

Unit 18: Our Environment

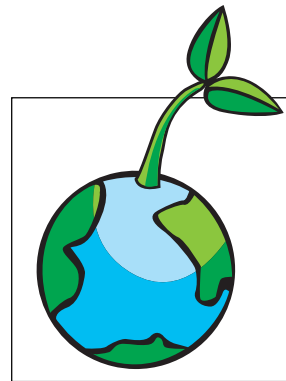
This unit includes information about pollution and environmental quality. Protecting our environment and its natural resources is stressed.

Student Goals

- Demonstrate an understanding of the impact technologies have on the quality of life and the environment.
- Understand how the use of fossil fuels relate to possible impacts of the greenhouse effect.
- Understand the interactions between science and public and private agencies concerning matters of broad, public interest.
- Identify the environmental influences in their neighborhood.
- Identify ways that humans are agents of change and their effect on the environment.
- Recognize ways that society is trying to maintain the balance of nature.
- Identify how society is trying to stop pollution and depletion of natural resources.
- Model the creation and clean up of an oil spill.
- Know forms of land and water pollution.

Unit Focus

- Know that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide. (SC.G.2.4.1)



- Know that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition. (SC.G.2.4.2)
- Know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events. (SC.H.3.4.3)



Vocabulary

Use the vocabulary words and definitions below as a reference for this unit.

- acid rain** rain that contains sulfuric acid; forms as a result of the mixture of air pollutants with moisture in the atmosphere
- conservation** measures taken to save natural resources for future use
- environment** all of the things that make up your surroundings
- fossil fuels** fuels made from decayed plants and animals that lived millions of years ago preserved below Earth's crust
Examples: coal, oil, natural gas
- greenhouse effect** a condition of increased heat resulting from the reflection of the sun's heat back to Earth from the atmosphere
- greenhouse gases** chemicals emitted into the atmosphere that add to the overall increase in Earth's temperatures
- hydrocarbons** unburned particles of fuel that contain hydrogen and carbon; fossil fuels produce hydrocarbons
- litter** waste materials found along roadsides and other public places



- natural resources** materials found on or inside Earth's crust that people can use
- nitrates** pollutants found in fertilizers and detergents made of nitrogen compounds
- nonrenewable resources** materials that are used up faster than they can be replaced in nature or can be used only once
- pesticides** chemicals used to kill organisms that are harmful or considered to be pests
- phosphates** pollutants found in fertilizers and detergents made of phosphorus compounds
- pollutants** substances in the air, water, and land that are harmful to living things
- pollution** a change in the air, water, or land that is harmful or unpleasant to living things
- recycling** processing materials so they can be used again
- renewable resources** materials that can be replaced in nature at a rate close to their rate of use or used over again
- smog** a pollutant that contains nitrogen, sulfur, and hydrocarbons; creates a brown haze and unpleasant odor



temperature inversion occurs when a layer of cool air gets trapped under a layer of warm air and acts like a lid, keeping pollutants near the ground

thermal pollution the unnatural heating of waters



Introduction

We must use what we know about Earth to improve and safeguard our living conditions, such as the exploration of land for building our homes, observation of air and ocean influences to predict floods and storms, and examination of photographs of geological structures from space to explore new sources of valuable metal deposits.

Protecting the Environment

The **environment** is very delicate. Special care must be taken of the *environment* if it is going to continue to provide an atmosphere that will support life and all of the **natural resources** people need to live. Some of these resources, such as minerals, ores, and **fossil fuels**, cannot be replaced. They are said to be **nonrenewable**. Others, such as the forests, soil, air, and water, can be replaced at a rate close to their rate of use and are **renewable**. People must learn to use resources wisely and conserve or preserve *natural resources* for future use.



Special care must be taken of the environment.

Pollution is a change in the air, water, or land that can be harmful or unpleasant to living things and the environment. *Pollution* upsets the balance of nature, and if not controlled, causes severe environmental problems. These problems could eventually lead to the extinction of entire populations.



Laws can be created to force large corporations and factories to stop polluting the environment.

