

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 1: Conservation of Natural Resources

Competency/Objective: Describe the importance of natural resources.

Study Questions

1. **What are natural resources?**
2. **What are the differences between inexhaustible and exhaustible resources?**
3. **Why is it important to conserve natural resources?**
4. **What is the difference between preservation and conservation?**
5. **What agencies monitor our natural resources?**
6. **What is pollution?**

References

1. *Exploring Agriculture in America* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Transparency Master
TM 1.1 Inexhaustible and Exhaustible Resources
3. Activity Sheets
AS 1.1 Exhaustible vs. Inexhaustible Resources
AS 1.2 Resources for the Future
AS 1.3 Oil Pollution of Water

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 1: Conservation of Natural Resources

TEACHING PROCEDURES

A. **Introduction**

Natural resources are important to the welfare of all living things. Many of the products needed for survival rely on one or more natural resources. Conservation of precious natural resources is important for several reasons. This lesson will examine the importance of natural resource conservation.

B. **Motivation**

1. Natural resources include coal, oil, air, water, soil, trees, and wildlife. Acid rain, contaminated or polluted drinking water, clear cutting of forests, and wildlife poaching are conservation problems that need to be addressed. Identify and discuss natural resources that are important to society at this time.
2. Bring to class mounted specimens of fish or wildlife to initiate a discussion of hunting or fishing for recreation and population control.

C. **Assignment**

D. **Supervised Study**

To prepare for an activity in Lesson 5, obtain the board game "Oh My Deer" from Carolina Biological Supply Co., 2700 York Road, Burlington, NC 27215. You will need one game for every four to six participants.

Discussion

Q1. What are natural resources?

A1. Natural resources can be defined as living things, including soil, water, air, etc., that people come in contact with that can be used to perform a useful function.

Ask students to describe a natural resource. Write their answers on the board. Note that resources may include minerals, oil, trees, wildlife, fish, water, soil, air, and other materials found in nature.

Q2. What are the differences between inexhaustible and exhaustible resources?

A2.

- a) **An inexhaustible resource can last forever regardless of human use.**
 1. **They renew themselves continuously.**
 2. **They may, however, be limited.**
 3. **They can be damaged by human misuse.**
 4. **Inexhaustible resources can be replaced by human efforts.**
- b) **An exhaustible resource cannot be replaced or regenerated.**
 - 1) **They exist in finite quantities, and once gone they are gone forever.**
 - 2) **They can, however, be conserved wisely.**

Describe the difference between an exhaustible and an inexhaustible resource. Show TM 5.1 to generate a discussion on the importance of both exhaustible and inexhaustible resources. Have students complete AS 1.1. Ask students why they think it is important to know the difference between exhaustible and inexhaustible resources.

Q3. Why is it important to conserve natural resources?

A3. Natural resources interact with each other and depend upon one another. When one natural resource is affected adversely, others may suffer.

Discuss why it is important to conserve natural resources. Include a discussion about how resources interact and depend on each other for survival. Conduct AS 1.2 and discuss the impact conservation has on future generations.

Q4. What is the difference between preservation and conservation?

A4.

- a) **Preservation maintains natural resources that already exist by prohibiting their use and returning them to a natural state.**
- b) **Conservation is the careful use and management of resources to avoid wasting them for future generations.**

Explain the differences between preservation and conservation. Discuss the fact that most people involved in agriculture take great pains to **conserve** their natural resources, and because agriculture depends on the wise **use** of natural resources, **preservation** is not necessarily a feasible option. Divide the board into two categories (one for preservation and one for conservation) and have students list resources, items, or areas that are preserved or conserved.

Q5. What agencies monitor our natural resources?

A5.

- a) **Bureau of Land Management**
- b) **U.S. Fish and Wildlife**
- c) **National Park Service**
- d) **Environmental Protection Agency**
- e) **Forest Service**
- f) **Natural Resources Conservation Service**
- g) **National Scenic Riverways**
- h) **Missouri Department of Conservation**
- i) **Missouri Department of Natural Resources**

Each agency has its own responsibilities.

Q6. What is pollution?

A6.

- a) **Pollution is the presence of substances in water, soil, or air that affects its usefulness or makes it offensive.**
- b) **Pollution involves two forms.**
 - 1) **Point source can be traced to a specific point of discharge and is readily identifiable. One example of point source pollution is water pollution caused by industrial waste that is dumped directly into a nearby stream.**

- 2) **nearby stream.**
Nonpoint source occurs from sources that cannot be directly traced to a specific point of discharge. One example of this is air pollution and smog in large cities caused by emissions from thousands of vehicles.

Have students complete AS 1.3 to become familiar with how pollution affects the water environment.

F. Other Activities

1. Students could research a recycling program in their community. Start research at pick-up points and follow the product's path to the recycling center or to the production of recycled products. Recycle the paper used in class for 1 week to calculate how much could be saved over a year's time.
2. Take the class on a field trip to a wastewater treatment plant or recycling facility.
3. Have students select one natural resource and provide information on the following.
 - a) Where is the resource geographically located?
 - b) What is the method used for retrieval for this resource (mining, drilling, etc.)?
 - c) What products are made from this resource?
 - d) What are the processing procedures of this resource?
 - e) How is it transported from area of retrieval to other parts of the region or world?
 - f) What are economic benefits to the country that possesses this resource?
4. View the video *Guarding Our Living Environment*, Ag Video 128, available from the Missouri Resource Center for Career & Technical Education (MRCCTE), University of Missouri-Columbia.
5. View the video *Soil Conservation Technician*, STW Video 27, available from MRCCTE, University of Missouri-Columbia. This video discusses career opportunities as well as the work a technician will perform.
6. Invite a forest service or conservation agent to speak to the class about the importance of conserving natural resources.
7. Give students trash bags containing both recyclable and nonrecyclable items. Customize the contents of each trash bag to the location of the classroom. Ask students to sort the contents of each bag into recyclable and nonrecyclable.

G. Conclusion

Practices to conserve natural resources should be implemented to preserve the natural condition of the land, air, water, and wildlife resources. Preservation of these resources will ensure their availability for future generations.

H. Answers to Activity Sheets

AS 1.1 Exhaustible vs. Inexhaustible Resources

1. I
2. E
3. E

5. I
6. I
7. E
8. I
9. E
10. E
11. The instructor should determine if answers are appropriate.

AS 1.2 Resources for the Future

Answers will vary.

AS 1.3 Oil Pollution of Water

Answers will vary.

