

LEVEL: Grades 4-8. Variation:
Grades Pre K-2

SUBJECTS: Science, Social Studies, Language Arts.

PROCESS: Through learning how fire is a natural event in forests and other ecosystems, students discover how fires help keep plants and other parts of the ecosystems healthy.

OBJECTIVES: The student will:

1. Observe a burning candle to learn about fire.
2. Describe a forest fire: how it starts, spreads, and burns out.
3. Explain several approaches to forest fire management.
4. Create and administer a survey about forest fires and discuss the results.

TIMEFRAME: Preparation: 50 minutes. Activity: Part A: 30 minutes; Part B: two to three 50-minute periods; Part C: two 50-minute periods. Variation: 30 minutes.

SKILLS: Analyzing, categorizing, classifying, observing, summarizing.

MATERIALS: Art materials, glass jar with metal lid, wooden kitchen matches, small birthday candles, paper match, corn or potato chip, magazine photos of forests or fires, "Fire Triangle" and "Colorado Wildfires" worksheets on Student Pages 1 and 2 (attached). Variation: 20 strands of yarn and pieces of blue poster board or construction paper to make necklaces, pieces of red and green construction paper to make head-bands. (Extension: Drawing materials, "Tree Tops Valley" Student Pages 3 and 4 (attached).)

VOCABULARY: Arson, firebreak, fuel, interface, prescribed burn.



LIVING WITH FIRE

OVERVIEW: Fire is a natural event in most forest ecosystems. Some forests depend on fire to recycle nutrients back into the soil. From an ecological standpoint, fire is neither "good" nor "bad." Fire occurs naturally through lightning strikes in the presence of dry fuel. Fires also occur when humans start them intentionally or accidentally.

Fires need heat, fuel, and oxygen to burn - these three elements are known as the "fire triangle." Remove any one of these three elements and the fire will not burn. Initially, the heat is provided by the source of ignition. Fuels include dry trees, dead trees and limbs, leaf litter, and dry grass.

Oxygen is, of course, available in the air. Weather conditions have a great influence on when fires occur and how they spread. Hot temperatures and dry winds can dry out trees and grasses in a forest, making them available as fuel for a fire to consume. The

stronger the winds, the more quickly moisture evaporates from the vegetation, and the faster the fire can spread.

Even in the largest fires, such as the Yellowstone fire in 1988, not everything burns. Patterns of burned areas across the landscape can help keep ecosystems healthy. Areas that have recently burned do not have much fuel or dry dead litter, and they are less likely to burn again soon. Having trees of mixed ages is healthy for the forest ecosystem in many ways, one of which is preventing the entire forest from burning down.

In the southeastern United States, the months of March, April, and May are called "fire season," when 75 percent of forest fires occur. Fire season in the West usually runs from June through October, during the very dry months of year. In the Northeast, it is March through May, and then again in the fall, corresponding to

into new areas of study.

PART C: CAUSE AND EFFECT

1. Have students contact their state forestry agency (usually within the state department of natural resources or department of agriculture) or a local office of the USDA Forest Service. They can ask for information concerning the causes of all large forest or range fires in the state over the past several years, including data on both prescribed burns and uncontrolled burns (see "Colorado Wildfires" student page 2 for sample data).

2. Using the Cause of fires table, have the students develop tables and pie charts showing the actual numbers and percentages of fires from different causes for the years studied. (student page 2).

3. Using the Colorado Fires table, have students compare the data for at least three different years:

-Determine the number of fires each year, noting increases or decreases.

-Reasons why increases or decreases might have occurred.

-Make a graph for 1977-1992. Chart number of wildfires and acres burned.

4. Have students research the effects of fire on the economy and the environment. Find out about financial costs involved in the loss of natural resources and in fire management, ecological costs involved in the loss of natural resources and in fire management, ecological costs or benefits from forest fires, and how various agencies or forest industries manage fire and handle fire prevention.

VARIATION: PRE K-2 FIRE TAG

This game simulates how trees can be destroyed by fire, how they can be protected from fire, and how they grow back.

1. Choose one student to become the Wildfire that burns the trees. She or he wears a red headband.

2. Choose four students to be Smokey Bear rangers. They wear green headbands.

Give each ranger five blue "fire protection" necklaces to hold (see Pre-activity).

3. The remaining students pretend to be trees. They scatter to different parts of the room and stand still.

4. The Smokey Bear rangers gather around the Wildfire in the middle of the room.

5. The game starts when someone yells, "Fire!" Then the Wildfire runs to grab the hand of a tree. When this happens, the tree becomes part of the Wildfire, and the two of them run to grab another tree. Thus, the fire builds and spreads.

6. At the same time, the Smokey Bear rangers run to protect the trees by putting fire protection necklaces around their necks. They can protect only trees that have not yet caught on fire.

7. When a tree receives a necklace, it joins hands with the other protected trees to make a "firebreak" (line of protection that the fire cannot penetrate). In reality, this could be a strip of wet or bare earth.