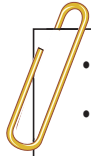
There are several measures society can take to help preserve the balance of nature. One way is to make people aware of the problems of pollution and the need for **conservation**. This can be accomplished through television and newspaper stories, local campaigns to clean up the environment, and education.

Society can help create laws to force large corporations and factories to stop polluting the environment and to stop overusing the natural resources. Laws are also important to



keep individuals from burning trash, improperly dumping garbage, and littering. Regulations, such as those requiring licenses to hunt and fish, and placing limits on the numbers of animals killed, are also important.

Conducting scientific research to help keep nature in balance is another measure of preservation. Some of the projects scientists are working on to accomplish this include the following:



- finding new sources for food
- trying to learn how to control the weather so unusable land can be made usable
- looking for ways to get usable minerals and natural resources from the ocean
- trying to find easier and less expensive ways to get fresh water from ocean water
- trying to find less expensive and easier ways to get the oil out of shale
- looking for new sources of energy
- looking for new ways to stop and clean up the harmful effects of pollution
- exploring space to possibly find new resources, answers to problems on Earth, and perhaps a new place for people to live.

Air Pollution

Unwanted, harmful substances in the air are **pollutants**. Air can become polluted. The amount of air pollution varies depending on the conditions in a particular location. Air *pollutants* especially harmful to human health are **hydrocarbons**, sulfur oxides, particulates, carbon monoxide, and nitrogen oxides. What are these pollutants, and where do they come from?

Hydrocarbons. *Hydrocarbons* involved in pollution are compounds of hydrogen and carbon. Hydrocarbons come from spilled or unburned particles of gasoline. Automobiles that do not have proper fuel settings or pollution control devices may produce excessive hydrocarbons.



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Carbon monoxide. Carbon monoxide is another dangerous gas produced by the incomplete burning of fuels. It is colorless and odorless. Its fumes can cause people to become very ill or die. The exhaust from automobiles, gas heaters, and charcoal grills produces carbon monoxide. Therefore, it is important not to operate a car or grill indoors because carbon monoxide poisoning could occur.



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Sulfur oxides. Fossil fuels, coal and oil, contain small amounts of sulfur. When the fuels are burned, the sulfur is released and combines with oxygen in the air to form sulfur oxides. Sulfur oxides irritate the eyes, nose, throat, and lungs. If sulfur oxides combine with moisture in the



Sulfur oxides irritate the eyes, nose, throat, and lungs.

atmosphere, a powerful acid called *sulfuric acid* forms. This acid then falls to Earth in rain or snow. This sulfuric acid damages plant leaves, stains the paint on buildings, and causes lung damage.

When sulfuric acid combines with rain, **acid rain** is formed. *Acid rain* kills fish, damages crops, and pollutes our water supplies. In Florida, the natural limestone rock helps neutralize the sulfuric acid in groundwater so acid rain is not a serious problem. The northern United States is not as fortunate; there, rock is granite and does not buffer the sulfuric acid as limestone does.

Nitrogen oxides. At very high temperatures, nitrogen and oxygen gases in the atmosphere react with each other and form nitric oxide. This gas forms in car engines and comes out of exhaust pipes. Nitric oxide then reacts with oxygen in the air and forms another compound, nitrogen dioxide. The brown haze over many cities is caused by nitrogen dioxide.



If sulfur oxides combine with moisture in the atmosphere, a powerful acid called "sulfuric acid" forms and then falls to Earth in rain or snow.



Sunlight causes a chemical reaction between nitrogen oxide, sulfur oxide, and hydrocarbon gases. This reaction produces a fog-like pollutant called **smog**. *Smog* got its name from the words smoke and fog. Most smog seems to come from the burning of fossil fuels. Smog usually occurs in areas with a lot of industry or heavy traffic. Smog creates an unpleasant odor, a brown haze in the air, and causes the burning of eyes and inflammation of the lungs.



Smog usually occurs in areas with a lot of industry or heavy traffic.

The condition of the air is dependent on other factors besides pollutants. The amount of pollution in an area also depends on geographical features in the area. Very windy areas seldom have much pollution because the wind carries the pollutants away. On the other hand, areas in valleys or with mountains on one side are more likely to have pollution problems because the pollution cannot escape. Weather conditions also have an effect on pollution. Moisture dissolves some pollutants in the air; however, as that moisture becomes a form of *precipitation*, it can pollute the land and waters instead.