I. ***Evaluation***

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

Inexhaustible vs. Exhaustible Resources

Inexhaustible Resources

Can be renewed or regenerated

Include:

- Water
- Air
- Wildlife
- Forests

Exhaustible Resources

Cannot be replaced when used

Include:

- Crude oil
- Coal
- Minerals
 - Gold
 - Copper
 - Iron
- Soil

Exhaustible vs. Inexhaustible Resources

Objective: Students will differentiate between exhaustible and inexhaustible resources.

Directions: To the left of each natural resource listed below, identify the inexhaustible resources by writing an "I" in the blank and identify the exhaustible resources by writing an "E" in the blank.

1. ___ Oak trees
2. ___ Crude oil
3. ___ Natural gas
4. ___ Water
5. ___ Air
6. ___ Wildlife
7. ___ Coal
8. ___ Pine trees
9. ___ Iron ore
10. ___ Soil
11. What steps can you take to conserve resources in your community?

Resources for the Future

Objective: Students will understand the importance of conserving resources for future generations.

Materials and Equipment:

Large container filled with peanuts

Lunch bag for each student

Procedure:

1. Divide the class into three equal groups. Name your own group.
2. The instructor will think of a number between 1 and 15. Each group tries to guess the number. The groups will proceed with the activity according to how close each group comes to guessing the correct number.
3. Everyone is given a lunch bag.
4. On the instructor's desk is a large bowl filled with peanuts. This bowl is labeled "The World's Supply of Peanuts."
5. The first group comes up to the bowl and everyone takes as many peanuts as desired.
6. When the first group is through, the second group takes whatever it wants. Finally, the third group takes as many peanuts as it can.
7. Within your group, designate someone to record responses to the following questions:
 - a. What does "exhaustible" mean? What are examples of exhaustible resources in your hometown?
 - b. How did the first group react when allowed to take the peanuts? How did you feel when you watched them take these resources?
 - c. What was the reaction of the last group when it had access to the peanuts?
 - d. If a fourth group could have some peanuts, how many would be available?
 - e. What will now happen to the world's supply of peanuts? What, if anything, could change this situation? What would you do to protect exhaustible resources?
8. Share your responses with the other groups.

Oil Pollution of Water Environment

Objective: Students will observe the effects of oil pollution on the water environment.

Materials and Equipment:

Water

Four 1-quart jars

1 quart motor oil

Table scraps

Dish soap

1 cup coffee grounds (used)

Algae

Microscope

Eight local/common water plants of varying types

Measuring cup

Labels

Eye dropper

Four slides and cover slips

Procedure:

1. Place 3 cups of water into each of the four 1-quart jars.
2. Label the jars as follows:
 - a) Jar 1 - fresh water - motor oil
 - b) Jar 2 - fresh water - dish soap
 - c) Jar 3 - coffee grounds
 - d) Jar 4 - table scraps
3. Add the algae and two water plants to the fresh water in each jar.
4. Use the dropper to add 8-10 drops each of oil to jar 1 and dish soap to jar 2.
5. Use the scoop to add a scoop of coffee grounds to jar 3 and table scraps to jar 4.
6. Every day, check the jars. Continue checking for 1 week. Record your daily findings in the chart found in step 9.
7. After 1 week, make a microscope slide from samples of each jar and observe the algae or plants. Record your findings in the chart shown in step 10.
8. Record your observations as you drop the oil in the water.

9. Record your daily observations in the chart below.

Day	Jar #			
	1	2	3	4
1				
2				
3				
4				
5				
6				
7				

10. Record your microscope observations in the chart below.

Jar #	Observation
1	
2	
3	
4	

Key Questions:

1. What change(s) occurred when the oil was placed in the water?
2. What happened to the algae or water plants when the oil was added?
3. What was the effect of dish soap on the algae and water plants?

4. How was the water plant affected by the oil?

5. What effect did the dish soap have on the water plant?

6. Did the coffee grounds or table scraps affect the algae? In what way?

7. Did the coffee grounds or table scraps affect the water plant? In what way?

8. How can household wastes pollute the water?

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 2: Soil Conservation

Competency/Objective: Describe the importance of soil conservation.

Study Questions

1. **What factors contribute to soil erosion?**
2. **How does soil erosion affect food production?**
3. **What is soil conservation?**
4. **What are soil conservation practices?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Transparency Master
TM 2.1 U.S. Land Affected by Soil Erosion
3. Activity Sheet
AS 2.1 How Does Mulch Prevent Soil Loss? (Instructor)

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 2: Soil Conservation

TEACHING PROCEDURES

A. **Review**

Lesson 1 discussed how natural resources are a precious commodity in the environment. Soil is a vital resource for the continued production of food and fiber crops. Each growing season, crops are planted and then harvested. Conservation practices to reduce soil erosion are important.

B. **Motivation**

1. Using different samples of soil, explain how plants get what they need from the soil. Pass around different types of soil samples for students to see and feel.
2. Ask students how many of them cross a creek to get to school. When a heavy rain comes, what color is the creek? Point out that the muddy color is actually soil in the water. Discuss how long it takes to replace 1 inch of topsoil. (It takes between 200 and 1,000 years.)
3. Take students on a walk on the school grounds. Identify erosion problem areas or potential areas. Discuss what could be done to control erosion in these areas.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

Q1. What factors contribute to soil erosion?

A1.

- a) **Human activity such as plowing or construction**
- b) **Water erosion**
 - 1) **Excess rainfall cannot be absorbed into the earth, so it runs off the surface and carries large amounts of soil with it.**
 - 2) **Raindrop splash causes soil particles to become separated and thrown about.**
- c) **Wind erosion - small particles of soil carried away by gusts of wind**
- d) **Natural events**
 - 1) **Earthquakes**
 - 2) **Floods**
 - 3) **Tornadoes**
 - 4) **Land slippage on wet, sloping land**

Discuss acreage that is affected by soil erosion and its impact on plant and animal life. Have students complete AS 2.1 to help them identify factors that affect soil erosion.

Q2. How does soil erosion affect food production?

A2.

- a) **Soils that have been eroded lose their nutrients and ability to hold water,**

- making plant life unable to thrive and grow.**
- b) **Plant nutrients are reduced and animals do not receive proper nutrients to grow and thrive.**

Explain to students how soil erosion impacts the food chain and how it affects overall food production.

Q3. What is soil conservation?

A3. Soil conservation involves the protection, conservation, and improvement of the soil.

