

LEVEL: Grades 4-8 (Can be an extension for 3rd grade, "Eat a Rock")

SUBJECTS: Consumer Education, Geography, Science, Art, Language Arts.

PROCESS: Through gathering data on uses and sites for mining and comparing uses of minerals mined all over the United States, students will explore the value of mining to our lifestyles and to the economy.

OBJECTIVES: The student will:

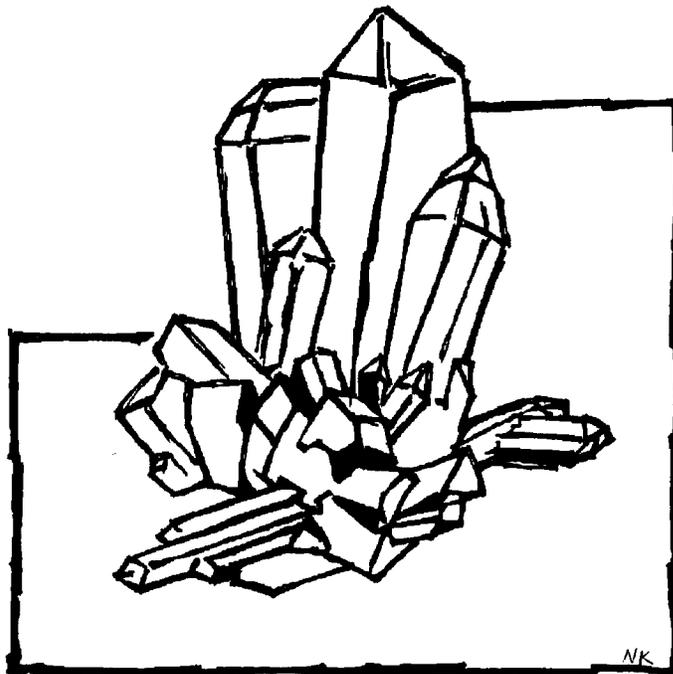
1. List ten of the original sources of ten common consumer products found in their daily lives.
2. Match these products to resources mined from the ground.
3. Identify mineral production in every state of the United States.
4. Evaluate the value of these minerals to their current lifestyles.

TIMEFRAME: Three 50-minute sessions.

SKILLS: Analyzing, applying, discussing, generalizing and predicting, inferring, listing, mapping, problem solving, reading, reporting.

MATERIALS: United States map, 50 small paper slips, library references and encyclopedia, poster board or large construction paper, art supplies (colorful markers, crayons, colored pencils, watercolor and/or poster paints, magazines, glue, etc.), computer (optional), samples of mineral objects: such as copper pipe or wire, plastic pipe, kitty litter, baby powder-talc, clay plant pot, silver, plastic, gold, copper jewelry, pennies, aluminum foil, tin cans, "State Minerals List" (attached), "Mining for Words" (attached).

VOCABULARY: Consumers, minerals, mining, resources.



HOME OF MINE STATE OF MINE

OVERVIEW: You wake up each morning, turn on the light and radio, wash your face, brush your teeth, get dressed, eat breakfast, pick up your homework, lunch box, and daypack, and catch the bus to go to school. Almost everything you have done so far would be impossible without minerals that have been mined from the ground. The alarm clock contains petroleum products, copper, and silver; the water pipes are made of copper, lead, or petroleum products; the light bulb contains tungsten filaments; the toothpaste may be in an aluminum tube and the brush is made from petroleum products. Almost everything you touch throughout the day, at home, at school, and at your friends' houses is made with resources removed from the ground. If the objects weren't made from a mined resource, they were most likely manufactured in a way that used mined resources. For example, consider how a tree (not a mined resource) is turned into paper.

You can bet it has come in contact with metals of many types. It has been transported on trucks made of metal and fueled by petroleum products, for example.

Like the food webs found in nature, we have a close bond to the earth through our dependence upon minerals. We could live without many of these, but our lifestyles would change drastically.

We use minerals in the amounts of billions of tons of sand and gravel each year, and approximately ten tons of minerals a year for every man, woman, and child in the United States. We also need mineral nutrients to keep healthy. Foods we eat supply us with calcium, copper, iron, phosphorus, and much more. Just look on the side of a box of cereal or vitamin bottle label. Minerals are found in fertilizers that grow our foods. Farmers use metal tractors, and grocers use petroleum-fueled metal trucks to bring foods to consumers.

jobs. Invite a geologist from a local college, university, or state geology office to talk about the mining industry.

