



What Is This Module About?

Water is one of the most important and most widely used substances on earth. Seventy percent (70%) of the earth's surface is covered with water, abundant enough to supply the needs of men, animals and plants alike. Yet, despite such an abundance, we still experience water shortage.

Why do we experience water shortage? Water shortage is only one of the many consequences of water pollution — one of the major environmental problems we are facing today. In fact, water pollution and its harmful effects on human beings and their environment have become a great concern of societies all over the world. We hear about the bad conditions of our rivers and lakes, and even the seas surrounding our coastlines. We hear news stories about whales being rescued by environmental groups because their habitat has been contaminated with oil spills. Closer to home, we are not even sure if the water that we are drinking is safe and clean. What is happening to our water resources?

In this module, we will introduce to you all types of water pollution. You will know how the water in rivers become polluted. You will be able to identify the harmful effects of water pollution on your health, household, environment and economy. Safety tips will likewise be taught to you so that you can readily protect your health from toxic chemicals accidentally spilled in various bodies of water. This module will also discuss the problem of water shortage. To help solve this problem, you have to learn how to conserve and protect water resources.

The module is divided into two lessons:

Lesson 1 — Why Is Water Pollution Harmful?

Lesson 2 — What Can You Do to Help Fight Water Pollution?



What Will You Learn From This Module?

After studying this module, you should be able to:

- ◆ describe problems related to water pollution;
- ◆ identify the causes and harmful effects of water pollution on our health, environment, domestic life and economy;
- ◆ discuss the government's efforts in solving the problem of water pollution; and
- ◆ prepare a plan of action for possible solutions to the problem of water pollution in the community.



Let's See What You Already Know

Write the letter of the correct answer on the line before each number.

- ____1. These are very small organisms that grow rapidly in rivers. They use up the oxygen that fish and water plants need to survive.
- a. algae
 - b. bacteria
 - c. germs
 - d. viruses
- ____2. During the rainy season, rainwater cleanses the chemicals in the air and returns them to the ground and to bodies of water. This phenomenon is known as _____.
- a. condensation
 - b. rain forest
 - c. acid rain
 - d. precipitation
- ____3. Which of the following is a nonhazardous substance used for making household cleaning solutions?
- a. solvent
 - b. household ammonia
 - c. thinner
 - d. rust remover
- ____4. How should you dispose of hazardous household chemicals?
- a. take them to the nearest hazardous waste collection center
 - b. flush them into your toilet bowl
 - c. pour them into your kitchen drain
 - d. throw them into your regular garbage can

- ____ 5. In nonpoint source pollution, rainfalls pick up and carry unwanted chemicals and pollutants through storm drains to surface waters. Which of the following is *not* an example of nonpoint source pollution?
- a. washing clothes using detergents that are high in phosphate
 - b. acid rain
 - c. pouring toxic chemicals into your bathroom drain
 - d. oil spills and the burning of toxic substances at seas
- ____ 6. What is the chemical contaminant that poses an immediate threat to young children? High-level contamination can result in a condition known as the “Blue Baby Syndrome.”
- a. radon
 - b. sulfur
 - c. nitrate
 - d. phosphate
- ____ 7. What does DENR Administrative Order No. 34 cover?
- a. Revised Water Usage and Classifications
 - b. Revised Effluent Regulations of 1990
 - c. Philippine Clean Water Act
 - d. Water Regulatory Classifications
- ____ 8. An oil spill is an example of what type of water pollution?
- a. thermal pollution
 - b. air-based pollution
 - c. illegal dumping and marine transport pollution
 - d. solid waste
- ____ 9. What chemical contaminant is produced in certain types of rocks and is spilled into the groundwater in the process of erosion?
- a. phosphate
 - b. sulfur
 - c. nitrate
 - d. radon

- ___10. Which of the following is an illness that is caused by water pollution?
- a. dysentery
 - b. cancer
 - c. Blue Baby Syndrome
 - d. all of the above

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 31.

If all your answers are correct, very good! This shows that you already know much about the topic. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This only shows that this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may now proceed to the next page to begin Lesson 1.

LESSON 1

Why Is Water Pollution Harmful?

This lesson will enable you to identify problems caused by water pollution. Through this module, you will be able to enumerate the harmful practices or activities of humans that pollute our water resources.

Below are some major causes of water pollution that damage our marine resources and deplete our water supply. These will be discussed in this lesson.

- ◆ Land-based pollution
- ◆ Air-based pollution
- ◆ Dumping and marine transport pollution

At the end of this lesson, you will also learn the harmful effects of water pollution on our health, domestic life, environment and economy.



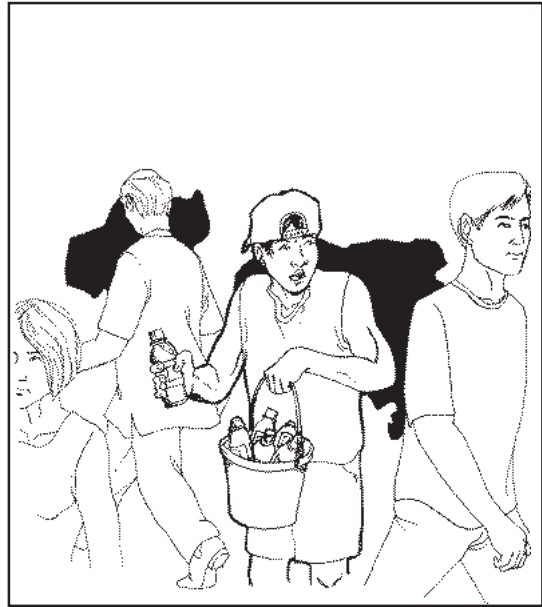
Let's Study and Analyze

A. Answer the questions below. Write your answers in the space provided after each question.

1. Do you have a continuous supply of running water in your home? Or does water come only at certain hours in your community?



2. Have you noticed that bottles of mineral water are sold almost everywhere—in the streets, schools and public places? Have you also noticed the growing business of water purification? What does this scenario tell us?



3. Are you drinking clean and safe water? Is it safe to drink water from your faucet? How do you know that your water is safe or not?

4. How does our drinking water become contaminated?

5. Why do we experience water shortage?

To check your answers, read on.



Let's Learn



Did you know that 97% of the earth's water is salt water? Less than 3% is fresh water and two-thirds of that fresh water is ice.

Nowadays, water becomes available only at certain hours in many homes. This is why many people store up water in big tanks, pails and drums for their daily use. We experience water shortage because we fail to conserve and use our water resources properly. We dump our garbage in and nearby streams, rivers and canals. These practices deplete our water supply and pollute our water sources.

We often see vendors selling mineral water in the streets and water purifiers displayed in various stores. It is because the water we drink from our faucets is more likely to be contaminated with harmful chemicals. In what way? Chemicals and bacteria line up in our water pipe. And so, we can not quite be certain how safe our water resource is. According to the report of the US Environmental Protection Agency, hundreds of tap water resources have failed to meet minimum drinking water standards. Tap water may reasonably be expected to contain small amounts of contaminants. These do not necessarily pose a health risk. However, the presence of lead, pesticides or asbestos in tap water can be very dangerous to our health.

Drinking water is unsafe when groundwater becomes infected with microbiological and chemical contaminants. These include pesticides, human and animal wastes, and chemicals carried to surface waters by rainfalls and floods.

Do you know that our problems concerning unsafe drinking water and water shortage are all caused by water pollution? You will find out later how harmful water pollution is.