Explain to students the concept of soil conservation. Remind them of the work done by the Natural Resources Conservation Service that was discussed in the previous lesson.

Q4. What are soil conservation practices?

A4.

- a) **Contour planting**
- b) **Crop rotation**
- c) **Terracing**
- d) **Grassed strips**
- e) **Diversion ditches**
- f) **Strip cropping**
- g) **Vegetative covers**

Show TM 2.1 to illustrate how land is affected by soil erosion. Refer to Figure 1 in the Student Reference for examples of soil conservation practices. Explain to students that this is just a sampling of the conservation practices being used in agriculture. Have the students research other ways in which conservation practices are being used in their local area.

F. *Other Activities*

1. Gather pictures of areas that have been affected by soil erosion. Discuss the adverse effects.
2. On the board, list measures or techniques that can be used to prevent soil erosion.
3. View the video Stream Sense (Ag Video 123) available through the Missouri Resource Center for Career & Technical Education, University of Missouri-Columbia.
4. Invite a representative of the Natural Resources Conservation Service to discuss soil conservation.
5. Invite a representative from the highway department to class to discuss the various requirements during construction.

G. *Conclusion*

Soil is a precious resource needed to sustain life. The movement of wind or water causes most soil erosion across the soil surface. Soil erosion removes fertile topsoil, leaving less fertile subsoil behind. Soil erosion is a problem that affects everyone. Farmers and others are using soil management practices to conserve soil resources.

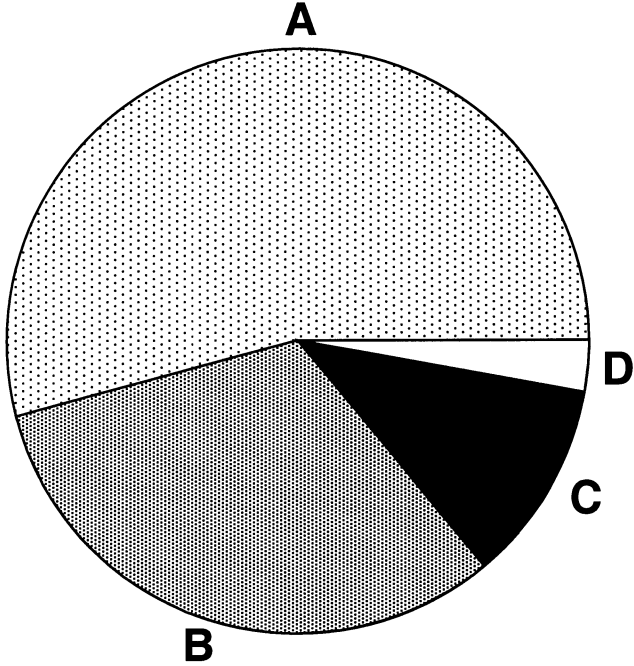
H. ***Answers to Activity Sheet***
There are no answers for this activity.

I. ***Evaluation***

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

U.S. Land Affected by Soil Erosion

- A. 1.2 billion acres not affected by soil erosion
- B. 775 million acres eroded to some extent
- C. 280 million acres seriously damaged by soil erosion
- D. 25 million acres lost due to soil erosion



Total Land is 2.2 Billion Acres

Source: *Applied Environmental Science Book*, Lesson 3 page 57

How Does Mulch Prevent Soil Loss?

Objective: Students will discover how mulch will prevent loss of soil through erosion.

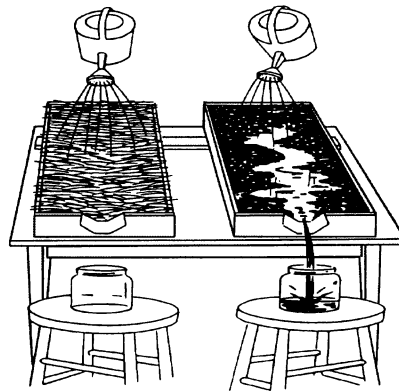
Materials and Equipment:

Two small boxes about 16 inches long, 12 inches wide, and 4 inches deep

Two quart-size flower sprinklers

Two half-gallon wide-mouth jars

Two sticks of wood about 1 inch thick



Procedure:

1. At one end of the box, cut a V-notch 1 to 1 ½ inches deep and fit with a tin spout to draw runoff water into a container (see drawing).
2. Fill the boxes with the same type of soil. Cover one box of soil with a thin layer of straw, grass, wood shavings, or sawdust. Leave the other box of soil bare.
3. Set the boxes on the table, placing sticks under one end to make a slope.
4. Put the empty jars on stools placed beneath the spouts.
5. Fill the two sprinklers with water and pour the water on both boxes at the same time. Pour steadily at the same rate for both boxes. Hold the sprinklers about the same height from the boxes. About a foot is satisfactory, although you can get various results with different heights.
6. Note how much and how fast the water runs off into each jar.
7. The water on the bare soil will rush off into the jars. The jar will contain muddy water. The water that flows over the mulch will take longer for the flow to start and it will continue longer. Also, not as much water will reach the jar. The water flowing into the jar should be fairly clean.
8. This demonstration illustrates how soil covered with mulch, or other protective coverings, reduces water runoff as opposed to soil that is bare.

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 3: Water Quality

Competency/Objective: Describe the importance of water quality.

Study Questions

1. **What is the hydrologic cycle?**
2. **What is water quality?**
3. **What factors affect water quality?**
4. **What are some types of water pollution?**

References

1. *Exploring Agriculture in America* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Transparency Master
TM 3.1 The Hydrologic Cycle
3. Activity Sheets
AS 3.1 Water's Going On?!
AS 3.2 Edible Earth Parfaits

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 3: Water Quality

TEACHING PROCEDURES

A. **Review**

In the previous lesson, the importance of soil and soil conservation was discussed. Another important natural resource is water. Water is needed for human consumption, to produce food, and to aid in the production of manufactured products. This lesson explains the water cycle, water quality, and the factors that affect the quality of water.

B. **Motivation**

1. To illustrate how pollutants enter the water cycle, perform the following exercise. Using a dropper, drop dark food coloring on a slice of white bread (fresh or stale) that is held vertically. Mist the bread with water. Watch how the food coloring seeps through the bread. Compare the food coloring to a pollutant, the bread to soil, and the water to rain. Notice how the food coloring is dispersed throughout the bread as water is applied to it.
2. Using a Bunsen burner, boil a small amount of water to produce steam. Ask students what has happened to the water.
3. Use the board to chart where your city's or community's water supply comes from or where water in farm streams or ponds originated.
4. Show the video *Missouri Groundwater: The Hidden Resource* (Ag Video 124), available from the Missouri Resource Center for Career & Technical Education (MRCCTE), University of Missouri-Columbia.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

Q1. What is the hydrologic cycle?