4. "Mining for Words" contains many of the minerals found in the "State Minerals List." This is a vocabulary enrichment activity that can be completed when students finish their reports.

RESOURCES: Major Minerals and Energy Occurrences - United States by Mineral Information Institute, Inc., Denver, Colorado.

Below are some state resources. Contact your state government for similar materials in your own state if your state isn't listed here.

State Mineral Summaries from U.S. Bureau of Mines State Mineral Officer, Regional Offices:

(CO) Building 20, Denver Federal Center, Denver, CO 80225

(AK) P.O. Box 550 - Mayflower Island, Juneau, AK 99802

(ND,SD) 5629 Minnehaha Avenue South, Minneapolis, MN 55417

(CA, HI, NV) 1605 Evans Avenue, Reno, NV 89512

(ID, MT, OR, WA, WY) East 360 Third Avenue, Spokane, WA 99202

(AZ, NM, UT) 210 E. 7th Street, Tucson, AZ 85705

STATE GEOLOGISTS:

Alaska: Director and State Geologist, Alaska State Geological Survey, Division of Geology and Geophysical Surveys, 794 University Avenue Suite 200, Fairbanks, AK 99709-3645, (907) 474-7147

Arizona: Arizona Geological Survey, 845 North Park Avenue #100, Tucson, AZ 857719-4816, (602) 882-4795

California: Department of Conservation, Division of Mines and Geology, 801 K Street Mail Stop 14-33, Sacramento, CA 95814-3534, (916) 323-5336

Colorado: Colorado Geological Survey, 1313 Sherman Street, Room 715, Denver, CO 80203, (303) 866-2611

Hawaii: Hawaii Geological Survey, Division of Water and Land Development, P.O. Box 373, Honolulu, HI 96809, (808) 587-0230

Idaho: Director and State Geologist, University of Idaho, Morrill Hall, Room 332, Moscow, ID 83843, (208) 885-7991

Montana: Montana Bureau of Mines, Montana College of Mineral Science and Technology, West Park Street, Main Hall, Butte, MT 59701, (406) 496-4180

Nevada: University of Nevada-Reno, Mail Stop 178, Reno, NV 89557-0088, (702) 784-6691

New Mexico: New Mexico Institute of Mining & Technology, Campus Station, Socorro, NM 87801, (505) 835-5420

North Dakota: North Dakota Geological Survey, 600 East Boulevard, Bismarck, ND 58505-0840, (701) 224-4109

Oregon: Dept. of Geology and Mineral Industries, 800 NE Oregon Street, #28, Suite 965 Portland, OR 97232, (503) 731-4100

South Dakota: South Dakota Geological Survey, USD, Department of Water & Natural Resources, Science Center, Vermillion, SD 57069-2390, (605) 677-5227

Utah: Utah Department of Natural Resources, 2363 South Foothill Drive, Salt Lake City, UT 84109-1491, (801) 467-7970

Washington: Washington Department of Natural Resources, Geology/Earth Resources, Washington Dept. of Natural Resources, Mail Stop PY-12, Olympia, WA 98504, (206) 459-6372

Wyoming: Geological Survey of Wyoming, P.O. Box 3008, University Station, Laramie, WY 82071-3008, (307) 766-2286

back with three facts about each mineral and two uses for each not shown on the list. Work in pairs, if you wish, to report on four states instead of two states. The report can be bound in a cover with a map of the United States that shows locations of minerals. [Optional--If there's a computer in the classroom, students can enter their researched information into a computer file that can later be printed out at the conclusion of everyone's activities. A printout of the reports can be presented to the school librarian. The report should contain each state in the United States in alphabetical order, with two minerals including three facts and two uses for each.]

5. Evaluate and discuss the display set up at the start of this activity to determine what minerals make up each item and where items might have been mined.

6. Have everyone list ten different manufactured items in their homes that have come from mineral products. Petroleum products are found in plastics; many metals contain iron ores. Bring the lists to school and try to determine, using the maps and other resources, where it might have been mined. Discuss with students their dependence upon mineral resources--especially petroleum.

7. Conclude "Home of Mine, State of Mine" by having students produce a product poster that shows uses for minerals found in their daily lives. They should use facts discovered in their combined reports on common household uses and the uses provided in the "State Mineral List." Each poster should contain a minimum of ten mined resources. Each item should be identified either in the poster or labeled and identified below it. An example of a poster is a person on rollerblades wearing all of the appropriate safety equipment. Students need to identify the raw resource, i.e. petroleum and steel. Posters can be constructed as collages from drawings found in magazines; from free-hand drawings using markers, paints, pencils, and/or crayons; or from multimedia assemblies.