Let's Study and Analyze

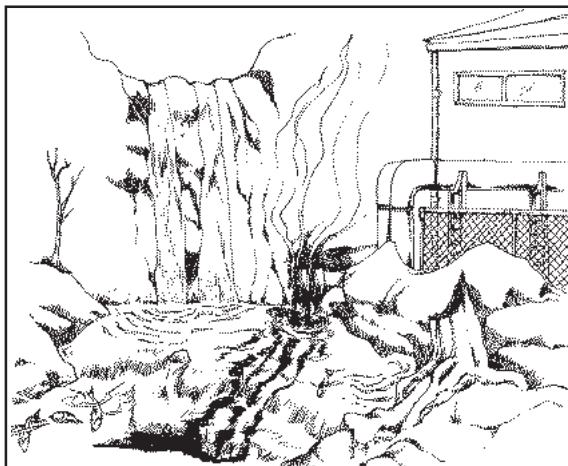
Study and describe the two illustrations below.

Picture 1



Before

Picture 2



After

Picture 1

Picture 2

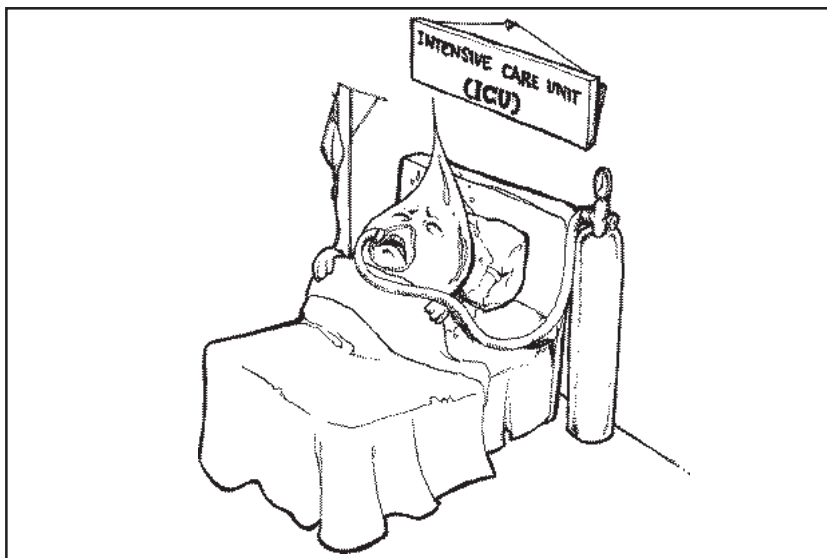
Compare your answers with those in the *Answer Key* on page 32.

The first picture shows a pollution-free environment. The water is crystal clear and there is an abundance of fish and plants in the river.

Meanwhile, the second picture illustrates how dirty this river has become. The river is contaminated with industrial wastes, and because of this, fish and water plants are dying. It is sad to learn that many of our rivers, lakes and seas are deteriorating like this.



Let's Think About This



Why is Captain River dying in the hospital?

1. Are there any bodies of water in your community? If there are none, have you seen bodies of water elsewhere? Describe them and tell if they are polluted or not.

2. Describe activities that contribute to water pollution in your community.

3. Can you cite other human activities/practices that cause water pollution?

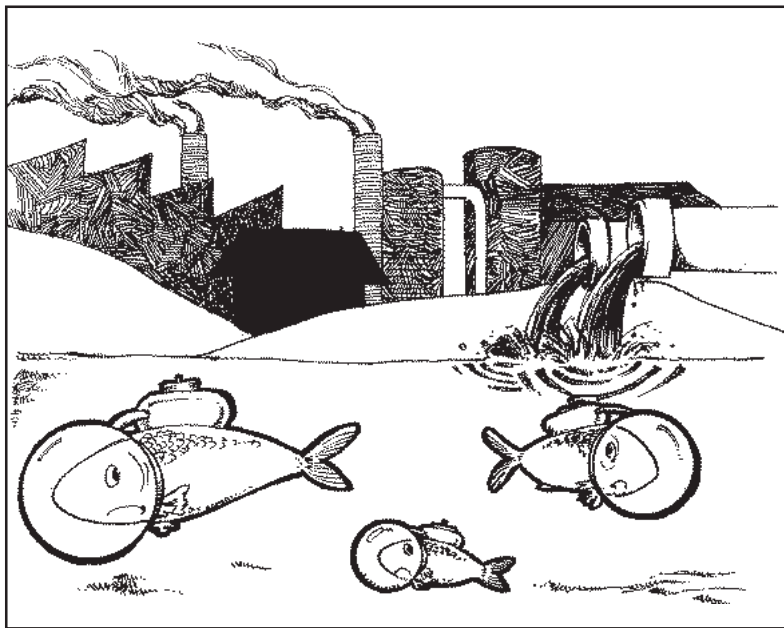
Compare your answers with those in the *Answer Key* on pages 32–33.



Let's Read

Most of our rivers and seas have become polluted. The waters that used to be clear and pure have become unclean. Because of the lack of oxygen, many schools of fish and water plants die.

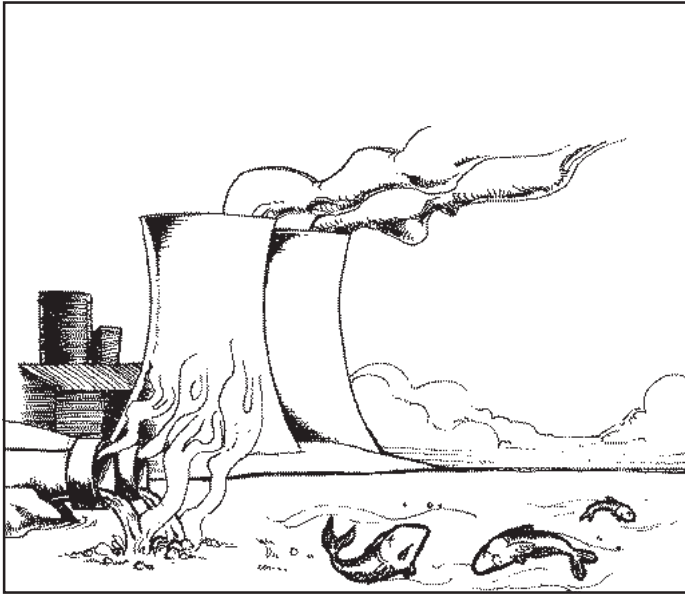
Have you ever wondered why the waters in our rivers, seas, lakes, streams and oceans have become polluted? Water pollution results when too much wastes and garbage are thrown into rivers and other bodies of water. Humans are the greatest contributors to water pollution. Study the illustrations below and see how some human practices harm our water resources.



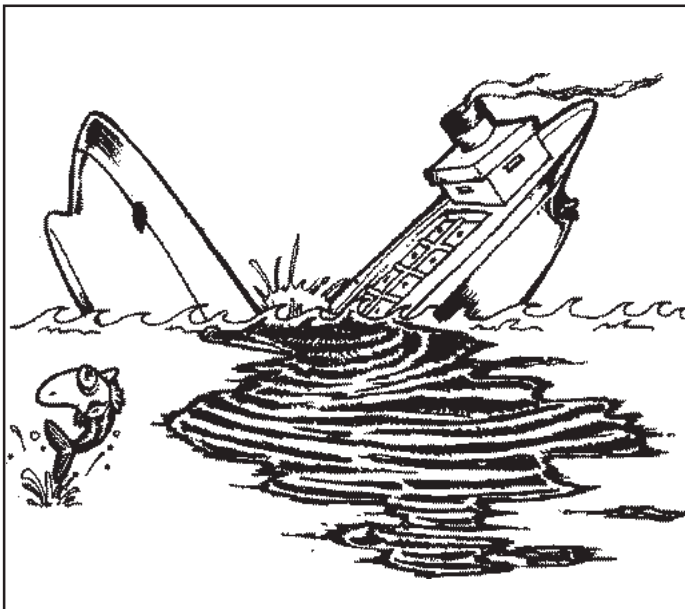
Dumping of toxic wastes into rivers and streams by industrial plants