Temperature inversion occurs when warm air acts like a lid and keeps pollutants near the ground.

Sometimes air pollution is made worse when a layer of cool air gets trapped under a layer of warm air. The warm air acts like a lid and keeps the pollutants near the ground. This effect is called a **temperature inversion** and can create dangerously high levels of pollution. When this occurs, people have to be warned to stay indoors until the weather clears.

Particulates. Particulates are tiny particles of dust, soot, ash, and oil. Burning diesel fuels, coal, oil, and wood gives off particulates. People may experience chest pains or coughing as a result. Particulates can cause lung diseases such as bronchitis, asthma, emphysema, and cancer.



Practice

Use the list above each section to complete the statements in that section.

conservation	natural resources	pollution
environment	nonrenewable	renewable
fossil fuels		

1. Special care must be taken of the _____ if it is going to continue to provide an atmosphere that will support life and all of the _____ people need to live.
2. Some resources, such as minerals, ores, and _____ cannot be replaced.
3. Natural resources which cannot be replaced are said to be _____ .
4. Other resources, such as the forests, soil, air, and water, can be replaced at a rate close to their rate of use and are _____ .
5. _____ upsets the balance of nature, and if not controlled, causes severe environmental problems.
6. There are several measures society can take to help preserve the balance of nature and make people aware of the problems of pollution and the need for _____ .



acid rain
hydrocarbons

pollutants
smog

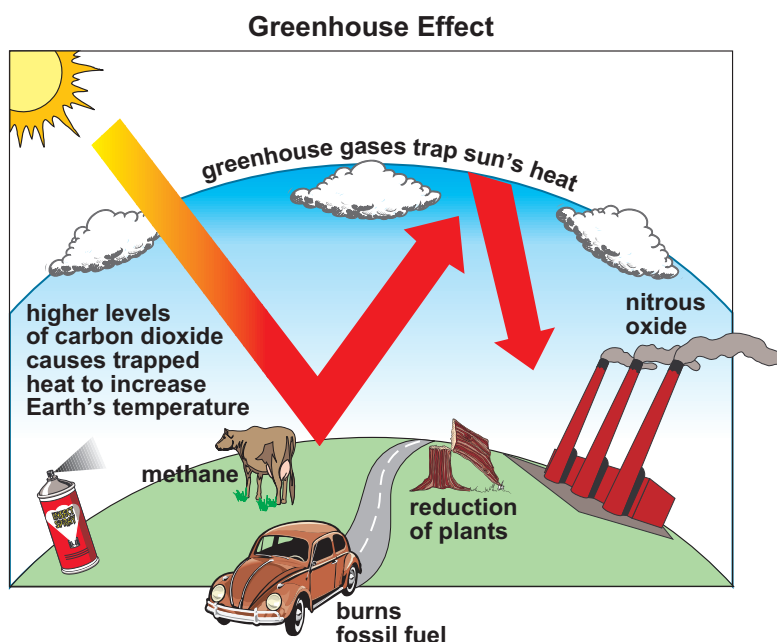
temperature inversion

7. Unwanted, harmful substances in the air are _____ .
8. _____ are compounds of hydrogen and carbon that come from spilled or unburned particles of gasoline.
9. When sulfuric acid combines with rain, _____ is formed.
10. Sunlight causes a chemical reaction between nitrogen oxide, sulfur oxide, and hydrocarbon gases and produces a fog-like pollutant called _____ .
11. Sometimes warm air, acting like a lid, traps a layer of cool air and keeps the pollutants near the ground. This effect is called a _____ .



Greenhouse Effect

The **greenhouse effect** occurs when the atmosphere reflects the sun's heat back to Earth, which increases temperatures. Fossil fuels burned to provide power to vehicles, homes, and factories produce chemicals called **greenhouse gases**. One of these *greenhouse gases* is carbon dioxide. Higher levels of carbon dioxide increase the atmosphere's ability to trap heat. This trapped heat may be causing an overall increase in Earth's temperatures. This increase, a process called *global warming*, may have an *adverse* effect on life on Earth.