8. What would happen if the states that produce copper no longer produced copper? Consider the products made from copper and consider the economy of the state. Discuss how each state benefits from the money earned from

the sale of the copper.

ASSESSMENT:

Ask students to:

1. Identify two minerals from two states.
2. List ten items found in the classroom and identify the resource origin.
3. Evaluate their needs for natural resources as they apply to their current lifestyles and report on this in two to three paragraphs.

EXTENSIONS:

1. If the same minerals are found in very different locations around the United States, what predictions can you make about climate conditions when the mineral was forming? (Possible answers can involve geologic history and climatic changes over time.) Is there a relationship?
2. Have students imagine a world without metals. Look around the room, compare everyone's mineral lists from home and classroom activities, and determine non-metal, non-mineral substitutes that would allow us to maintain our current lifestyles. (Would you be able to make these changes in our lives? Try to make these changes for a day in the classroom.) Remember that even pencils and papers come in contact with mined resources.
3. People all over the country work in mining and in the manufacturing processes that change raw resources into consumer items. Have students interview family members (uncles, aunts, grandparents, cousins, etc.) and friends to find out who works where and what they do. The United States economy is very dependent upon mining and manufacturing. Without them, we couldn't have restaurants, doctors, clothing stores, or anything as we currently know it. Encourage students to share interview findings in class. What would happen if these jobs disappeared? What would happen if the minerals disappeared or were no longer available? Why might they no longer be available? What could happen? (There are no wrong answers.) Extend this idea to shopping at Christmas, buying school supplies, and into all levels of the economy. Have students invite some of their relatives/friends in to talk to the class about their

25. Missouri	barite zinc	petroleum medicine
26. Montana	silver petroleum	wire dishes
27. Nebraska	clay natural gas	cat litter cooking
28. Nevada	lithium mercury	rockets thermometers
29. New Hampshire	beryl mica	jewelry glass
30. New Jersey	titanium zinc	jet engines fuses
31. New Mexico	molybdenum vanadium	kitchen tools X-rays
32. New York	slate talc	chalkboards glass bowls
33. North Carolina	asbestos lithium	oven mitts batteries
34. North Dakota	lignite salt	electricity ice cream
35. Ohio	salt sandstone	cheese sidewalks
36. Oklahoma	limestone petroleum	roofing grocery bags
37. Oregon	mercury uranium	mirrors submarines
38. Pennsylvania	iron ore coal	school buses trains
39. Rhode Island	sand gravel	cement roads
40. South Carolina	clay mica	statues oven door windows
41. South Dakota	uranium vanadium	energy fabric dyes
42. Tennessee	marble copper	counter tops electric cables
43. Texas	asphalt petroleum	driveways cassettes
44. Utah	salt vanadium	preserving food rockets
45. Vermont	asbestos marble	insulation fudge boards
46. Virginia	coal soapstone	electricity insecticide
47. Washington	lead tungsten	batteries light bulbs
48. West Virginia	coal salt	electricity ice cream
49. Wisconsin	iron ore zinc	food cans car engines
50. Wyoming	diamonds phosphate	stereos fertilizer

