

• describe the effects of mining on natural ecosystems;

• explain how toxic chemicals contaminate groundwater;

• explain how scientists measure and study acid precipitation;

• describe how acid precipitation affects plants and animals.

BEFORE THE FILM

• Discuss some common pollutants. What constitutes a "pollutant"? Identify the chemical or physical characteristics of pollutants that make them harmful.

• Hold a class discussion on acid rain. Ask students to describe what acid rain is and where it comes from. Discuss the differences between an acid and a base and list examples of both. Discuss the concept of a buffer.

• Have students make a mural of the water cycle. Have them identify sources of water as well as activities and processes that use water. Discuss how human activities may influence the cycle. At what points do contaminants enter the cycle?

• Visit a stream, pond or other aquatic habitat in your area. Identify the source of water in your habitat. What kinds of plants and animals depend on the water? Have students map where the water goes as it travels downstream, seeps underground, emerges as springs, or evaporates. How have human activities influenced the quality and amount of water in your habitat? What effect does the water quality have on the plants and animals?

AFTER THE FILM

• Have students monitor the acidity of rain that falls in their community. Construct rain gauges and use pH test kits to measure the acidity at different times of year. Have students list sources that could be contributing to acid rain in their area.

• Monitor the affect of different concentrations of acidity on the growth and survival of freshwater algae or zooplankton. Have students monitor the changes that take place when the organisms are exposed to increasingly concentrated solutions of vinegar or another common acid.

• Visit a natural area in your community. Have students hypothesize the different successional changes that will take

place at the site if an area of land is cleared. In what order will incoming plants and animals take up residence at the site? What factors will determine whether the site returns to its previous state?

• Give students the name of a common contaminant and its source, such as ozone emitted in automobile exhaust. Have them research and diagram the pathways that contaminant will follow through the ecosystem. Will the contaminant be chemically altered as it travels through the environment? How do people come in contact with the contaminant? What are the potential health effects?

• Have your students report on an environmental problem in their community. Have them research both the technological and social causes of the problem. Encourage them to visit sites in the community that have been affected by the problem and record their observations. Have students present and support their own solutions to the problem.

• Plan a trip to a natural area near your school. Contrast the area with a similar site that has been developed or disturbed by human activities. How do the numbers and kinds of plants and animals differ at each site? What factors influence the presence or absence of certain organisms at each site?

• Have students research different methods for disposing of chemical waste (alternatives to conventional methods include reducing overall use of chemicals, using genetically-engineered bacteria to decompose waste, and recycling.) Have students research the advantages and disadvantages associated with each method. What is the best way to reduce levels of chemical waste?

• Have students chart their activities over a typical day and identify any waste they generate. For example: The car or bus they ride to school produces nitrous oxides and ozone; the cellophane wrapping they remove from their sandwich at lunch ends up as garbage. Have students propose ways in which they might reduce the amount of waste they produce each day.

• Visit a water treatment plant in your area. How is the water treated? What chemical processes are involved? What happens to the contaminants once they're removed from the water?

KEY CONCEPTS

This film helps reinforce the following concepts:

• Decisions regarding resource use involve ethical considerations for both individuals and society.

• A society's notion of right and wrong is not fixed and may change over time.

• Activities that provide short-term economic prosperity may have long-term negative effects on both society and the environment.

• Long-term economic prosperity depends on a healthy environment.

• The personal beliefs and values people hold about the natural environment may greatly influence their actions toward the environment.

• Alternatives exist to the environmental problems we face today.

• Individuals may play an important role in determining environmental policy in their communities.

LEARNING OBJECTIVES

After viewing this film, your students will be able to:

• explain the importance of the Rocky Mountains to the southwestern states' economies and to the livelihood of people throughout the region;

• describe the ways in which people have permanently altered the natural environment of the Rocky Mountains for economic gain;

• explain the causes and effects of at least two environmental problems facing southwestern states;

• judge the importance of major rivers in determining settlement patterns in the western United States;

• explain the disadvantages of a boom-and-bust economy;

• compare the consequences of short-term vs. long-term exploitation of resources on the natural environment;

• apply what they've learned about environmental problems in the Rocky Mountains to their own community.

BEFORE THE FILM

• Discuss some of the ways in which Americans' views about the environment have changed over the last two hundred years. What events or beliefs influenced people's feelings toward nature? How did early frontiersmen view the wilderness? What about the romanticists? How did people's views of nature correspond with their views on social issues, such as Indian rights, labor unions, and equality among the sexes? What kinds of laws were enacted to protect the environment? Were these laws instituted primarily to conserve natural resources or to protect human health?

• Identify and discuss some of the key environmental problems facing our country today. Examples include water and air pollution, toxic waste disposal, and the loss of endangered plant and animal species. What are some of the causes of these problems? Do different problems share similar causes?