The burning of fossil fuels releases carbon dioxide into the atmosphere. During *photosynthesis*, green plants use carbon dioxide for food, and help to remove dangerous levels of carbon dioxide from the air. In order to remove these dangerous levels of carbon dioxide from the air, we rely on green plants to use carbon dioxide in photosynthesis. This process also releases oxygen. Without plants, our lives would not be possible. One effect of building roads and making more parts of the world accessible to vehicles is a reduction in the amount of plant life. An example of this is the destruction of the vast Amazon rainforest. As the amount of plant life decreases and the quantity of greenhouse gases increases, Earth's climate may change, thus adding to global warming.



Controlling Air Pollution

Efforts have been made to control air pollution. Laws were passed requiring that unleaded gas be used in new cars in an effort to stop one type of air pollution. Some other important solutions to the problem include the following:

- Laws have been passed, such as the 1970 Clean Air Act, that require industry not exceed safe levels of pollutants. This law is scheduled to be reviewed every five years.
- Warning systems have been installed in areas with high pollution rates.
- More greenery has been planted in cities to reduce the amount of carbon dioxide and increase the amount of oxygen.
- Pollution control devices have been installed on cars.
- Laws have been passed to prohibit the burning of garbage and leaves in residential and other restricted areas.



Every individual can do his or her part to help reduce air pollution. Actions such as walking, riding bicycles, car pooling, using public transportation, and making sure our cars are in proper working order can help solve the problem of air pollution.



Water Pollution

Water is one of our most important natural resources. We use fresh water to drink, grow food, produce energy, and manufacture products for transportation and recreation. Both the water on the surface of Earth and the groundwater beneath Earth's surface need to be kept free from pollution. As with air, there are many ways that water can be polluted.



Water can be polluted by chemicals from industrial plants, sewage systems, mines, and households.

Bacteria and viruses from untreated sewage and animal wastes can cause pollution of the water supplies. This can cause illness and diseases such as typhoid. Water treatment plants and the addition of chlorine to the water are common methods of preventing this type of pollution.

Water can also be polluted by chemicals from industrial plants, sewage systems, mines, and households. **Phosphates** and **nitrates** found in fertilizers, detergents, and cleaning supplies cause algae and pond weeds in lakes to multiply very rapidly, using up all of the available nutrients. When large numbers of these plants die, bacteria that decompose them exhaust the oxygen supply. Many other organisms, such as fish, will then die because of a lack of oxygen. **Pesticides** and other poisonous chemicals pollute waters, killing plant life and fish.

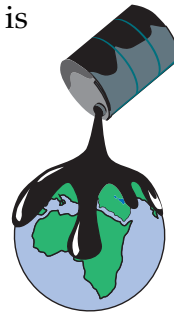
The unnatural heating of waters is called **thermal pollution**. Electric power plants that use both fossil fuels and nuclear fuels produce a lot of heat. Power plants use water to condense steam. When the water is returned to the lakes and rivers, it is warmer than before. This upsets the balance of nature. Some organisms cannot live at these higher temperatures. *Thermal pollution* also disrupts the breeding cycles of some fish. Some people argue that thermal pollution can be beneficial in winter—providing refuge from the cold for manatees, for instance. Manatees congregate in the winter near power plants, such as St. Marks and Crystal River, to take advantage of the warmer waters.

Too much sediment buildup in waterways can create pollution problems. Sand and soil settle to the bottom of rivers and lakes, gradually filling them. These sediments cover up the food supply of fish, causing them to



die. Sediment buildup also smothers nonmoving organisms such as oysters and clams and clogs animals' gills, suffocating them. Dredging may then be necessary to open the waterway. Disturbing the bottom by dredging causes other problems such as destroying the nutrients in the sediments and altering the water flow.

Another pollution concern for all bodies of water is the oil spill. Major spills result from tanker collisions in the oceans. These oil spills from tankers spoil our beaches, pollute our ocean water, and cause birds and fish to die. Many cleaning methods are used to remove the oil.