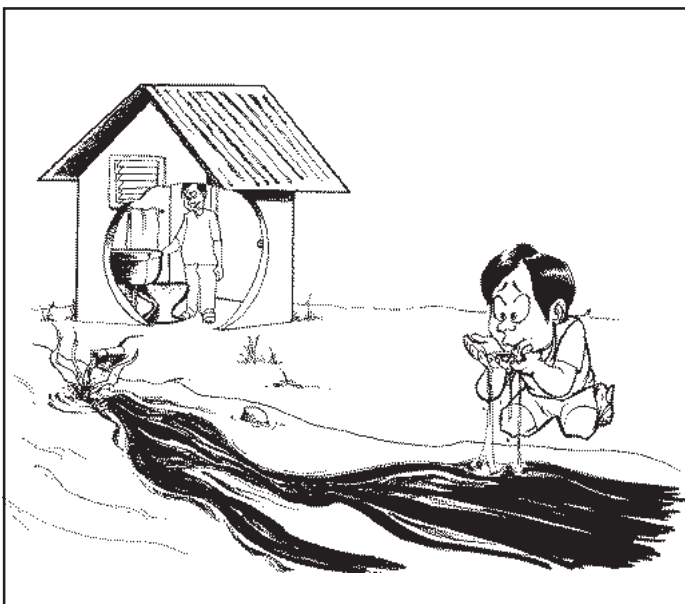
Dumping of garbage in canals and in nearby bodies of water



Disposal of hot water by electrical plants to different bodies of water causing *thermal pollution*.



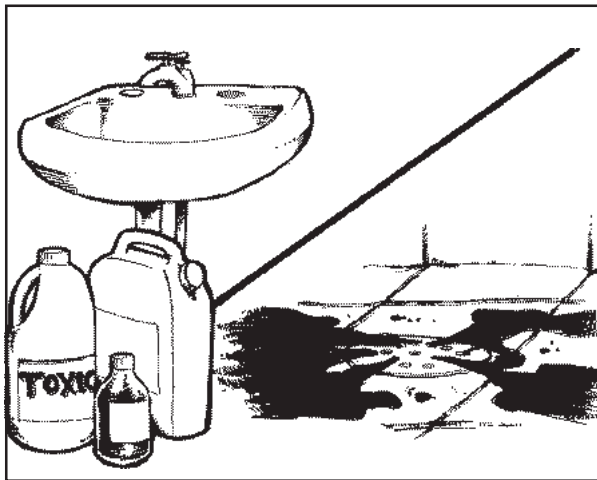
Accidental spillage of millions of tons of oil into the oceans (oil spills).



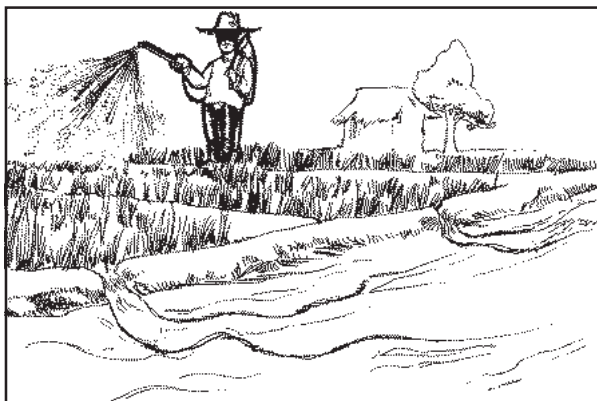
Poor sewage disposal.



Use of detergents containing chemicals such as phosphate. This chemical contributes to the rapid growth of **algae**. These tiny organisms live on phosphate and use all the oxygen in the rivers. The massive reproduction of these algae will eventually lead to the death of our rivers.



Pouring toxic residue into kitchen and bathroom drains



Runoffs such as excess fertilizer, insecticides from agricultural lands, and animals wastes contaminate our rivers and underground sources of drinking water.

At this point, we have identified the causes of water pollution and enumerated some human activities or practices that contribute to the destruction and depletion of our water resources. On the following pages, we will classify these practices according to three (3) major pollutant sources.

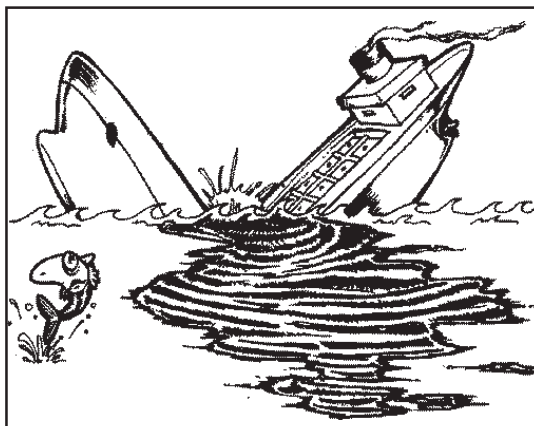


Let's Learn

Three Major Pollutant Sources

1. Dumping and Marine Transport Pollution

Many industrial plants dump their toxic wastes into rivers and streams. Some industrial plants dispose of their radioactive wastes from ships and other man-made structures by throwing these into the seas. Toxic wastes are burned in the seas and some ships illegally wash their empty tanks here. Millions of tons of oil are spilled into the oceans every year.



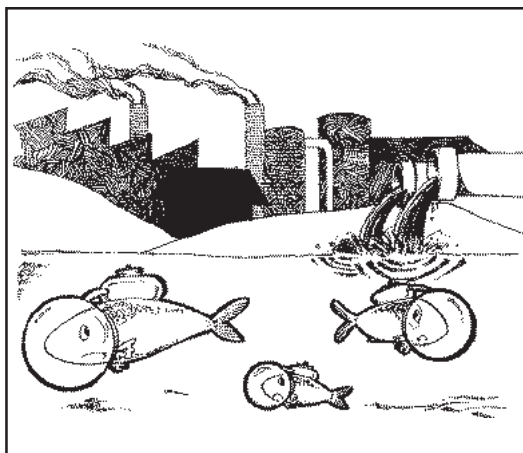
2. Air-Based Pollution

One example of air-based water pollution is the **acid rain phenomenon**. During the rainy season, rainwater washes away the chemicals in the air and brings them to the ground and into bodies of water. This is harmful to the schools of fish and other animals living in the seas and oceans. For more information on acid rain, you can read the NFE A&E module entitled *Wanted: Clean and Fresh Air*.



3. Land-Based Pollution

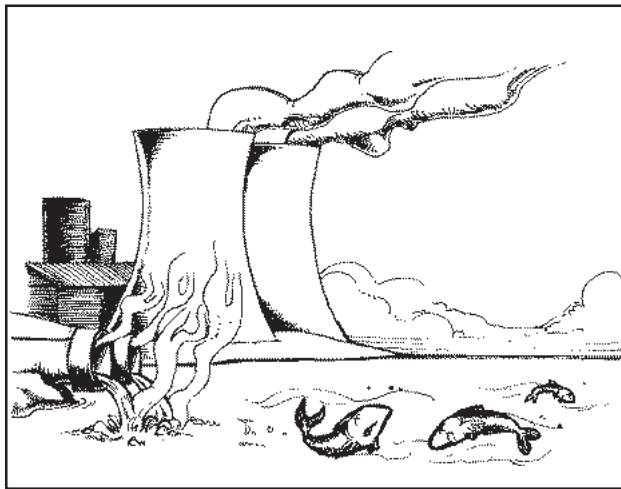
Urban development contributes to water pollution. When large groups of people migrate to urban areas to seek better employment opportunities, these areas become overpopulated. Because of overpopulation and the establishment of industrial plants and factories in these areas, the sources of drinking water become filthy and contaminated.