8. When the fire runs out of fuel, it burns out. Wildfire students drop their hands and stand still to show that new trees have grown in the enriched soil. Once again, there is a forest.

9. Before dismissing the group, discuss the meaning of Smokey Bear's slogan: "Only you can prevent forest fires!"

ASSESSMENT: Have students create a picture-board story of wildfire - it's like a comic book but without any dialogue. The picture board should have at least ten frames showing:

a. How the forest looked before the fire (the fuel-dead trees, leaf litter, etc. should be labeled).

b. How the fire was ignited (natural or human source).

c. The pattern the fire burned (burning near a cabin because there are dry trees around it).

oil, found in all plants.)

Explain that the primary way fire managers prevent fires is by reducing fuels so fires will not start as easily, and won't burn as intensely or for as long.

3. Finally, extinguish the flame by adding water, which removes the heat and smothers the flame. With all of today's "high-tech" firefighting equipment, water is still the main "tool" used to fight fires.

4. Try to have a local firefighter visit your group to talk about the equipment and techniques that are used to suppress fires. Prepare students to ask questions about how fire can be prevented and how they can protect themselves should a fire occur. You can also have a forester visit your group to talk about wildfires. Prepare students to ask questions about how forest fires are managed in their region, and how they can best be prevented.

Note: For grades 6-8, the candle demonstration can be done by groups of students rather than the teacher.

PART B: SURVEY DEVELOPMENT

1. Use magazine pictures of fires and forests to initiate a discussion revolving around students' attitudes on forest fires.

2. Present your research question to your students.

Examples:

-Should controlled burns be allowed in public forests?

-Do forest fires play a negative role in ecosystem management?

-Do forest fires play a positive role in ecosystem management?

Students may be involved in the development of those questions.

3. Discuss surveying as a technique to gather information.

4. Have students develop a ten-question

survey related to perceptions associated with forest fires. Samples:

SAMPLE SURVEY

Please take a few minutes to complete our survey. Simply circle the best response for each question. Thank you!

1. I support controlled forest fires.
Strongly Agree
Agree
No opinion
Disagree
Strongly Disagree

2. I feel that forest fires started by lightning strikes should be allowed to burn until personal property is in jeopardy.
Strongly Agree
Agree
No opinion
Disagree
Strongly Disagree

3. I feel that all forest fires should be extinguished immediately.
Strongly Agree
Agree
No opinion
Disagree
Strongly Disagree

4. I feel that no intervention should occur with forest fires.
Strongly Agree
Agree
No opinion
Disagree
Strongly Disagree

5. Have students pass out surveys to parents, neighbors, teachers, other classes, etc. asking first if they would like to participate. Finished surveys are collected and participants are thanked. After each student collects five surveys, results are tallied and discussed. Be careful, however, not to place too much validity on the results. There are many variables that influence survey results, including such things as the age, education, occupation, residence, etc. of the respondent. Survey questions must be carefully worded. Results can, however, lead

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FIRE TRIANGLE

1. Fires need heat, fuel, and oxygen to burn. This is known as the "fire triangle." Draw a triangle below and label each of the three sides with the word and a picture for each of the three parts.

4. Oxygen is available in the air. Weather has a great influence on when fires occur and on how they spread. Hot temperatures and dry winds can create severe fire conditions by affecting fuel, moisture, and oxygen. What can dry winds do to fuels to make them more likely to burn?

2. Initially, the heat is provided by an ignition source, which can be human or natural. Name two natural and two human-caused sources of heat for fire ignition.

Natural:

1. _____

2. _____

Human-caused

1. _____

2. _____

3. Fires need fuel to burn. In a forest, what sort of fuels might you expect to find? Name three potential fuels:

1. _____

2. _____

3. _____

5. If you cut off any one of these elements, a fire will not burn. What are some ways firefighters might cut off each of the three parts of the fire triangle?

d. How the fire was put out. Which parts of the fire triangle were removed to stop the fire?

RESOURCES:

Fire, George R. Stewart, University of Nebraska Press, 1984.

Fire Ecology: The United States and Southern Canada, Henry A. Wright and Arthur W. Bailey, New York, John Wiley and Sons, 1982.

Fire in America: A Cultural History of Wildland and Rural Fire, Stephen J. Pyne, Princeton, NJ, Princeton University Press, 1982.

Fire: The Story Behind a Force of Nature, Jack DeGolia, Las Vegas, KC Publications, 1989.

Introduction to Wildland Fire: Fire Management in the United States, Stephen J. Pyne, Princeton, NJ, Princeton University Press, 1984.

Wildlife in Transition: Man and Nature on Yellowstone's Northern Range, Don Despain, Douglas Houston, Mary Meagher, and Paul Schullery, Boulder, CO, Roberts Rinehart Publishers, 1986.

Yellowstone and the Fires of Change, George Wuerthner, Salt Lake City, Haggis House Publications, 1988.