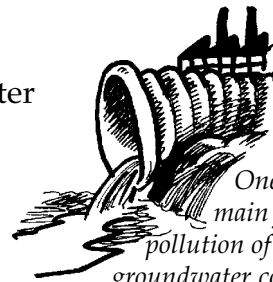


Another pollution concern for all bodies of water is the oil spill.

Some of these methods create other types of pollution, however. Burning the oil releases hydrocarbons into the atmosphere. Adding chemicals to breakdown oil introduces other substances into an already stressed environment. Scraping up or collecting oily debris contributes to the problem of waste disposal and scarce landfills. The benefits of cleaning methods must be considered along with their risks and disadvantages.

Groundwater Pollution

One of the main forms of pollution of groundwater comes from the dumping of chemical wastes, especially radioactive wastes. When it rains, some of the dangerous chemicals seep down into the water table. These chemicals will eventually be pumped up into wells or enter streams, lakes, or oceans as part of the groundwater.



One of the main forms of pollution of groundwater comes from the dumping of chemical wastes.

Protective measures must be taken to keep water pure. Controlling chemical use by farmers, homeowners, and industry and building waste treatment plants are examples of things that can be done to help reduce water pollution.



Land Resources

Natural resources found on land must also be conserved and protected from pollution. One of the most noticeable forms of pollution on land is **litter**. To help control *litter*, laws can be passed to place fines on littering. **Recycling**, which refers to processing materials so they can be used again, can also help to solve the litter problem. Glass bottles, aluminum cans, plastic, and paper are common forms of litter and can all be recycled.



Glass bottles, aluminum cans, plastic, and paper are common forms of litter. All can be recycled.

Wastes in landfills, dumps, and septic tanks can cause pollution, if not disposed of properly. The creation of waste management companies and urban sewage treatment plants has helped to eliminate some pollution from these sources.

Chemicals from industry, buried radioactive wastes, and *pesticides* pollute the land when they enter the soil. Plants grown in this soil may contain these dangerous chemicals. These chemicals are then passed on to people and animals who eat the plants.



Land resources must not only be protected from pollution, they must also be conserved so that there are enough resources for future generations.

Crops must be rotated and fertilizers added to keep farm land productive. Some land that is unsuitable for farming because it is too hilly can be terraced or contoured. Land too dry to grow crops can be irrigated in order to become productive. Land used for grazing must be carefully controlled to allow the vegetation to grow back before it is used again.

Forests are another valuable land resource. Trees must be replanted to replace the ones cut down. Since trees prevent erosion, foresters must be careful not to cut down too many trees in a particular place at any given time.

Practicing *conservation* and controlling pollution of natural resources will allow people to enjoy the gifts of nature and good health for many years to come. It is important that we become aware of the destructive nature of



items that we throw away every day. Some of these items require special disposal methods. Many communities have established hazardous-waste collection sites or other alternatives. Below is a chart of the toxic trash that should be separated from other trash.

Toxic Trash List

- **ammonia**
- **automotive fluids and body filler** for repairing auto body dents and holes
- **batteries** that are disposable or rechargeable (NiCad) batteries
- **caustic cleaners** such as oven cleaners and lye
- **cosmetics** such as fingernail polish and removers
- **electrical devices** with mercury switches
- **florescent light bulbs and their ballasts**
- **fuel** such as charcoal lighter
- **glue, rubber cement, and thinners**
- **herbicides** and their containers (don't rinse)
- **insect sprays, powders, strips, repellants, and their containers** (don't rinse)
- **liquid correction paper and thinner**
- **mothballs**
- **motor-oil cans** (don't rinse)
- **paint, polishers, dyes, and paint thinners** (give away what you don't use; latex paint can be dried out and disposed of in trash)
- **photographic chemicals**
- **pool chemicals**
- **solvents and spot removers**
- **spray cans**
- **wood preservatives** such as sanding sealer and water sealer
- **and anything labeled "dispose of carefully"**



Summary

There is an interconnectedness of Earth's systems and the quality of life. Protecting our environment and natural resources is extremely important for the future of Earth. Controlling pollution of air, land, and water is one part of the effort. Each of us has a responsibility as a caretaker of the environment. Many different kinds of scientists are working on solutions to today's problems.