Factories, farms, houses and industries also contribute to water pollution. People often dump garbage, chemicals and animal wastes into canals and nearby bodies of water. Wastes, acids from factories and pesticides are also dumped in the waters. These are poisonous to the plants and animals there. These are a few examples of the ill practices brought about by urban development which contribute to water pollution.

Sixty percent (60%) of the wastes and garbage that pollute the rivers and clog canal systems comes from domestic households. Forty percent (40%) comes from factories and industrial plants.

Other types of land-based pollution are *thermal pollution* and *nonpoint source pollution*.



Thermal pollution is another type of water pollution. It takes place when electric plants throw away clean hot water into different bodies of water. This endangers the life forms in these bodies of water because hot water reduces oxygen.

Nonpoint source pollution is the leading cause of the drop in the quality of our waters. Many people do not realize that while remaining in their respective homes, they too, contribute to water pollution. When chemicals and other pollutants are not disposed of properly in their homes, these are picked up and carried to surface waters through drains. We are not aware that the chemical wastes we pour into our kitchen and bathroom drains end up in the rivers, which are sources of our drinking water.

Animal wastes and fertilizers also contaminate water. In areas where sanitation is neglected, the wastes from comfort rooms (including human wastes) and kitchens are likely to infect our drinking water. The water becomes contaminated with bacteria and can cause diseases such as cholera and dysentery.



Let's Review

Based on what you have just read, answer the questions below.

1. How does water become polluted? Enumerate at least ten possible causes of water pollution.

2. Why is thermal pollution harmful to our water resources?

3. What is nonpoint source pollution? Why is it considered the leading source of water pollution?

Compare your answers with those in the *Answer Key* on pages 33–34. Did you get all the answers right?



Let's Try This

What have you learned at this point? We have discussed that water pollution is a result of human activity. It is caused by too much waste and garbage thrown into bodies of water. Water becomes contaminated with foreign substances such as chemicals, industrial wastes and sewage.

Having learned the causes of water pollution, do you know anything about its harmful effects? Why is water pollution harmful to our health and environment? How does it affect our domestic life? Does water pollution also affect our economy? How?

Supply the table on the following page with your own ideas regarding the effects of water pollution on our health, households, environment and economy.

Harmful Effects of Water Pollution	
Domestic Life/ Household	What will happen if our water supply is inadequate for our daily use? <hr/> <hr/> <hr/> <hr/> <hr/>
Environment	What will happen to our beaches, marine plants and fish if our rivers and seas are polluted? <hr/> <hr/> <hr/> <hr/> <hr/>
Health	What are the sicknesses/illnesses caused by contaminated water? <hr/> <hr/> <hr/> <hr/> <hr/>
Economy	What will happen to our economy if water pollution remains a threat? <hr/> <hr/> <hr/> <hr/> <hr/>

To check your answers, continue reading.



Let's Read

Indeed, water performs an important role in our lives.

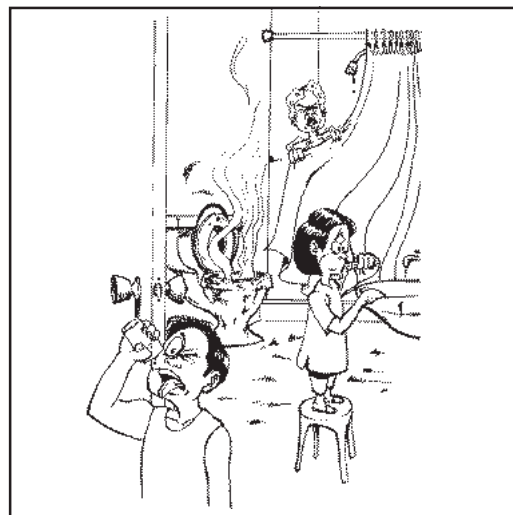
Every morning, we use water for bathing and other morning cleaning activities. We also use water to wash our clothes and dishes. We use water when we cook our meals and clean our homes.

What will happen to us if we wake up one morning and find out that there is no water in our watersheds? Will we survive? What will we drink instead? From these, we can see the consequences of water pollution in our everyday lives.

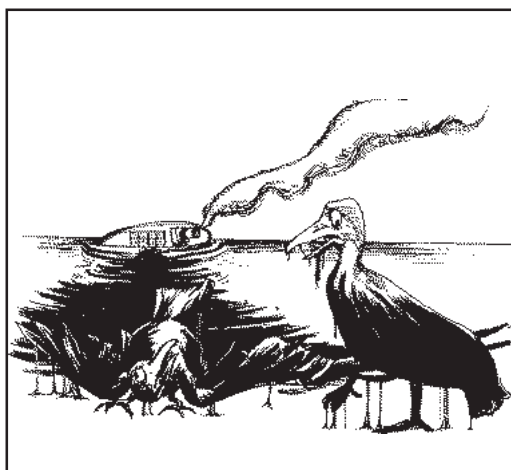
We also see the effects of water pollution on the aquatic environment. We hear warnings not to eat clams because of red tide poisoning. We hear from the media how environmental groups help save endangered animals such as seals, whales and sea birds from oil spills. Birds living near the sea are endangered when oil gets into their feathers, preventing them from swimming or flying. Can you recall when our beaches like Boracay were closed to the public because of water contamination?

Fish and marine plants die when chemicals or runoffs increase the phosphorus and nitrogen levels in lakes and seas. The foul-smelling algae and other microscopic organisms that grow rapidly use too much oxygen. As a result, the fish and other animals die from lack of oxygen. The wildlife that feed on these animals are, in turn, also affected.

Human health can also be harmed. According to the World Health Organization (WHO), five million people all over the world die each year because of the intake of contaminated water. If we drink water contaminated with toxins, serious health problems like cancer, birth defects and gastrointestinal diseases such as typhoid and hepatitis can occur. Small amounts of contaminants may cause nausea, lung irritation, skin rashes, diarrhea, vomiting and dizziness. Excessive levels of nitrate in drinking water is fatal to babies and young children. This can result to a condition known as the “Blue Baby Syndrome,” which can even cause death. Radon is a contaminant that is



What would happen if we don't have enough water?



Water pollution puts the lives of sea birds and other aquatic animals at risk.



Small amounts of contaminants may cause diarrhea, vomiting and dizziness.

produced in certain types of rocks and when these rocks erode, the chemical mixes with groundwater.

Poor water quality and water shortage have a negative effect on the economy, specifically when agricultural production decreases. Because of inadequate water supply for irrigating crops in the fields, some farms are forced to close down. Moreover, when workers in the urban areas get sick because of contaminated water, work productivity slows down. These affect our industries and, consequently, our economy.



Some farms are forced to close down due to water shortage.

To sum up, water pollution has several undesirable or harmful effects. These are:

- ◆ destruction of marine life;
- ◆ death of marine plants and fish;
- ◆ red tide;
- ◆ decline of tourism industry;
- ◆ decline of fishing industry;
- ◆ decrease in agricultural production;
- ◆ closing down of agricultural farms because of inadequate water supply;
- ◆ minor health problems like nausea, lung irritation, skin rashes, diarrhea, vomiting, dizziness, etc.; and
- ◆ serious health problems such as cancer, birth defects and gastro-intestinal diseases.



Let's See What You Have Learned

Write the correct answers in the blanks.