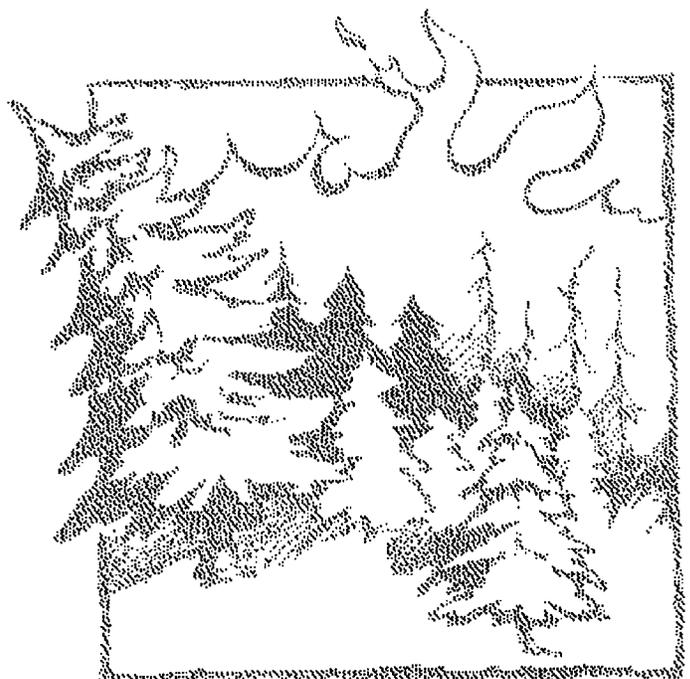
Videos:

Yellowstone Forest 1988, produced by Video Visions, P.O. Box 6721, Bozeman, MT 59715. One hour.

Yellowstone in the Summer '88, produced for Travel Montana and Wyoming Travel Commission by Sage Advertising, P.O. Box 1142, Helena, MT 59624, (406) 442-9500. 17 minutes.

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The walls of our houses, made of bricks, stones, and concrete, are nailed together with nails of steel and other metals. Inside walls are often of gypsum wallboard. Copper wire and pipes running between the walls provide us with water and electricity for cooking our meals.

Minerals also provide the materials for people to express themselves artistically. Minerals are found in paints, and in the clays and marbles used by sculptors. Even soap sculptures are dependent upon minerals since salt is used to manufacture soap.

Scientists would be unable to perform their highly technical research without the aid of computers. Each computer is reported to contain more than 42 different minerals, all mined somewhere.

Like the food we buy in the grocery store, many minerals come from other parts of the country or the world. Minerals come from private property and public lands all across the country including farms, ranches, national forests, and Bureau of Land Management property, especially in the western states. Steel comes from iron ores and blends of metals mined from the ground in places like Pennsylvania, Michigan, and Minnesota. Salt doesn't start at the store, but from places in the earth where there was once sea water like Utah, Louisiana, and Nevada. Coal that is used to generate electricity may come from Wyoming, Montana, and West Virginia; and petroleum used to create plastics and fuel our cars often come from Texas, Colorado, and California. We depend on these resources, yet do we really understand that they come from within the ground and from all over the country and the world?

Mined resources are found in every state within the United States, but not all mined resources are found in every state. For example, copper is found in some states and not in others. Copper is an important mineral in Arizona, Montana, and New Mexico, but not in North Dakota. It might be present, but not in enough quantity that it is worth the cost to mine it. Yet, North Dakota offers other minerals not found in Arizona, Montana, or New Mexico.

PROCEDURE:

PRE-ACTIVITY:

1. Photocopy "State Minerals List" and the U.S. map for each student.

2. Set up a display of items from the materials list and "pretest" students by discussing the sources for these items. Number (1 to 50) and fold 50 small slips of paper and place them in a box or hat for later use.

3. Provide each student with the State Minerals List and U.S. map. This handout provides a list of common minerals from each state. (Note: These are not the only minerals found in the state--just two of the most important ones.) Also included on the list is a common use of each mineral. These manufactured products are not necessarily made in the state, but are made with the minerals mined in that state.

ACTIVITY:

1. On the U.S. map, have the students locate each state and write on that state the two minerals mined there.

2. Ask students to place their initials on states that they have been to or where they have relatives.

3. Create a color key and color in one shade for states with the same mineral. For example, states producing copper could be colored in orange and states producing iron ore could be grey. Select only one duplication per state since there could be many. Identify the climatic and geographic differences in these states. For example, copper is mined in Michigan and in Arizona. Michigan is wet, cool and not a desert while Arizona is hot, dry and definitely a desert. Use travel and family experiences of students to help determine these characteristics.

4. Tell students: 50 slips of paper are numbered 1 - 50 in this box (or hat). As you finish your maps, pull two slips of paper from the hat. Each number will match a state on the "State Minerals List." Number two will be Alaska, three is Arizona, and so on. You are to select the two minerals from the list for each state to report on. Using library resources, including encyclopedias, you need to report