A1. Also called the water cycle, the hydrologic cycle is the process whereby water moves from bodies of water to the atmosphere, to the land, and back to the bodies of water.

Use TM 3.1 to display the hydrologic cycle. Convey to students that this is the ongoing process whereby the earth is supplied with water necessary to sustain life. Have students complete AS 3.1 to demonstrate how the hydrologic cycle works. Have students complete AS 3.2 and discuss the amount of water used daily in the home. Discuss the importance of conserving water.

Q2. What is water quality?

A2. Water quality is determined by assessing the condition of water for a particular use.

It is important to understand that the end use of water will determine its level of quality. For instance, drinking water would be set to a higher standard of quality than water used for

industrial purposes.

Q3. What factors affect water quality?

A3.

- a) **Odor and taste**
- b) **Color**
- c) **pH**
- d) **Hardness**
- e) **Turbidity**
- f) **Heavy metals**
- g) **Chemical residues**
- h) **Bacteria**

Discuss and explain the factors that affect water quality. Explain the importance of testing the water quality to ensure it is safe for human consumption.

Q4. What are some types of water pollution?

A4.

- a) **Sediment**
- b) **Pathogens**
- c) **Organic wastes**
- d) **Inorganic materials**
- e) **Organic chemicals**
- f) **Thermal pollutants - water added to lakes or streams that was used for industrial purposes and is much warmer than normal**

Discuss factors that affect water quality. Note that there are water sources aboveground including lakes, rivers, and streams. In addition, there are many underground water storage reservoirs called aquifers. Pollution of water resources, either aboveground or underground, is a serious problem, affecting the quality of water throughout the world. Have students complete AS 3.3 and discuss how pollutants can enter drinking wells and contaminate drinking water.

F. *Other Activities*

1. Have students take a water sample from a local stream, river, or pond. The instructor should have the results of an earlier test ready to discuss with the students.
2. Have students clip articles from local newspapers that deal with water pollution topics. Post the articles on the bulletin board.
3. Show the video *The Groundwater on the Move* (Ag Video 125), available from the Missouri Resource Center for Career & Technical Education (MRCCTE), University of Missouri-Columbia.
4. Tour a local water treatment plant for students to compare the quality of the water coming into the facility to the quality of water going out for public use. Investigate how water quality is measured.

G. *Conclusion*

Water is a precious resource. Although water may be considered a renewable resource, it can be contaminated to the point that it is virtually unusable. Each individual can take part in protecting

water supplies. An awareness of the causes of pollution is vital in maintaining quality water resources.

H. ***Answers to Activity Sheets***

AS 3.1 Water's Going On?!

The instructor should determine if the answers are appropriate.

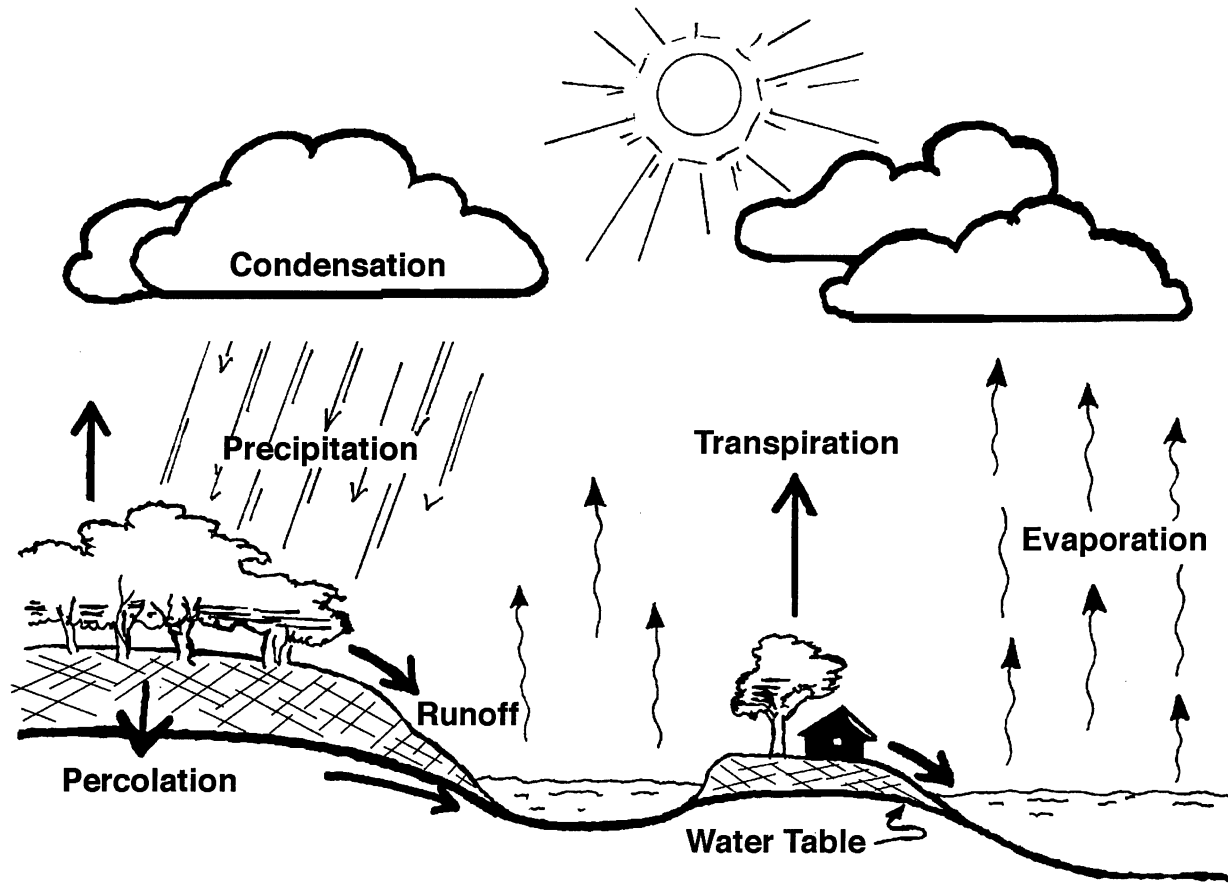
AS 3.2 Edible Earth Parfaits

There are no answers to this activity.