- _____ 1. What happens when too much wastes and garbage are thrown into bodies of water?
- _____ 2. What microorganisms reproduce so rapidly that they use up all the oxygen in the water, causing plants and fish to die because of lack of oxygen?
- _____ 3. }
- _____ 4. }
- _____ 5. } Give five (5) sicknesses or illnesses caused by water pollution.
- _____ 6. }
- _____ 7. }
- _____ 8. What does WHO stand for?
- _____ 9. How many millions of people die each year due to the intake of contaminated water?
- _____ 10. }
- _____ 11. }
- _____ 12. } Give five (5) household uses of water.
- _____ 13. }
- _____ 14. }
- _____ 15. What kind of water pollution is caused by accidents at sea involving oil tankers?

Compare your answers with those in the *Answer Key* on pages 34–35.



Let's Talk About This

Discuss among your friends, co-workers, co-learners, family members and Instructional Manager the condition of the Pasig River or any polluted river within or near your locality. Identify the reasons for its deterioration. Also discuss among yourselves the harmful effects of polluted water on the health, households, environment and economy of nearby communities.



Let's Remember

In this lesson, you learned that:

- ◆ Water pollution is a result of human activity. Human beings are the greatest contributors to the worsening situation of water pollution.
- ◆ Water pollution is a result of too much waste and garbage thrown into bodies of water.
- ◆ Water pollution is harmful to our health, households, environment and economy.

LESSON 2

What Can You Do to Help Fight Water Pollution?

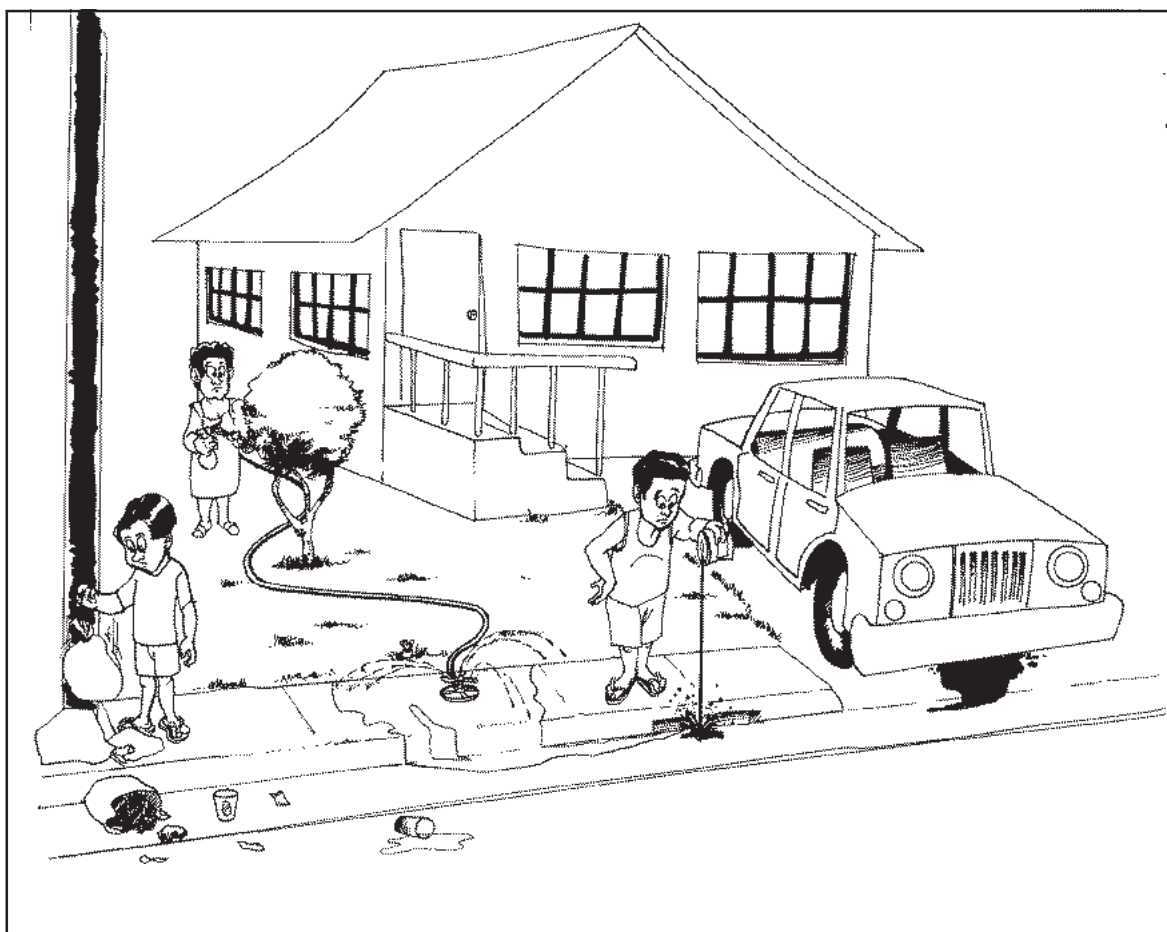
This lesson will teach you how to conserve water and minimize water pollution. Safety tips will also be discussed so that you can readily protect your health from toxic chemicals that have contaminated various bodies of water. This lesson will also keep you informed about the government's existing programs on water pollution.



Let's Study and Analyze

What is wrong with the picture below?

Encircle five bad practices that contribute to water pollution.



Were you able to spot them all? Write them down on the lines below. Also explain why you consider them bad practices.

1. _____

2. _____

3. _____

4. _____

5. _____

How many were you able to spot? Were you able to locate the man pouring used motor oil down the ground drainage? Why is this not a good practice? It is because chemicals like motor oil can damage water plants and kill fish when they reach the lakes and streams.

Similarly, the oil that leaks from the car, as shown in the picture, is washed into the ground drainage when it rains. It is best that you check cars and vehicles for leaks and drips to prevent further pollution of our rivers and streams.

Did you also notice that the sprinklers are not properly positioned? They should have been placed on the lawn and not on the sidewalk to save water. Watering the lawn or garden should be done early in the morning to lessen evaporation. This allows more water to sink in the soil and reach the plants' roots.

Another bad practice is the use of fertilizers and pesticides by the woman tending her plants. The use of fertilizers and pesticides contribute to water pollution. Fertilizers contain large amounts of nitrogen and phosphorous that can be washed into lakes and streams. Also, pesticides contain materials that are harmful to fish, plants and humans. When it rains, these toxic materials can be swept into the ground drainage, which heads directly to streams and rivers.

Lastly, were you able to spot the boy throwing garbage on the street? Remember that plastic bags, candy wrappers and plastic cups littering the streets eventually drift to the sea. Marine animals might mistake the plastics for food and they may die from eating these.

Were you able to explain why the practices you have spotted are not considered good practices? What have you learned about protecting and conserving our water resources? Can you name some hazardous products or chemicals used in the house that pollute our water resources?



Let's Try This

Look for ten (10) toxic materials that can be found in your home and which contribute to the pollution of rivers, lakes and other bodies of natural water. These materials are hidden in the puzzle below. Can you find and encircle them?

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

To know if you encircled the right items, check your answers using the *Answer Key* on page 35.



Let's Learn

The conservation and protection of our water resources should always be a shared responsibility. As caretakers of our environment, each and everyone of us should do his/her part in protecting and conserving our water resources. We should bear in mind that conservation is as yet the most effective way of preserving our water resources.