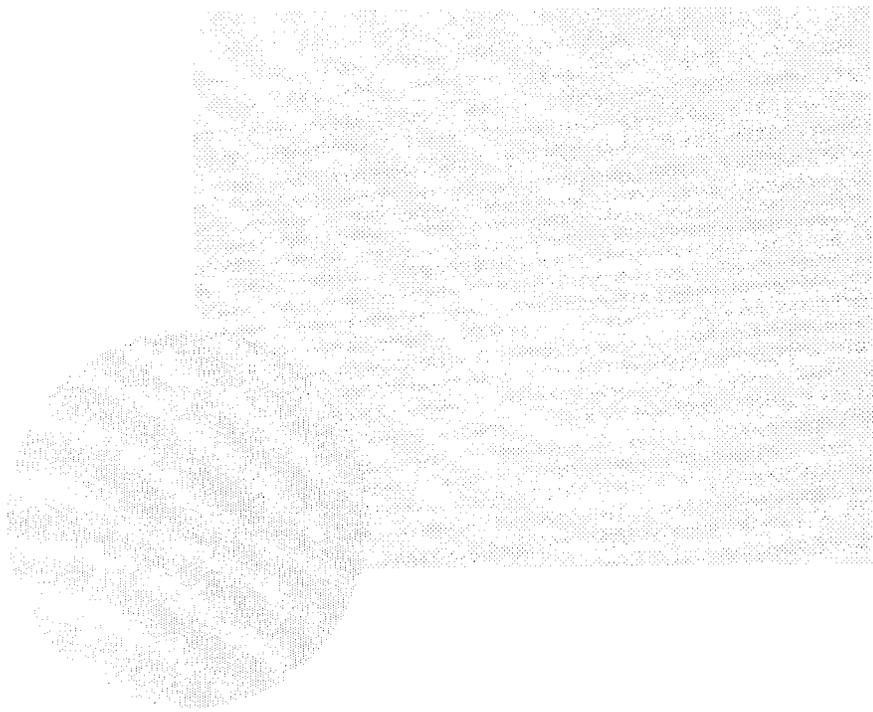
STATE MINERALS LIST

Number/State	Mineral Resource*	Consumer Use**
1. Alabama	salt iron ore	soap iron pipes
2. Alaska	gold petroleum	dental fillings telephones
3. Arizona	copper silver	electric wire radios
4. Arkansas	diamonds aluminum/bauxite	jewelry cooking foil
5. California	asbestos tungsten	roofing material light bulbs
6. Colorado	gypsum copper	wallboards plumbing pipes
7. Connecticut	clay gravel	glossy paper sidewalks
8. Delaware	calcium magnesium	fertilizer lightweight metal alloys
9. Florida	gravel titanium	cement rocket engines
10. Georgia	iron ore talc	highrise buildings baby powder
11. Hawaii	clay volcanic ash	cat litter glass
12. Idaho	cobalt gold	jet engines jewelry
13. Illinois	coal lead	electricity television tubes
14. Indiana	gypsum limestone	plaster buildings
15. Iowa	coal gypsum	electricity cement
16. Kansas	lead salt	batteries food seasoning
17. Kentucky	fluorspar petroleum	toothpaste toys
18. Louisiana	salt sulfur	food seasoning fabric dyes
19. Maine	clay mica	paper coating roofing
20. Maryland	limestone natural gas	caulking cooking
21. Massachusetts	granite limestone	buildings sidewalks
22. Michigan	copper peat	pans houseplants
23. Minnesota	manganese iron ore	pans tractors
24. Mississippi	clay iron ore	dishes airplanes

MINING FOR WORDS (SOLUTION)

M T I W E L E A D F Z M L C I F P G D B
O E Z P V R A Z V C S F L X T Q F K Y A
Y E W V C G Y P S U M L E I F I S E A R I
Y P E P V E W T Q I G T V I M A W Z N I
H E C B C P V K O R D I A M O N D S S T
Q T B S L G A S K E U D R K E Y U W J E
U R E E A G J G U V E F G F I Q A Q K S
D O N R T K S H L L K P C O A L S M I N
Q L O D B T B K U I D D T T F E B D N Y
D E T B P J W W U S U E V L O N E C Y P
A U S G O L D F Y C K U T A W P S S K T
Y M E E M C O W T J K W L S I C T M S L
D O M T M I F R Q J R I A Y G Q O U Y D
U T I V U R K E A F U X B P F S S N H R
A T L E I R F P I M F K O M Q H Z I J E
J P Q T N T T P V I L N C R Y O F M V T
O V F D A A S O Q C U K Z X I G U U H L
J O Z O T G J C T A S B X G Y J J L V P
I S V P I V E L U I R O N O R E E A C Z
W O D C T Y Q X S T A V S B D J G F S S
T R K U R A N I U M A T E L B R A M Q W

SALT
IRON ORE
GOLD
PETROLEUM
COPPER
SILVER
DIAMONDS
ALUMINUM
ASBESTOS
GYPSUM
GRAVEL
TITANIUM
TALC
COBALT
COAL
LEAD
LIMESTONE
SULFUR
MICA
BARITE
URANIUM
MARBLE



MINING FOR WORDS

M T I W E L E A D F Z M L C I F P G D B
 O E Z P V R A Z V C S F L X T Q F K Y A
 Y E W V C G Y P S U M L E I F I S E A R
 Y P E P V E W T Q I G T V I M A W Z N I
 H E C B C P V K O R D I A M O N D S S T
 Q T B S L G A S K E U D R K E Y U W J E
 U R E E A G J G U V E F G F I Q A Q K S
 D O N R T K S H L L K P C O A L S M I N
 Q L O D B T B K U I D D T T F E B D N Y
 D E T B P J W W U S U E V L O N E C Y P
 A U S G O L D F Y C K U T A W P S S K T
 Y M E E M C O W T J K W L S I C T M S L
 D O M T M I F R Q J R I A Y G Q O U Y D
 U T I V U R K E A F U X B P F S S N H R
 A T L E I R F P I M F K O M Q H Z I J E
 J P Q T N T T P V I L N C R Y O F M V T
 O V F D A A S O Q C U K Z X I G U U H L
 J O Z O T G J C T A S B X G Y J J L V P
 I S V P I V E L U I R O N O R E E A C Z
 W O D C T Y Q X S T A V S B D J G F S S
 T R K U R A N I U M A T E L B R A M Q W