I. ***Evaluation***

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

The Hydrologic Cycle



Lesson 3: Water Quality

Name _____

Water's Going On?!

Objective: Students will assess amounts of water used in the home and illustrate the importance of water conservation.

Directions: Enter in Column C the number of times each situation occurs each day. Multiply Column B x Column C and enter total in Column D.

A	B	C	D
WHAT WE DO	HOW MUCH WATER IS USED	HOW OFTEN	DAILY WATER USE
Flushing a toilet	5-7 gallons		
Taking a bath with a tub full	30 gallons		
Taking a shower with water running	20 gallons		
Shaving with water running	15 gallons		
Brushing teeth with water running	5 gallons		
Washing hands or face with water running	2 gallons		
Drinking - running water to cool	1 gallon		
Cleaning vegetables with water running	3 gallons		
Dishwasher on full cycle	16 gallons		
Wash dishes by hand with water running	30 gallons		
Washing clothes on full cycle at top water level	60 gallons		
<i>Total Water Use</i>	<i>(add the numbers in Column B)</i>		

Reference: U.S. Department of Agriculture, Natural Resources Conservation Service

Edible Earth Parfaits

Objective: Students will understand how pollution can get into groundwater and how pumping can cause a decline in the water table.

Materials and Equipment:

Blue or red food coloring
Vanilla ice cream
Clear soda pop
Crushed ice
Assorted cake decoration sprinkles and sugars
Drinking straws
Clear plastic cups

Procedure:

1. Begin to construct your edible well by filling a clear plastic cup one-third full with crushed ice; this represents gravels and soils.
2. Add enough soda to just cover the ice.
3. Add a layer of ice cream to serve as a "confining layer" over the water-filled "well."
4. Add more crushed ice on top of the "confining layer."
5. Sprinkle colored sugars and sprinkles over the top to create the porous top layer, representing soils.
6. Add the food coloring to the soda. The food coloring represents contamination. Watch what happens when it is poured on the top of the well. Keep in mind that the same thing happens when contaminants are spilled on the earth's surface.
7. Using your straw, drill a well into the center of your aquifer.
8. Slowly begin to pump the well by sucking on the straw. Watch the decline in the water table.
9. Notice how the contaminants can get sucked into the well area and end up in the groundwater by leaking through the confining layer.
10. Now recharge your well by adding more soda, representing a rain shower.
11. Review what you have learned as you enjoy eating your edible well.

Credit: The Groundwater Foundation, P.O. Box 22558, Lincoln, NE 68542-2558 (402) 434-2740
<<http://www.groundwater.org>>

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 4: Air Quality

Competency/Objective: Describe the importance of air quality.

Study Questions

1. **What is air quality?**
2. **What types of pollution affect air quality?**
3. **What are the sources of air pollution?**
4. **Why is it important to maintain air quality?**
5. **What is being done to ensure air quality?**

References

1. *Exploring Agriculture in America* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Transparency Master
TM 4.1 Air Pollution in the Past
3. Activity Sheets
AS 4.1 Factors Affecting Air Quality
AS 4.2 Pollutants in the Home

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 4: Air Quality

TEACHING PROCEDURES

A. **Review**

Previous lessons discussed water quality and conservation. This lesson will discuss air quality. Fresh, clean air is necessary for life but frequently is taken for granted. Citizens should strive to keep air clean by recognizing and reducing causes of air pollution.

B. **Motivation**

1. Using an oxyacetylene torch, light the torch with only acetylene to show the soot that is formed. Ask students what happens to the soot in the air.
2. Using a white paper towel, hold it over the exhaust pipe of a car that is running. Repeat the experiment on a diesel car or truck. Were there any differences in the color of the exhaust emissions?
3. Show students an air filter from a furnace to show them how much dust and other matter is captured from the air people breathe.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

Q1. **What is air quality?**

A1. **Air quality is the purity of the air that is used by living organisms.**

High-quality air is free of pollution. Air with low quality contains materials that are toxic for living organisms to breathe. Have students brainstorm a list of possible ways that humans and other living things are affected by the quality of the air.

Q2. **What types of pollution affect air quality?**

A2.

- a) **Gaseous pollutants**
 - 1) **Carbon monoxide**
 - 2) **Nitrogen dioxide**
 - 3) **Sulfur dioxide**
 - 4) **Hydrocarbons**
- b) **Odor**
 - 1) **Factory odors**
 - 2) **Animal odors**
 - 3) **Waste treatment facilities**
- c) **Particulate matter**
 - 1) **Natural particles**
 - 2) **Human-generated particles**

Many factors contribute to the reduced quality of air in the environment. It is important to take steps to improve the quality of air in the environment. Complete AS 4.1 as a group and discuss possible ways humans contribute to the reduction of the quality of their air. Complete AS 4.2 and identify sources of air pollution in the home.

Q3. What are the sources of air pollution?

A3.

- a) **Human activities - burning, factories, automobiles, etc.**
- b) **Natural processes - fires, volcanic eruptions, decay, etc.**

Have students relate the types of pollution identified in study question 2 to their sources in this study question.

Q4. Why is it important to maintain air quality?

A4.

- a) **Human health**
- b) **Plant health**
- c) **Climate**
- d) **Maintain beauty of surroundings**
- e) **Reduce damage to property**

Air rich in chemicals, hazardous gases, and other pollutants affects the health of animals and plants. It damages property and causes a dingy, dirtier looking world in which to live. Discuss important reasons to maintain air quality.

Q5. What is being done to maintain air quality?

A5.

- a) **Motor vehicle emission controls on new cars**
- b) **Motor vehicle exhaust inspection**
- c) **Increased public transportation**
- d) **Use of ethanol and electric cars**
- e) **Use of alternate energy such as solar power, water power, and windmills**

Although progress has been made in controlling air pollution, more needs to be done. The public has become more conscious of the environment and is taking steps to maintain air quality. Each person should do his or her part to reduce air pollution and to maintain a healthy environment in which to live. Display TM 4.1 to demonstrate how pollution standards have developed and changed over history.

F. *Other Activities*

1. Have students clip out newspaper articles on air pollution and write short critiques or summaries of these articles or have students to make a collage of magazine and newspaper pictures of air pollution sources.
2. Ask students to identify one source of air pollution and present to the class a way the source can be prevented or reduced.
3. Have students debate whether the air is cleaner now than it was 20 years ago. Encourage them to consider the current population and amount of industries in operation. What safeguards do we now have that were not enforced 20 years ago?