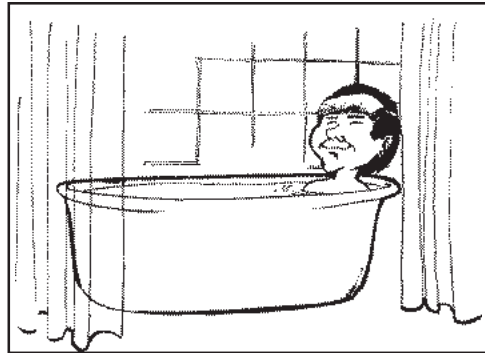
There are a number of ways we can help our government reduce water pollution. We can teach ourselves, our families and neighbors how to save water. We can educate them about the dangers of household chemicals that may contaminate our drinking water. Also, we can involve ourselves in environmental protection activities (e.g., watershed-protection projects) and attend seminars on toxic waste management sponsored by environmental organizations or our government. Such seminars will teach us the proper handling or disposal of excess paints, thinners, pesticides, used oil and other toxic materials.

On the following pages are some valuable tips on how to save water and at the same time, keep it free from contamination.

Ways to Save Water

Bathing and personal care

1. Tightly turn faucets off to avoid leaks.
2. When brushing your teeth, don't let the water run continuously.
3. Lessen the rate of water flow when washing or using the faucet.



Laundry

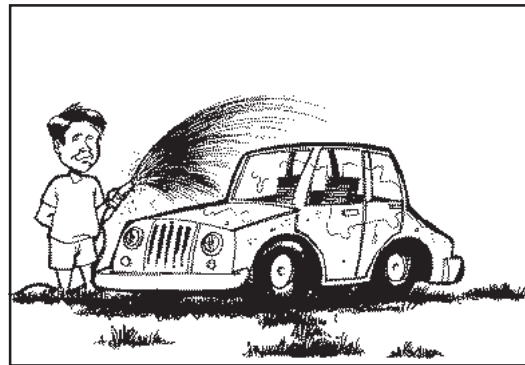
1. Wash clothes only when they are dirty.
2. Wash clothes in bulk, not one piece or a few pieces at a time.

Cooking

1. Use tight-fitting covers on pans to minimize the evaporation of water.
2. Use as little water as possible when cooking food.
3. Use a small pan of water to peel or clean vegetables rather than letting the water run over them continuously.

Household cleaning

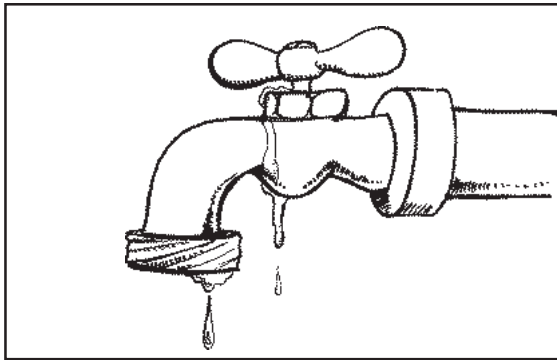
1. Use a broom instead of a hose when cleaning your driveway and garage floor.
2. Wash your car on the grass so that the grass can be watered at the same time.
3. When washing dishes, use a pan of soapy water for washing and another pan of hot water for rinsing.
4. Wipe rather than rinse dishes if they are not so dirty.



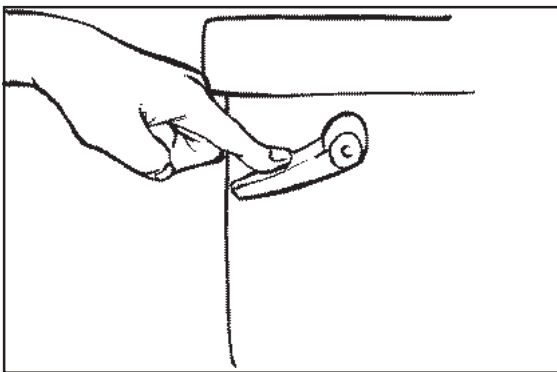
Garden and lawn

1. Water your lawn or garden early in the morning or at night to lessen or minimize evaporation, so that more water will sink in the plants' roots.
2. Pull out weeds from your garden or lawn.
3. Check hoses and faucets frequently for leaks.
4. Cut grass to a length of three inches.

DID YOU KNOW THAT...



...a leaking faucet is a common household water waster? A faucet that leaks one drop per second can waste 2,400 gallons per year.



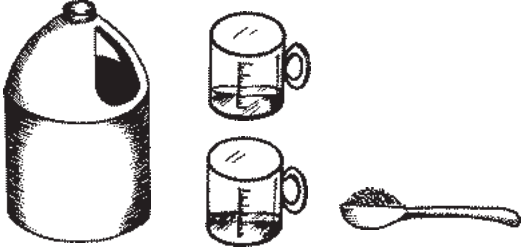
...about 3.5 to 5 gallons of water is used per flush of the toilet. You can lessen this if you place a bottle filled with water and pebbles inside your toilet tank. This adds volume to the water, thus lessening the amount needed to fill up the toilet tank.

Source: United Environmental Protection Agency

Now study the following tips which you can follow to help protect our water resources.

Ways to Protect Water From Contamination

1. Be aware that common chemicals used around the house such as oven and toilet cleaners, bleaches, paints, solvents, polishers and glues, are toxic. Use nontoxic substitutes like vinegar, pure soap, baking soda, borax and household ammonia instead.



Try this recipe for an all-purpose cleaner.

- ◆ 1 gallon hot water
- ◆ $\frac{1}{4}$ cup household ammonia
- ◆ $\frac{1}{4}$ cup vinegar
- ◆ 1 tablespoon baking soda

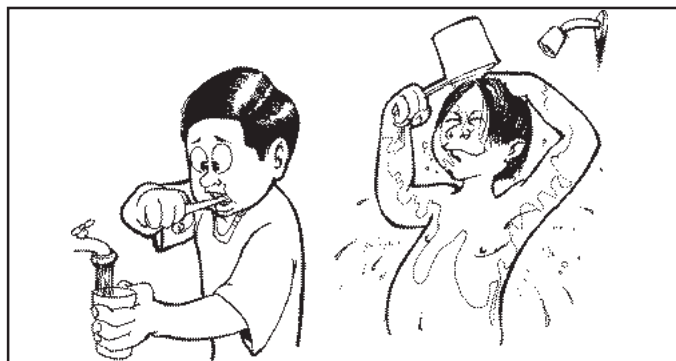
2. Limit the use of hazardous chemicals. Buy chemicals that you think would be used immediately. Do not store or throw away the excess chemicals carelessly.

3. Properly dispose of household toxic wastes. Do not pour hazardous chemicals down the drain or on the ground. The soil cannot purify these chemicals. Likewise, do not dispose of them in regular household garbage cans.
4. Clean household drains with hot water mixed with $\frac{1}{2}$ cup of baking soda.
5. Use low-phosphate or phosphate-free detergents. These chemicals are eaten by tiny organisms called algae. These algae multiply rapidly in rivers and use up all the oxygen that is also needed by fish and marine plants. This will eventually contribute to the death of rivers.
6. Clean up spilled brake fluid, oil and grease. Do not pour them into the ground drainage where they will eventually reach nearby lakes and rivers.
7. Place litter, including cigarette butts, in trash cans. Never throw garbage on the streets because, when it rains, it can flow into the ground drainage.
8. Animal wastes contain bacteria and viruses. These wastes should be properly disposed of in garbage cans.
9. Instead of using pesticides on house plants in your garden, try the following:
 - a. Pull weeds by hand.
 - b. Pull off and throw away infected leaves.
 - c. Rotate garden crops to control soil-borne diseases and to maintain the nutrients of the soil.
 - d. Use biological control such as ladybugs or other insects to maintain the condition of your soil.



Let's Review

Answer the following questions.