Practice

Use the list below to write the correct term for each definition on the line provided.

greenhouse effect	nitrates	recycling
greenhouse gases	pesticides	thermal pollution
litter	phosphates	

- _____ 1. waste materials found along roadsides and other public places
- _____ 2. chemicals used to kill organisms that are harmful or considered to be pests
- _____ 3. processing materials so they can be used again
- _____ 4. a condition of increased heat resulting from the reflection of the sun's heat back to Earth from the atmosphere
- _____ 5. pollutants found in fertilizers and detergents made of nitrogen compounds
- _____ 6. the unnatural heating of waters
- _____ 7. pollutants found in fertilizers and detergents made of phosphorus compounds
- _____ 8. chemicals emitted into the atmosphere that add to the overall increase in Earth's temperatures



Practice

Follow the steps below to conduct an **environmental survey** of your neighborhood.

Environmental Influences

Human beings are agents of change, and the rate at which they are changing the environment increases rapidly as their population increases. Only recently have people become aware of their impact on the atmosphere, water, and the crust of Earth.

1. Look over the survey on the next page. General categories for the ways people change the environment are listed on the left side of the page. Across the top are the various areas of the environment that may be affected by the processes and materials which people use.
2. Walk or ride through your neighborhood—at least a 10-block square—taking the survey with you.
3. Place a check in the last column to the right after each type of environmental influence found in your neighborhood. For example, if new houses are being built, put a check (✓) after houses.
4. Find the area being influenced in the column headings at the top of the chart. Put an (L) in the left half of the box if the influence is large, or (S) in the left half of the box if the influence is small. In the right half of the box, put a (+) if the effect is good; put a (–) if the effect is bad.



KEY (√) Influence found (L) Large influence (S) Small influence (+) Good influence (-) Bad influence Ex.—Large, negative influence L-		Environmental Aspects																			
		health	scenery	recreation	temperature	air	water	other	influence												
Environmental Influences	Construction:																				
	houses																				
	roads																				
	shore structures																				
	commercial																				
	Traffic:																				
	streets																				
	highways																				
	Chemicals:																				
	fertilization																				
	weed control																				
	insect control																				
	Waste Disposal:																				
	litter																				
	dumps																				
	sewage																				
	Other:																				



Practice

Answer the following using complete sentences.

1. List three ways in which road construction using concrete pavement changes the environment. _____

2. What other ways could people travel which would have fewer adverse effects on the environment? _____

3. How does an automobile affect the atmosphere? _____

4. If there is smog in your community, what is its source? _____



5. What resources are used in local construction? _____

6. What resources are lost to humans when cities move into the surrounding countryside? _____

7. Describe some solutions to the problems above. _____

Write **True** if the statement is correct. Write **False** if the statement is not correct.

_____ 8. Human influence can be recognized on your local environment.

_____ 9. The chart on page 565 does not permit the estimation of a negative impact on an environment.

_____ 10. The public can suggest ways to improve and protect the environment.



Practice

Answer the following using complete sentences.

1. Name three ways society can help preserve the balance of nature.

2. Name five ways scientists are trying to maintain the balance of nature. _____

3. Name three ways laws can help stop the pollution and depletion of natural resources. _____

4. Name three ways people can be made aware of the problems of pollution and the necessity of conservation. _____



Lab Activity: Water Pollution

Facts:

- Oil spills pollute our ocean water and cause animals to die. Many cleaning methods are used to remove the oil.

Investigate:

- You will create and clean up an oil spill.

Materials:

- aluminum pie plate
- new or used motor oil
- pieces of nylon net
- pieces of nylon stocking
- pieces of cardboard
- pieces of string
- pieces of straw
- salad oil
- plastic bowl
- cotton balls
- spoon
- detergent
- eyedropper

Thirty miles from the shore of Santa Barbara, an oil production platform pulled up a worn-out drill. Oil and gas began escaping into the water. Before the leak could be stopped, 700,000 gallons of oil were released. What can be done to clean up the spill?