G. ***Conclusion***

H. ***Answers to Activity Sheets***

AS 4.1 Factors Affecting Air Quality

Answers will vary.

AS 4.2 Pollutants in the Home

Answers will vary.

I. ***Evaluation***

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

Air Pollution in the Past

- 1960** Studies are conducted on how carbon dioxide creates the greenhouse effect.
- 1963** About 300 people were killed and thousands of others were injured in New York City because of high concentrations of air pollutants that accumulated in air over the city. Other episodes in major cities led to much stronger air pollution control programs in the 1970s.
- 1963** Clean Air Act of 1963 authorized the U.S. Public Health Service to study air pollution and provided grants and training for states to control it.
- 1970** With the passage of the Clean Air Act Amendments of 1970, responsibility for controlling air pollution was assigned to the Environmental Protection Agency. Ambient air quality standards and performance standards for coal-fired power plants were established. These standards became known as the New Source Performance Standards.

Air Pollution in the Past

1987 CFC production is banned through a multinational treaty called Montreal Protocol.

1990 Clean Air Act Amendments of 1990 targeted several specific areas:

Acid Rain: Reduce by half sulfur dioxides and nitrogen oxides.

Urban Smog: Establish targets for cities that do not meet limits on ozone (a key ingredient in smog.) These cities (non-attainment areas) have specific phased-in targets to be met.

Automobile Emissions: Set specific targets for reduction of tailpipe emissions of hydrocarbons. Require longer-lasting pollution control equipment on cars and cleaner kinds of gasoline (such as gasohol) in cities with the worst carbon monoxide problems. Mandate development of automobiles meeting even stricter standards in extremely pollution-prone cities like Los Angeles.

Air Pollution in the Past

1990 Toxic Air Pollutants: Expand the number of regulated toxic air pollutants from 7 to 189, set new safety standards for residents living near polluters, require polluters to install the best available pollution control equipment to reduce toxic emissions by 90% by the year 2003.

Depletion of the Ozone Layer: Phase out destruction of ozone-destroying chemicals throughout the 1990s, including CFCs, methyl chloroform, and carbon tetrachloride and establish rules for recycling and disposal of such chemicals.

Lesson 4: Air Quality

Name _____

Factors Affecting Air Quality

Objective: Students will identify sources affecting air quality.

Directions: Generate a list of sources contributing to reduced quality of air and list them to the right of each category.

Gaseous Pollutants

Odor

Particulate Matter

Lesson 4: Air Quality

Name _____

Pollutants in the Home

Objective: Students will identify sources of pollution in the home.

Directions: Identify possible sources of pollution in your home, ways in which the pollutant could have harmful effects on people in the home, and possible ways in which the pollution could be reduced.

Sources of Pollution

Effects

Solutions

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 5: Wildlife Management

Competency/Objective: Describe the importance of wildlife management.

Study Questions

1. **What is wildlife management?**
2. **What factors affect wildlife habitat?**
3. **What are agencies involved in wildlife management?**
4. **What are some wildlife management practices?**

References

1. *Exploring Agriculture in America* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Transparency Masters
TM 5.1 Economic Impacts of Recreation & Wildlife Watching in Missouri 1996
TM 5.2 Wildlife Management Agencies
3. Activity Sheets
AS 5.1 Maintaining Wildlife Habitats
AS 5.2 Oh My Deer

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 5: Wildlife Management

TEACHING PROCEDURES

A. **Review**

In the previous lesson, the importance of maintaining air quality was discussed. This lesson will discuss wildlife management. Wildlife includes all animals that live in the natural environment without human assistance. Domestic animals require humans to survive and may not survive in nature.

B. **Motivation**

1. Ask students if they know of anyone who has tried to tame a wild animal and keep it for a pet. Have them describe the experiences this person had.
2. Have a Department of Conservation agent speak to the class about the goals of wildlife management.
3. Ask students if they can name any endangered wildlife in their state. Also ask students if they know what is being done in their state to protect these wildlife species.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

Q1. **What is wildlife management?**

A1. **Wildlife management practices involve caring for wildlife and their environment to ensure the continuation of the species.**

Many wildlife management practices have been implemented to ensure the continuation of species nearly destroyed by human progress. Have students perform AS 5.1 and discuss when a wildlife habitat is destroyed, basic needs are endangered.

Q2. **What factors affect wildlife habitat?**

A2.

- a) **Urbanization**
- b) **Tilling the land for crops and pasture for livestock**
- c) **Manufacturing and industry**
- d) **Mining of land**
- c) **Cutting trees in forests**
- e) **Recreation areas**

Human advancement and habitation often come at the expense of wildlife habitats. It is important to develop methods for humans to advance society while maintaining natural habitats for wildlife. Complete AS 5.1 and discuss ways people can maintain wildlife environments. Wildlife is sustained to some degree through economics. Refer to TM 5.1 to demonstrate the financial impacts of recreation (fishing, hunting, and wildlife watching).

Q3. **What agencies are involved in wildlife management?**

A3.

- a) **U.S. Fish and Wildlife Service**
- b) **U.S. Department of Agriculture**
- c) **Bureau of Land Management**
- d) **Forest Service**
- e) **Missouri Department of Conservation**
- f) **Missouri Department of Natural Resources**

Wildlife management is a responsibility conducted on a federal, state, local, and even individual level. Use TM 5.2 to describe the organizations responsible for managing and protecting wildlife.

Q4. What are some wildlife management practices?

A4.

- a) **Managing habitat**
- b) **Controlling and preventing the spread of disease**
- c) **Hunting and hunting regulations**
- d) **Artificial stocking**
- e) **Managing funds**

Discuss wildlife management practices that have been implemented by federal and state agencies to ensure the health and growth of wildlife habitat and species. Conduct AS 5.2 to illustrate management practices for wildlife.

F. *Other Activities*

1. Assign students to make posters on different types of wildlife by collecting pictures from magazines.
2. Ask students to clip newspaper articles on wildlife preservation or current events dealing with wildlife.
3. Have a panel debate the pros and cons of regulating hunting and fishing.
4. View one of the following videos available through the Missouri Resource Center for Career & Technical Education (MRCCTE), University of Missouri-Columbia.
 - a) *Guarding Our Living Environment* (Ag Video 128)
 - b) *Time Shadows: Encounters with the Whitetail* (Ag Video 127)
 - c) *Dedicated to Conservation II* (Ag Video 129)
 - d) *Back to the Wild* (Ag Video 250)
5. Take a field trip to a wildlife area.
6. Have students attend a hunter safety course or workshop.