1. What can you do to reduce water pollution in your home and community?

2. How can you conserve water in your home and community?

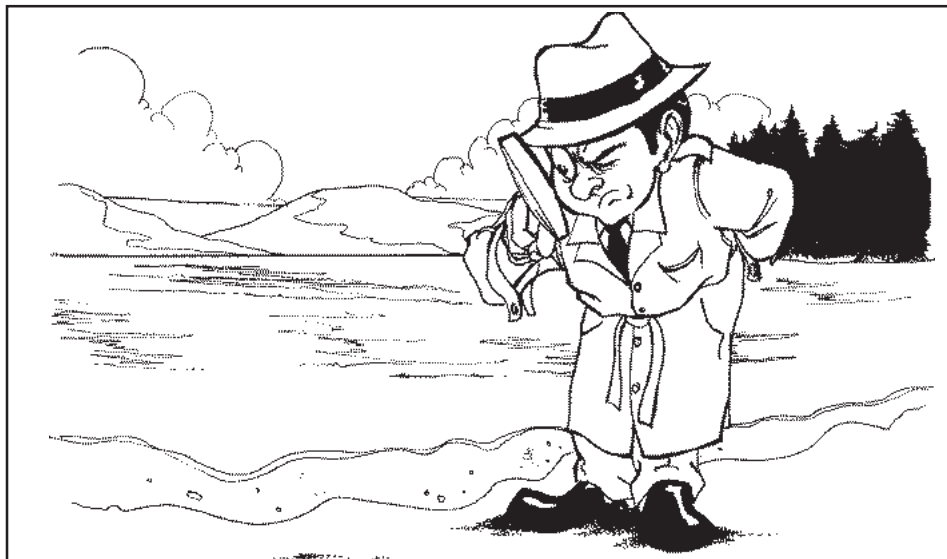
3. How can you help our government solve the water pollution problem?

Compare your answers with those in the *Answer Key* on pages 35–36.



Let's Read

What Does the Government Do to Fight Water Pollution?



Are you aware of the government's efforts in safeguarding public waters? Do you involve yourself in environmental programs initiated by our government?

The Department of Environment and Natural Resources (DENR) ensures the implementation of DENR Administrative Order No. 32. This states that “the quality of Philippine waters shall be maintained in a safe and satisfactory condition according to their best usage.” In fact, water quality monitoring and control programs have been set up by the Environmental Management Bureau (EMB) of DENR to protect public waters from the discharging and dumping of toxic wastes. The EMB conducts special response and monitoring units during water pollution emergencies and catastrophes.



Let's Try This

Go visit a river, lake or sea within or near your community. Make observations and assess the water condition. If there are any abnormalities such as schools of dead fish, oil spills, leaking barrels and other forms of pollution, report them to your local environment department. Discuss also your observations of the water condition with your Instructional Manager, coworkers, friends and family members.



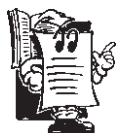
Let's Remember

- ◆ We can do many things in our own homes to help save water and protect it from contamination.
- ◆ Conservation plays a major part in our efforts in protecting and preserving water resources as well as improving the water condition.
- ◆ The best and most effective way to be safe at home and in the workplace is to use earth- and human-friendly cleaning alternatives rather than hazardous chemicals.



Let's Try This

Share what you have learned in this module with your friends, coworkers and family members. This is one way of increasing public awareness and promoting environmental education. Educate people in your community about how they can help protect our water resources.



Let's Sum Up

- ◆ Water pollution is a result of human activity. Human beings are the greatest contributors to water pollution.
- ◆ Water pollution is a result of too much waste and garbage thrown in bodies of water. Water becomes contaminated with foreign substances such as chemicals, industrial wastes and sewage. These are harmful to our environment.
- ◆ Water pollution is harmful to our health, homes, environment and economy.
- ◆ There are many things that we can do to conserve water and help protect it from contamination.
- ◆ Conservation plays a major part in our efforts in preserving, improving and saving our water resources and environment.
- ◆ The best and most effective way to be safe at home and in the workplace is to use earth- and human-friendly cleaning alternatives rather than hazardous chemicals.

Congratulations! You have just completed this module. But before proceeding to an entirely new module, take this last test. Do your best and good luck!



What Have You Learned?

1. How and when does water pollution take place?

2. List the types of water pollution found in your community.

3. Discuss the causes and effects of water pollution on your health, domestic life, environment and economy.

4. What solutions do you propose to end the water pollution problems in your community?

5. What can you do as an individual to help the government reduce our water pollution problems?

Were you able to answer the five items? Very good! Now compare your answer with those in the *Answer Key* on pages 36–37. If your score is:

- 5 Very good! You have learned a lot from this module. You may now study a new one.
- 3 – 4 Good! Just review the parts of the module that you didn't understand very well.
- 0 – 2 Read this module again to understand its lessons better.



Answer Key

A. Let's See What You Already Know *(pages 2–4)*

1. (a) Algae are minute organisms that grow rapidly in rivers. They use up the oxygen in the river causing the suffocation of fish and water plants in the area.
2. (c) Acid rain is an example of air-based water pollution. It occurs when chemicals found in the air are brought down to bodies of water by rainfall.
3. (b) Household ammonia is a nonhazardous substance used for making cleaning solution. Solvents, thinners and rust removers are hazardous chemicals.
4. (a) When disposing of hazardous household chemicals, never throw them into your toilet bowl or kitchen drain. Neither should you place them in the garbage can. They should be taken to the nearest hazardous waste collection center.
5. (d) Examples of nonpoint source pollution are acid rain, the pouring of toxic chemicals down the drain or the use of high-level phosphate detergents. Oil spills and the burning of toxic substances at sea are not examples of nonpoint source pollution.
6. (c) Nitrate is the chemical contaminant that poses an immediate threat to young children. High-contamination levels can result to “Blue Baby Syndrome.”
7. (a) DENR Administrative Order No. 34 is about Revised Water Usage and Classifications.
8. (c) An oil spill is an example of illegal dumping and marine transport pollution.
9. (d) Radon is a chemical contaminant that is produced in certain types of rocks. It can contaminate the water we drink.
10. (d) All of the above. Dysentery, cancer and Blue Baby Syndrome are examples of illnesses/sicknesses caused by water pollution.

B. Lesson 1

Let's Study and Analyze (page 8)

Picture 1 (Before) – Description of a pollution-free environment

- ◆ Water is crystal clear.
- ◆ There are many fishes and plants in the river.
- ◆ The air is fresh.
- ◆ Trees, shrubs and plants are abundant.

Picture 2 (After) – Description of a polluted environment

- ◆ Water is heavily polluted.
- ◆ Fish and plants are contaminated or poisoned.
- ◆ Wastes and garbage are dumped along the riverbank.
- ◆ Toxic chemicals coming from an industrial plant flow into the river.

Let's Think About This (page 9)

Why is Captain River dying in the hospital?

1. Possible answer:

Yes. The river is dirty. It is contaminated with industrial wastes. Plastic bags, candy wrappers and plastic cups are thrown along the riverbank. Wastes and garbage are dumped in the river.

2. Activities contributing to water pollution in my community are:

- ◆ dumping of garbage and wastes in canals and in nearby bodies of water;
- ◆ poor sewage disposal;
- ◆ use of detergents rich in phosphate;
- ◆ pouring of chemicals or toxic residues into drains; and
- ◆ flushing of chemicals down toilet bowls;

3. Other human activities/practices that contribute to the pollution of our water resources are:
- a. dumping of toxic wastes in rivers and streams by industrial plants;
 - b. dumping of garbage and wastes in canals and in nearby bodies of water;
 - c. disposal of hot water by electrical plants in different bodies of water, otherwise called *thermal pollution*;
 - d. oil spills;
 - e. poor sewage disposal;
 - f. use of detergents containing phosphate;
 - g. pouring toxic residues into kitchen and bathroom drains;
 - h. flowing of excess fertilizers, insecticides from agricultural lands, and animal wastes into our rivers, streams, and even groundwater;
 - i. disposal of radioactive wastes at seas;
 - j. burning of toxic wastes at seas;
 - k. illegal washing of empty ship tanks at sea;
 - l. nonpoint source pollution, e.g., pouring of chemicals or toxic residues into drains or in the ground, flushing of chemicals in toilet bowls, and the use of detergents that are high in phosphate; and
 - m. pollution of rivers due to housing development.