1. Obtain an aluminum pie plate or similar container. Pour about one inch of water in the plate.
2. Use an eyedropper to place 15 to 20 drops of salad oil on the surface of the water.
3. The problem you face is the same as that faced by the people of Santa Barbara. How can you clean up the oil with the tools at hand? Select any of the materials available and use them to clean up the oil slick. Use a watch with a second hand to determine the amount of time it takes you to clean up the spill. Use the Data Chart on the next page to record your results.



4. Repeat the simulation by adding salad oil to new water. Try at least three different techniques and materials and record the results.
5. Up to this point you have been using a light oil. Now perform the same procedures using a heavier oil—in this case, motor oil. Record your results in the Data Chart below.
6. You have been very lucky. The weather during your oil recovery operations has been fair and calm. Many oil spills occur in stormy weather. To simulate rough weather, carefully make waves in your model ocean. You can make waves by *gently* blowing over the surface or moving a card through the water. Get new water and repeat two of the techniques with heavy oil and rough water. Record your data in the Data Chart below.
7. Select the method you feel works best and modify it as follows. After you have added 15 to 20 drops of heavy oil, add 5 to 10 drops of detergent. Stir the water to mix the oil and detergent. Then proceed to remove the oil and soap mixture with the technique you selected. Record your results in the Data Chart below.

Data Chart

	Material	Time Taken to Clean Spill	Estimate Percent of Oil Cleaned Up	Comments: (e.g., messy, left with oily straw)
Light Oil				
Heavy Oil				
Heavy Oil and Rough Water				
Heavy Oil Plus Detergent				



8. Clean up your lab station. Place the used oil in the container provided by your teacher. Wash the equipment with detergent and store.

9. Which method most rapidly cleaned up the oil spill? _____

10. Which method was most effective with light oil? _____

Was the same method most effective with heavy oil? _____

If not, which method was most effective with the heavy oil?

11. The first activities following an oil spill involve attempts to contain the spill. Containment keeps the spill from spreading.

Which of the materials provided helped to contain an oil spill?

Ocean spills are often contained by placing booms. A boom is a barrier or fence of some type. Floating logs, foam, and rubber tubes have been tried.

Under what weather conditions would booms work best? _____



12. Most of the oil removal techniques which use the materials provided remove the oil by *absorption*. The oil is absorbed by other substances like straw, sawdust, etc. The oil-soaked material is then removed from the water.

Which of the techniques removed oil by absorption? _____

Some people say that these techniques simply move the oil spill from the water to the land.

What do you suppose they mean? _____

13. What effect did the detergent have on your oil spill? _____

Did the detergent make your cleanup technique more effective or less effective? _____

Please explain. _____



14. Fire is another technique often used to remove oil spills. The oil spill is ignited and allowed to burn.

Where does the oil from the water go when it is burned? _____

15. What factors affect the cleaning up of oil spills in the ocean? _____

16. Once the oil reaches the beach, other problems occur.

What is one technique you might use to remove oil from beach sands? _____

Which animals are likely to be most affected by oil on the beach?

17. Who should be responsible for cleaning up the spills? _____



18. Some bacteria will use oil as their only food source. Ocean scientists would like to be able to plant these bacteria in oil spills. For these bacteria to be successful in cleaning up spills, the bacteria have to pass several tests. Some of the tests are listed below.

Rank these tests in order of importance from 1 to 5. In the blank next to the test, write in the order number. The most important test to consider would be number 1, etc.

- _____ The cost of the bacteria.
- _____ The bacteria will eat the oil quickly.
- _____ The bacteria will eat the oil thoroughly.
- _____ The bacteria will produce no harmful by-products.
- _____ The bacteria will disappear when their job is done.