• Identify some historical environmental problems. Examples include the destruction of agricultural land during the Dust Bowl and the near extinction of bison and other species during the expansion of the frontier. Are these problems similar to the environmental problems we face today? How are they different?

• Help your class conduct a cost-benefit analysis of an environmental problem. For example: What are the costs and benefits of installing cleaning equipment to halt harmful emissions from a chemical plant? What are the costs and benefits of doing nothing? Who benefits in either case? Who pays? What if only a few people living next to the plant are adversely affected by the fumes? Is it still worth cleaning up the plant?

• Hold a class debate on the rights of individuals to a clean environment. Do all citizens have a right to clean air and water, or only those who can pay for it? What exactly is a "clean" environment? At what point does human alteration of the environment become "pollution," and under what circumstances do individuals have a right to pollute?

• Hold a class discussion on the different values we assign to natural resources. Do we have a right to use up all the resources available to us if they provide us with materials we need? Who should decide how a particular resource, such as water or timber, should be used? Are natural resources, such as lakes and trees, valuable in their own right, apart from their usefulness to people? What is the "best" use of a natural resource?

AFTER THE FILM

• Have your students interpret the filmmakers' point of view. Was the film fair? Did it present all sides of the issues? If not, which sides were not fairly represented?

• Hold a class discussion about the issues raised in the film. Who should clean up the pollution caused by abandoned mines? Do private companies have the right to pollute the environment if they provide a beneficial service or product to society? If so, how much pollution should they be allowed to produce? Who should pay to clean up the pollution if it begins to affect public health: the people who benefit from the company's products or the company itself?

• Do the people of Crested Butte have a right to prevent the mining company from mining molybdenum if there is a need for that metal? Who should decide if the mining company should have access to that resource? Which should take precedence: jobs or the environment? Is there a way to have both jobs and a clean environment?

• Have students pretend that they are environmentalists of the 1800s, when the miners and fur trappers first came to Colorado. Have them develop a media campaign that would persuade the frontiersmen to conserve the area's natural resources.

• Draw a map for your students of an imaginary town, noting the town's size, population, proximity to other towns, as well as its natural features, such as lakes, forests and minerals. Tell them they've been hired as the town's planning director. Point out that the town needs certain things for its citizens to survive and prosper: transportation, trade, a waste disposal system, jobs, water, food and shelter. What kind of industry will the students recommend? What kind of transportation system will they build? How will they conserve the town's limited resources while providing for housing and other needs? What will they do with any waste that's produced?

• Tell your students to imagine that they are residents of a town called Mountain View. The Mine-It-All Mining Company wants to locate a huge ore mine in a publicly owned section of the town that is located next to a small skiing resort. The mining company will provide residents with high-paying jobs and will pay to reclaim any land it mines.

• Have students hold a mock city council meeting and debate whether the mining company should be allowed to develop the land. Have students act out the roles played by different community members. Potential speakers include the town mayor, the president of the mining company, the owner of the ski resort, the head of the chamber of commerce and local townspeople.

• Have students develop potential solutions to an environmental problem in their community. Examples of problems include litter in a public park, loss of open space from increased development, spraying of toxic weed killers on public lawns or excessive noise from a factory. Encourage students to collect firsthand information on the problem by interviewing residents or by visiting sites in the community that have been adversely affected. Encourage students to write letters to local politicians outlining the problem and its potential solutions, or write an editorial for the local newspaper.

• Have your class sponsor a panel discussion on an environmental problem in the community. Invite local civic and community leaders, representatives from environmental groups and informed citizens to speak on the panel. Have students monitor the discussion and pose questions. If possible, hold an evening session and encourage members of the community to attend.

GLOSSARY

acid: a class of chemical compounds which, when put in solution, reacts with certain metals and bases to form salts; a solution with a pH value of less than 7; many acids are corrosive, have sour tastes, or turn blue litmus paper red.

acid mine drainage: water flowing through mines or mine tailings that is high in sulfuric acid.

acid rain: popular name for precipitation (snow, rain or fog) that contains abnormally high levels of dissolved sulfuric and nitric acids; precipitation with abnormally low pH levels.

aquifer: a permeable body of rock containing flowing water.

bioconcentrate: a process in which contaminants become increasingly concentrated as they travel up the food chain due to predators feeding on contaminated plants and animals.