Let's Review (page 15)

1. Answers are same as the answers on question no. 3 of *Let's Think About This* on page 9.
- a. dumping of toxic wastes in rivers and streams by industrial plants;
 - b. dumping of garbage and wastes in canals and in nearby water bodies;

- c. disposal of hot water by electrical plants in different water bodies, called *thermal pollution*;
 - d. oil spills;
 - e. poor sewage disposal;
 - f. use of detergents containing phosphate;
 - g. pouring toxic residues into kitchen and bathroom drains;
 - h. flowing of excess fertilizers, insecticides from agricultural lands, and animal wastes into our rivers, streams and even groundwater;
 - i. disposal of radioactive wastes at seas;
 - j. burning of toxic wastes at seas;
 - k. illegal washing of empty ship tanks at sea;
 - l. nonpoint source pollution, e.g., pouring of chemicals or toxic residues into drains or in the ground, flushing of chemicals in toilet bowls, and the use of detergents that are high in phosphate;
 - m. pollution of rivers due to housing development.
2. Thermal pollution is harmful to our water resources because hot water, when poured into a body of water, reduces the oxygen content, thereby endangering the living forms dwelling in the water.
 3. Nonpoint source pollution is the process where in chemicals and other pollutants around your home are picked up and carried through the pipe drains to surface waters.

Let's See What You Have Learned (page 19)

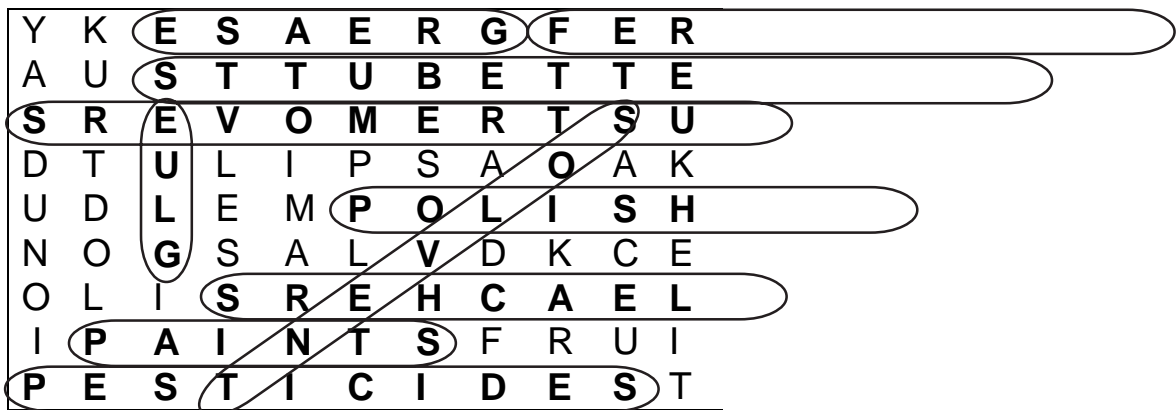
1. water pollution
2. algae
- 3–7. Sickesses/illnesses caused by water pollution: cancer; birth defects; Blue Baby Syndrome; and gastrointestinal diseases such as dysentery, cholera, typhoid, hepatitis and diarrhea.
8. World Health Organization
9. five (5) million

- 10–14. Five (5) household uses of water:
- (a) washing of clothes and dishes;
 - (b) washing of cars;
 - (c) watering of plants;
 - (d) flushing of toilet bowls; and
 - (e) taking baths.

15. oil spill

C. Lesson 2

Let's Try This (page 23)



Let's Review (pages 26–27)

1. Some suggestions to reduce water pollution in your community:
 - a. Conserve water.
 - b. Avoid using hazardous materials. Use nontoxic substitutes such as vinegar, baking soda and household ammonia.
 - c. Do not litter on the streets.
2. Methods for conserving water:
 - a. Fix leaking faucets.
 - b. Turn-off faucets when not in use, e.g., while brushing.
 - c. Clean your car on the grass, so that the grass can be watered at the same time.
3. Ways to help the government solve our water pollution problem:
 - a. Support and participate in government-initiated water conservation or clean up projects.

- b. Educate your neighbors about the harmful effects of toxic chemicals.
- c. Convince people to use nontoxic substitutes.
- d. Attend related seminars to improve one's awareness on matters concerning environment protection.

D. What Have You Learned? (*pages 29–30*)

1. Water pollution takes place when too much waste and garbage are dumped into the rivers, seas and other bodies of water.
2. Answers may vary. Possible answers are:
 - a. dumping and marine transport pollution;
 - b. air-based pollution; and
 - c. land-based pollution: thermal pollution, nonpoint source pollution, etc.
3. Causes of water pollution:
 - a. dumping of toxic wastes in rivers and streams by industrial plants;
 - b. dumping of garbage and wastes in canals and in nearby water bodies;
 - c. disposal of hot water by electrical plants to different water bodies, called *thermal pollution*;
 - d. oil spills;
 - e. poor sewage disposal;
 - f. use of detergents containing phosphate;
 - g. pouring toxic residues into your kitchen and bathroom drains;
 - h. flowing of excess fertilizers, insecticides from agricultural lands and animal wastes into our rivers streams and even groundwater;
 - i. disposal of radioactive wastes in the sea;
 - j. burning of toxic wastes in the sea;
 - k. illegal washing of empty ship tank in the sea;
 - l. nonpoint source pollution, e.g., pouring of chemicals or residue into drains or grounds, flushing chemicals down toilet bowls and use of detergents that are high in phosphate; and
 - m. pollution of rivers due to housing development.

Effects of water pollution:

- a. destruction of marine life;
 - b. death of marine plants and fishes;
 - c. red tide;
 - d. decline of tourism industry;
 - e. bankruptcy of fishing industry;
 - f. decrease in agricultural production;
 - g. closing down of agricultural farms due to inadequate water supply;
 - h. minor health problems like nausea, lung irritation, skin rashes, diarrhea, vomiting and dizziness; and
 - i. serious health problems such as cancer, birth defects and gastro-intestinal diseases.
4. Solutions to water pollution problems in your community:
- a. Conserve water.
 - b. Avoid using hazardous materials.
 - c. Do not litter on the streets.
5. Ways to help government solve our water pollution problem:
- a. Support and participate in government-initiated water conservation or clean up projects.
 - b. Educate your neighbors about the harmful effects of toxic chemicals.
 - c. Convince people to use nontoxic substitutes.
 - d. Attend related seminars to improve one's awareness on matters regarding environmental protection.



Glossary

Acid rain Rain that has a high concentration of sulfuric and nitric acids due to air pollution

Algae A group of plants, variously one-celled, containing chlorophyll and found in water and damp places

Borax A white, crystalline salt used in glass and soaps

Evaporation Changing a liquid or solid into vapor

Gastrointestinal Pertaining to the stomach and intestines

Nitrate Any of several chemical compounds containing nitrogen and used especially to make soil more fertile

Pollution The action of polluting, especially by environmental contamination with man-made wastes

Radon A chemical element or a radioactive gas



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