G. *Conclusion*

Wildlife management is an important part of wildlife protection. Everyone must recognize and take responsibility for protecting wildlife resources. Wildlife habitat is affected by several factors resulting from human habitation and advancement. There are several federal and state agencies dedicated to protecting wildlife. Wildlife management practices help ensure the continued health and growth of habitat and species.

H. *Answers to Activity Sheets*

A.S 5.1 Maintaining Wildlife Habitats

Answers will vary.

AS 5.2 Oh My Deer

Answers will vary.

I ***Evaluation***

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

Economic Impacts of Recreation & Wildlife Watching in Missouri in 1996

Economic Impact	Anglers		Hunters	
	Residents (millions)	Nonresidents (millions)	Residents (millions)	Nonresidents (millions)
Expenditures	\$594.1	\$208.9	\$521.3	\$290.4
Total business-generated revenue	\$1,166.8	\$410.3	\$1,023.8	\$570.5
Earnings generated from expenditures	\$572.8	\$201.4	\$502.6	\$280.0
State sales tax generated	\$25.1	\$8.8	\$22.0	\$12.3
State income tax generated	\$13.3	\$4.7	\$11.6	\$6.5
Jobs supported	15,340	5,390	13,460	7,500

Economic Impact	Wildlife Watchers		Total		Grand Total All Spenders (Millions)
	Residents (millions)	Nonresidents (millions)	Residents (millions)	Nonresidents (millions)	
Expenditures	\$410.6	\$97.3	\$1,526.0	\$596.6	\$2,122.6
Total business-generated revenue	\$806.5	\$191.2	\$2,997.1	\$1,172.0	\$4169.1
Earnings generated from expenditures	\$395.9	\$93.8	\$1,471.3	\$575.2	\$2046.5
State sales tax generated	\$17.3	\$4.1	\$64.4	\$25.2	\$89.6
State income tax generated	\$9.2	\$2.2	\$34.1	\$13.4	\$47.5
Jobs supported	10,600	2,510	39,400	15,400	54,800

Wildlife Management Agencies

Federal

U.S. Fish and Wildlife Service

U.S. Department of Agriculture

Bureau of Land Management

Forest Service

State

Missouri Department of Conservation

Missouri Department of Natural Resources

Maintaining Wildlife Habitats

Objective: Students will identify factors that contribute to the destruction of wildlife habitats.

Directions: Under each category that contributes to the destruction of wildlife habitats, name a specific practice that destroys the environment for wildlife. Then name a method in which this destruction could be reduced.

Urbanization

Manufacturing

Mining

Cutting trees

Tilling land for crops and pasture for livestock

Recreation

Oh My Deer*

Objective: Students will recognize features that affect the size and survival of a deer herd and will describe the influence of hunting and absence of hunting on a deer herd.

Directions: In this board game, participants are managing a deer herd for 6 years.

Note: The address for ordering the "Oh My Deer" board game is provided in Lesson 1 of this unit.

Materials:

Flip-chart paper

Colored marking pens (one color for each team)

One "Oh My Deer" board game for every four to six participants.

Procedures:

1. Divide into teams of four to five participants. Select someone to read the directions to the team. Be sure to note that only 14 deer can survive an average winter.
2. Stack the winter cards in each game to ensure that all teams have the same environmental conditions.
3. Use the flip chart to record the information from all teams.
4. Begin playing the game and play six rounds.
5. During the game, team members record the herd size at the end of each year. The final total of bucks and does is recorded in the harvest and nonharvest boxes.
6. Each group enters its data on the flip chart and then shares its results and management strategies with the other groups.
7. After the game is played, answer the following questions in the space provided.

Key Questions:

1. Which group was most successful in managing its deer herd?
2. Was it the group with the most deer?
3. Was it the group with the greatest number of harvested deer?

5. How do wildlife regulations affect wildlife?

6. How does winter carrying capacity affect long-run population numbers?

7. Why is it hard to survey herd size and condition?

* This activity was adapted from "Oh My Deer," Investigating Your Environment Wildlife, U.S. Department of Agriculture Forest Service.

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 6: Conservation Issues

Competency/Objective: Describe how conservation issues affect agriculture.

Study Questions

1. **What are some agriculture-related conservation issues?**
2. **What conservation legislation affects agriculture?**
3. **How is agriculture working to maintain and conserve natural resources?**

References

1. *Exploring Agriculture in America* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. Activity Sheet
AS 6.1 Conservation in Agriculture

UNIT V - NATURAL RESOURCES AND CONSERVATION

Lesson 6: Conservation Issues

TEACHING PROCEDURES

A. **Review**

The previous lesson discussed factors affecting wildlife habitats and management of wildlife habitats. This unit will discuss conservation issues as they relate to agricultural management practices.

B. **Motivation**

Present students with the following hypothetical situation. Congress is working to pass legislation that will completely outlaw chemicals used in crop production due to the pollutants created by such practices. Have students generate a list of ways in which this will affect the production of food in the United States as well as ways in which it will affect their daily lives.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

Q1. What are some agriculture-related conservation issues?

A1.

- a) **Maintaining soil productivity**
- b) **Controlling pollution**
- c) **Disposing of wastes**
- d) **Destruction of forests**

Divide the board into three sections: agriculture producers, consumers (or the general public), and natural resource conservationists. Have students list how each group would have different points of view on each of the above issues.

Q2. What conservation legislation affects agriculture?

A2.

- a) **1985 Farm Bill created the Conservation Reserve Program, which sets aside land to be maintained as natural vegetation for 10 years.**
- b) **1996 Federal Agriculture Improvement and Reform Act modified programs involved in natural resource conservation as directed by the Natural Resources Conservation Service.**
 - 1) **Environmental Quality Incentives**
 - 2) **Conservation Farm Option**
 - 3) **Flood Risk Reduction Program**
 - 4) **Conservation of Private Grazing Land**

Discuss ways in which legislation has helped agriculture to conserve natural resources.

Q3. How is agriculture working to maintain and conserve natural resources?

A3.

- a) **Precision farming**

- b) **Genetically altered crops**
- c) **Biological pest control**
- d) **Pesticide container reclaiming**
- e) **Minimum tillage or no-till cropping**
- f) **Rotational livestock grazing**
- g) **Set aside acreage**
- h) **Alternative power sources**

Have students complete AS 6.1 and discuss practices and methods that help make agriculture environment friendly.