Practice

Use the list above each section to complete the statements in that section. **One or more terms will be used more than once in the first section.**

acid rain	hydrocarbons	pollutants
automobiles	nitrogen oxides	sulfur oxides
carbon monoxide	particulates	sulfuric acid
fossil fuels		

1. _____ are substances in the air, land, and water that are harmful to living things.
2. Four types of air pollution are _____ , _____ , _____ , and _____ .
3. Unburned particles of fuel that contain hydrogen and carbon are called _____ .
4. Most hydrocarbons come from _____ that are not properly maintained.
5. The sulfur found in _____ is a major cause of pollution.
6. Sulfur combines with oxygen and moisture in the atmosphere to form _____ .
7. Sulfuric acid in the atmosphere combines with rain to form _____ .



automobile exhaust	hydrocarbons	smoke
carbon monoxide	industry	sulfur oxides
charcoal grills	nitrogen oxides	temperature inversion
fog		

8. Smog is a chemical reaction between _____ , _____ , and _____ .
9. The word smog came from combining the words _____ and _____ .
10. _____ is a dangerous gas produced by the incomplete burning of fuels.
11. _____ and _____ are two sources of carbon monoxide.
12. A _____ is a layer of cool air trapped under a layer of warm air that keeps pollutants near the ground.
13. The 1970 Clean Air Act has helped reduce the levels of pollutants produced by _____ .



Practice

Answer the following using complete sentences.

1. What are four uses for fresh water? _____

2. Where do bacteria and viruses that pollute water come from?

3. How can bacteria and viruses be prevented from polluting our water supplies? _____

4. What effect do phosphates and nitrates have on our water supplies?

5. How is thermal pollution caused? _____



6. How does thermal pollution affect the fish and other organisms?

7. How can sediment buildup cause pollution? _____

8. How do oil spills cause pollution? _____

9. How can dumping chemical wastes pollute groundwater? _____

10. Name four ways that we can help prevent water pollution. _____



Practice

Answer the following using complete sentences.

1. What is one of the most noticeable forms of pollution of the land?

2. Name two ways littering can be controlled. _____

3. What is recycling? _____

4. Name at least three kinds of items that can be recycled. _____

5. How do chemicals from industry and radioactive wastes pollute the land? _____



6. What else must be done for land resources besides protecting them from pollution? _____

7. Name four ways land can be made more productive. _____

8. How can forest land be protected? _____



Practice

Circle the letter of the correct answer.

- _____ is a pollutant that contains nitrogen, sulfur, and hydrocarbons. It creates a brown haze and unpleasant odor.
 - Smog
 - Phosphate
 - Pesticide
 - Hydrocarbon
- _____ is a change in the air, water, or land that is harmful or unpleasant to living things.
 - Acid rain
 - Smog
 - Pollution
 - Littering
- _____ are chemicals used to kill insects.
 - Hydrocarbons
 - Phosphates
 - Nitrates
 - Pesticides
- _____ are pollutants found in fertilizers and detergents made of nitrogen compounds.
 - Fossil fuels
 - Hydrocarbons
 - Nitrates
 - Phosphates
- _____ are unburned particles of fuel that contain hydrogen and carbon.
 - Fossil fuels
 - Pesticides
 - Hydrocarbons
 - Nitrates



6. Taking measures to save natural resources for future use is called _____ .
- recycling
 - conservation
 - temperature inversion
 - thermal pollution
7. Rain that contains sulfuric acid is _____ .
- smog
 - acid rain
 - thermal pollution
 - litter
8. Your _____ is all of the things that make up your surroundings.
- litter
 - smog
 - environment
 - conservation
9. Fuels made from plants and animals that lived millions of years ago are _____ .
- smog
 - pesticides
 - hydrocarbons
 - fossil fuels
10. Waste dropped along roadsides and other public places is _____ .
- pesticides
 - litter
 - nitrates
 - phosphates
11. _____ are pollutants found in fertilizers and detergents made of phosphorus compounds.
- Nitrates
 - Fossil fuels
 - Hydrocarbons
 - Phosphates



12. _____ are substances in the air, water, and land that are harmful to living things.
- Acid rain
 - Fossil fuels
 - Nitrates
 - Pollutants
13. Processing used materials so they can be used again is called _____ .
- recycling
 - conservation
 - littering
 - temperature inversion
14. The unnatural heating of waters is _____ .
- pollution
 - recycling
 - smog
 - thermal pollution
15. _____ occurs when a layer of cool air gets trapped under a layer of warm air that acts like a lid, keeping pollutants near the ground.
- Acid rain
 - Littering
 - Recycling
 - Temperature inversion