SALT
 IRON ORE
 GOLD
 PETROLEUM
 COPPER
 SILVER
 DIAMONDS
 ALUMINUM
 ASBESTOS
 GYPSUM
 GRAVEL
 TITANIUM
 TALC
 COBALT
 COAL
 LEAD
 LIMESTONE
 SULFUR
 MICA
 BARITE
 URANIUM
 MARBLE



They graze on several different grasses, such as rice grass, as a primary food source. They tend to browse quite often on brush and plants with woody stems, especially blackbrush. They also feed on a few forbs, which are green leafy plants other than grasses. Water must be available at all times to maintain a healthy herd. Some sources of water are streams, waterholes, tanks (eroded depressions in the rock that water collects in), dew, springs, and water found in food. Water is the greatest limiting factor for desert bighorn. They prefer open space around their drinking holes so they can see anything that is approaching. They also will not venture more than a few hundred meters from the rough, rocky, broken terrain (their preferred escape terrain) to get water.

Escape terrain is used by bighorns to get away from predators since few animals are able to move as quickly as bighorns through such rugged terrain. Predators of bighorns are eagles (which primarily feed on lambs), gray foxes, coyotes (the most common predator), bobcats, and mountain lions. Predation is not a big problem to bighorn survival due to the rugged terrain they inhabit and the variety of wildlife that these predators prey upon.

As already mentioned, the desert bighorn prefer rough terrain, such as cut up washes or other open areas. Caves and the shelter of trees are used during poor weather and to escape aircraft and eagles. Bighorns do not run long distances, but escape their enemies by climbing and hiding in the rugged terrain of their habitat.

Desert bighorns are not as thick-bodied as northern bighorn sheep. Adult desert bighorns are 30 to 39 inches tall at the shoulders. Males are normally larger than females. An adult male, called a ram, averages 160 to 200 pounds or more in early summer. Rams have a thick, blocky appearance. They have thick necks and large curled horns that measure 30 to 40 inches along the outside of the curl.

An adult female bighorn, called a ewe, averages 105 pounds. Ewes are more slender than males; they have especially slender necks. Ewes have small horns measuring 10 to 13 inches long. They have their first lambs at about age three. They have one or two lambs.

Lambs are born in the spring and gain weight quickly. By two to three months of age they have sleek, well proportioned bodies. At six months of age they are weaned from their mothers; that is, they no longer depend on their mothers for milk.

Lambs are usually born in rough terrain with caves or overhanging rocks for protection from predators and weather. Nighttime bedding grounds are often near the top of a ridge or long spur from which much territory can be seen. Locations like this allow for a quick escape over the ridge or down the mountain.

Cold, cloudy, wet springs influence the health of the lambs by restricting the amount of sunshine and vitamins they need to remain healthy. Warm sunny springs bring them down onto open slopes sooner for feeding. The herd's health is usually good; however, these areas provide less cover for young lambs and predation on lambs is more possible.

Desert bighorns have a "nursery system" so ewes can travel into more open areas to feed on the succulent spring foods. Two ewes remain with all of the lambs along the edge of rough terrain so they can escape danger more quickly. The lambs are very obedient to the two ewes in charge. The other ewes return to the lambs on occasion to nurse and exchange places with one of the nursery ewes. As lambs become older and larger, they begin to eat more solid foods and will follow along with their mothers. Then the nursery ends for that year.

The cause of bighorn mortality is very difficult to determine in 90% of animals found. Possible causes may be attributed to disease caused by bacteria and viruses, parasites, accidents (such as falling, fighting, being hit by cars, or being trapped in tanks or water holes), tumors, mineral and dietary deficiencies, poisonous plants, and extreme climatic conditions.

Desert bighorns must compete with both wild and domestic animals for their needs. Bighorns compete with mule deer for water. They occasionally compete with wild burros for food and water. Desert bighorns also compete for water to some degree with birds and bees. Javelina, jack rabbits, and rodents are other