F. ***Other Activity***

Have students debate the use of genetically altered crops as a form of reducing pesticide usage on crops.

G. ***Conclusion***

Agriculture has taken great strides in improving natural resources conservation. Legislation has educated producers in ways to improve their farming practices to reduce soil erosion and pollution and improve natural habitats for wildlife. New technology assists producers in reducing chemical use and developing alternative methods of production.

H. ***Answers to Assignment Sheet***

Answers will vary.

I. ***Answers to Evaluation***

1. a
2. a. E
b. I
c. E
d. I
e. E
f. E
3. d
4. a
5. b
6. d
7. b.
8. d
9. a
10. d
11. a
12. c
13. d
14. a
15. d
16. b
17. They interact with and depend upon one another. When one is affected adversely, others may suffer.
18. Preservation maintains an existing natural resource. Conservation manages the use of natural resources to avoid wasting them

19. Any three of the following: Bureau of Land Management, Department of Fish and Wildlife, National Park Service, Environmental Protection Agency, Forest Service, Natural Resources Conservation Service
20. Any three of the following: human activities, water erosion, wind erosion, natural events (including earthquakes, floods, tornadoes), land slippage
21. Any three of the following: contour planting, crop rotation, terracing, grassed strips, diversion ditches, strip cropping, vegetative cover
22. Any three of the following: odor and taste, color, pH, hardness, turbidity, heavy metals, chemical residues, bacteria
23. Any three of the following: sediment, pathogens, organic wastes, inorganic wastes, organic chemicals, thermal pollutants
24. Any three of the following: human health, plant health, climate, maintain beauty of surroundings, reduce damage to property
25. Any two of the following: motor vehicle emission controls, motor vehicle exhaust inspection, increased public transportation, use of ethanol and electric cars, use of alternate energy
26. Any three of the following: Urbanization, tilling the land for crops and pasture for livestock, manufacturing and industry, mining of land, cutting trees in forests, recreation areas
27. Any three of the following: managing habitat, controlling and preventing disease, hunting and fishing regulations, artificial stocking, managing funds
28. Any three of the following: precision farming, genetically altered crops, biological pest control, minimum or no-till cropping, alternate power sources, pesticide container reclaiming

Conservation in Agriculture

Objective: Students will be able to identify agriculture-related conservation issues, the problems associated with each, and new practices that have been developed to improve conservation efforts.

Directions: Beside each agriculture-related conservation issue, list current developments that have improved conservation efforts.

Issue	Past Problems	Current Developments
Disposing of Wastes	No controls were placed on disposal of pesticide containers.	
Maintaining Soil Productivity	Soil erosion was drastic due to improper tillage procedures.	
Controlling Air Pollution	No controls were placed on vehicle emissions, and air was becoming polluted.	

UNIT EVALUATION

Circle the letter that corresponds to the best answer.

1. Natural resources are used by _____.
 - a. Plants
 - b. All living things
 - c. Humans
 - d. Animals

2. Place an "I" in front of the inexhaustible resources and an "E" in front of the exhaustible resources.
 - a. _____ Soil
 - b. _____ Water
 - c. _____ Oil
 - d. _____ Air
 - e. _____ Coal
 - f. _____ Natural gas

3. How do point source pollution and nonpoint solution differ?
 - a. Point of cleanup
 - b. Point of light
 - c. Point of effectiveness
 - d. Point of origin

4. How does soil erosion affect the production of food?
 - a. Decrease in crop and animal production
 - b. Decrease in mechanization
 - c. Decrease in human activity
 - d. Decrease in human population

5. Soil conservation is defined as _____.
 - a. Failure of crops growth due to soil erosion
 - b. Protection, preservation, and improvement of soil
 - c. Land overgrazed by livestock
 - d. Reducing human activity to conserve the soil

6. How is water purified naturally?
 - a. Condensation
 - b. Evaporation
 - c. Rain cycle
 - d. Hydrologic cycle

7. Determining the condition of water for a particular use is known as _____.
- Water safety
 - Water quality
 - Ecological quality
 - Environmental safety
8. The purity of the air used by living organisms is known as _____.
- Potability
 - Aerability
 - Oxygen quality
 - Air quality
9. What type of air pollutant is carbon monoxide?
- Gaseous
 - Chemical
 - Liquid
 - Invisible
10. What type of pollutant is soil in the air?
- Dirt matter
 - Fine matter
 - Soil-air matter
 - Particulate matter
11. What is the source of air pollution caused by factories?
- Human activity
 - Natural activity
 - Machine activity
 - Particle activity
12. Air pollution caused by a volcanic eruption would be the result of _____.
- Eruption activity
 - Particle activity
 - Natural processes
 - Human activity
13. The practices involved in caring for wildlife and its environment are known as _____.
- Wildlife quality
 - Environment management
 - Environment protection
 - Wildlife management
14. Which wildlife management organization protects and preserves endangered species?
- U.S. Fish and Wildlife Science
 - Forest Service
 - Bureau of Land Management
 - U.S. Department of Agriculture

15. Disposing of wastes and maintaining soil productivity are examples of _____ issues.
- a. Recreational
 - b. Air quality
 - c. Wildlife management
 - d. Agriculture-related conservation
16. How are the Federal Agriculture Improvement Reform Act and the Farm Bill similar?
- a. They outlawed farming.
 - b. They are conservation legislation affecting agriculture.
 - c. They are designed to eliminate conservation.
 - d. They fine farmers for spoiling the land.

Complete the following short answer questions.

17. Briefly explain the importance of conserving natural resources.
18. Explain the difference between preservation and conservation.
19. List three government agencies that monitor resource quality.
- a.
 - b.
 - c.
20. List three factors that could contribute to soil erosion.
- a.
 - b.
 - c.
21. List three agricultural soil conservation practices.
- a.
 - b.
 - c.

22. List three factors affecting water quality.
 - a.
 - b.
 - c.
23. List three sources of water pollution.
 - a.
 - b.
 - c.
24. List three reasons for maintaining air quality.
 - a.
 - b.
 - c.
25. Describe two practices that have been implemented to maintain air quality.
 - a.
 - b.
26. List three factors that could affect wildlife habitat.
 - a.
 - b.
 - c.
27. List three wildlife management practices.
 - a.
 - b.
 - c.
28. List three ways in which agriculture is working to maintain resources.
 - a.
 - b.
 - c.