Continental Divide: in the U.S, the line or zone which separates rivers that flow west toward the Pacific Ocean from those flowing east toward the Arctic and Atlantic Oceans; also known as the Great Divide.

continental plates: huge, moving fragments of the earth's crust that underly the continents.

craniosynostosis: an abnormality distinguished by premature fusing of a fetus' skull and bulging of the head; a birth defect.

ecosystem: a system which includes the organisms of a natural community and their environment.

groundwater: any subsurface water.

headwaters: the source of a stream or river.

heavy metal: a metal with a density at least five times greater than the density of water.

leach: to separate or dissolve soluable metals from an ore body through water percolation.

mine tailings: the refuse material that results from processing ore.

molybdenum: a hard, silvery-gray metal resembling iron; used to improve the performance of special steels and iron-based alloys.

non-renewable resource: a natural resource that cannot be replenished and that occurs in finite reserves.

ore body: a solid and fairly continuous mass of ore which can be distinguished by form or character from adjoining rock; a mineral formation containing a metal.

pH scale: a scale ranging from one to fourteen used to measure the acidity or alkalinity of a solution; a solution with a pH level above seven (neutrality) is considered basic, while a solution with a pH level below seven is considered acidic; if an acid is added to water, the acidity of the water increases and its pH decreases.

radioactivity: the property of spontaneous disintegration possessed by unstable types of atomic nuclei.

reclamation: the recovery of land or other natural resources that have been damaged by natural disasters or human use.

smelter: an industrial furnace used to extract metal from ore.

subalpine valleys: valleys located in mountainous regions below timberline; in the Rocky Mountains, subalpine valleys lie between 9,000 and 11,000 feet in elevation.

Superfund Priority List: a list of hazardous waste sites in the United States designated by the federal government to receive priority funding for clean up under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

watershed: a drainage area which supplies water to a stream and its tributaries, either by surface or groundwater runoff.

SUGGESTED READINGS

BOOKS

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PERIODICALS

High Country News
P.O. Box 1090
Paoina, CO 81428

Environment
400 Albemarle Street, N.W.

Washington, DC ZIP 20016

Environmental News
Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

U.S. Water News
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and The Freshwater Foundation
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ADDITIONAL RESOURCES

For more information on water and air pollution, contact:

Citizen's Clearinghouse For Hazardous Wastes, Inc.
P.O. Box 926
Arlington, VA 22216
(703) 276-7070

Clean Water Action Project
733 15th Street, N.W.
Washington, DC 20005
(202) 638-1196

Environmental Action, Inc.
1525 New Hampshire Avenue, N.W.
Washington, DC 20036
(202) 833-1845

Environmental Defense Fund
1616 P Street, N.W.
Washington, DC 20003
(202) 783-7800

Environmental Protection Agency
Public Information Office

401 M Street, S.W.
Washington, DC 20460
(202) 829-3535

National Audubon Society
950 Third Avenue
New York, NY 10022
(212) 832-3200

The Sierra Club
Public Affairs
730 Polk Street
San Francisco, CA 94109
(415) 776-2211

The Wilderness Society
1400 I Street, N.W.
Washington, DC 20005
(202) 842-3400

For more information on pollution problems in the Rockies, contact:

Environmental Defense Fund
1405 Arapahoe
Boulder, CO 80302
(303) 440-4901

Environmental Research Group
P.O. Box 2190
Aspen, CO 81612
(303) 925-2832

The Wilderness Society
777 Grant Street
Denver, CO 80203
(303) 839-1175

Planet Drum Foundation

P.O. Box 31251
San Francisco, CA 94131
(415) 285-6566

For more information on acid rain, contact:

The Acid Rain Information Clearinghouse (ARIC)
33 S. Washington Street
Rochester, NY 14608
(716) 546-3796

The Acid Rain Foundation, Inc.
181 Butler Avenue West
St. Paul, MN 55118
(612) 455-7719

National Wildlife Federation
1412 Sixteenth Street, N.W.
Washington, DC 20036
(202) 797-6800

National Academy of Sciences
Public Information Office
2001 Wisconsin Avenue, N.W.
Washington, DC 20007
(202) 334-2000

Related Bullfrog Films:

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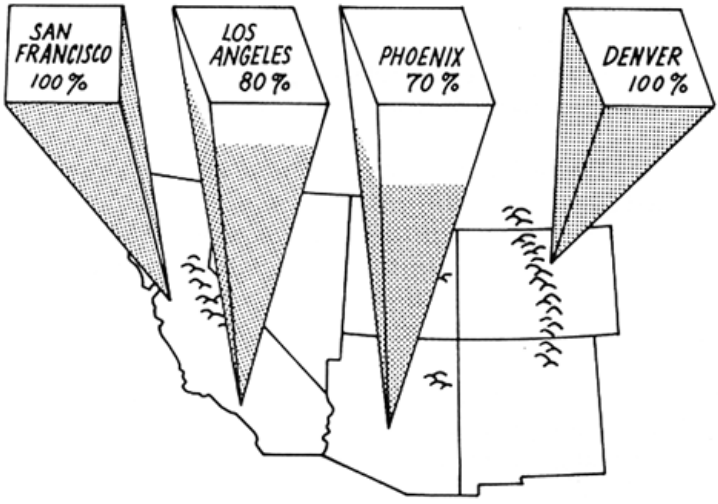
59 min. A complete and moving account of the way people and governments responded to the first Toxic emergency.



CITY DEPENDENCE ON MOUNTAIN WATER