
LANGUAGE AND CIVIL SOCIETY

ENVIRONMENTAL EDUCATION

Preface

Welcome to the Environmental Education volume of the *Forum's* electronic journal *Language and Civil Society*. Each of the ten chapters in this volume will focus on a key environmental topic such as endangered animal species or rain forest depletion. Individual topics have been selected because of their global importance, as well as their interest and relevance to students of English as a foreign or second language around the world. Motivated by the excitement of using their English language skills to solve real-world problems, students are engaged, observant and active learners. As teachers work through the activities in this volume with their classes, their students will gain competence in English as well as learn how they can help preserve the world's delicate environment.



The primary author for this volume is Susan Stempleski. Susan Stempleski is Coordinator of Faculty Development at the Hunter College International English Language Institute of the City University of New York and teaches specialized methodology courses in the MA Program in TESOL at Columbia University Teachers College. Internationally recognized as an authority of the use of video and other electronic media in language teaching, she founded the Video Interest Section of the international TESOL association and is a past member of the TESOL Board of Directors. She is series editor of the ABC News intermediate ESL Video Library, ESL director and supervising editor of the *Hello, America* multimedia EFL course and co-author of the telecourse *That's English*. She has written more than 30 student texts and teacher resource books including *Earth Watch*, *Focus on the Environment*, *Video in Action* and *Video in Second Language Teaching*.

TABLE OF CONTENTS

ENVIRONMENTAL EDUCATION

VOLUME

Introduction		
Chapter 1	Endangered Species	
Chapter 2	Air Pollution	
Chapter 3	Human Population	
Chapter 4	Rain Forests	
Chapter 5	Oceans and Coasts	
Chapter 6	Climate Change	
Chapter 7	Energy Conservation	
Chapter 8	The Ozone Layer	
Chapter 9	Recycling and Reusing	
Chapter 10	Waste Management	
Internet Resources	References	Glossary

INTRODUCTION

Environmental education brings the real world into the language classroom, empowering learners to make positive changes in their local communities and in the world. Language teachers who introduce environmental topics such as rain forest destruction and endangered animal species into their lessons find that students are fascinated by the problems these issues present. Besides serving as a rich and stimulating source of real-world content, environmental education:

- provides an effective framework for integrating language skills;
- bridges the gap between English and other school subjects;
- develops critical and creative thinking skills;
- fosters the development of problem-solving skills;
- provides opportunities for exploring cross-cultural attitudes and values;
- engages multiple intelligences;
- encourages student interaction.

Another reason, and the most important, for bringing environmental issues into the language classroom is the urgency of the environmental situation itself. If students are to participate fully in solving the environmental problems of today and the future, environmental education is essential. Problems such as plant and animal extinction are pressing. All educators have an ethical and personal responsibility to contribute to students' awareness of environmental issues and to foster in their students the development of skills that promote sustainable development.



A GLOBAL APPROACH

Besides offering practice on specific language skills such as speaking or reading, each of the activities presented in this volume incorporates one or more of the following global objectives related to the environment:

- *Awareness:* Promoting awareness of a particular environmental problem and what individuals can do to help solve the problem.
- *Concern:* Encouraging students to explore their own values and feelings of concern about the environment.
- *Skills:* Helping students to acquire and develop the necessary skills to solve environmental problems.
- *Action:* Providing opportunities for students to get actively involved in doing something to remedy environmental problems.

STUDENT-CENTERED ACTIVITIES

Many of the classroom activities in this volume take a student-centered approach that provides opportunities for students to work together in small groups or teams, pooling their knowledge and learning from one another. Students carry out a wide variety of interactive tasks — such as brainstorming, discussion, values clarification activities, debate — which encourage analysis and interpretation of environmental issues. During the activities, students have the opportunity to examine the issues in the context of their experience, their culture, and the world as a whole.



A POSITIVE ATTITUDE

Motivated by the excitement of using their English language skills to solve real-world problems, students are engaged, observant and active learners.

Environmental problems such as ocean pollution and global warming may seem overwhelming, but learning about them doesn't have to be ponderous or depressing. By using classroom activities that take a positive approach and focus on what individuals can do to help save the earth, teachers can provide students with an enjoyable and satisfying learning experience.



I hope you find the contents of this volume to be informative, enjoyable and useful. If this is your first time visiting this site, I hope that you'll come back for another visit very soon.

Susan Stempleski

CHAPTER 1

ENDANGERED SPECIES

When people hear the word **endangered**, most of them think of a large and majestic species, like the Asian elephant, or a cute and cuddly one, like the giant panda. While these creatures are indeed endangered, the threat of **extinction** is not limited to the few **species** we can recognize in pictures or on visits to zoos. The threat of extinction affects nearly every species on the planet.

Endangered Species has been selected as the theme of the first chapter of the Environmental Education volume because of its universal importance and its interest to students. By learning about some animal and plant species that are in trouble, students can discover why we need to protect all the species on the planet, including the ones that are not as cute as pandas or as majestic as elephants. Learning about endangered species is important for other reasons too. By examining the problems of endangered species, students can begin to appreciate the crucial role of **habitat** protection.

While reading about and discussing endangered plant and animal species, students improve their language skills by learning and using new vocabulary and concepts associated with the topic. The topic is a broad one and can be exploited in a variety of ways. Some teachers may decide to use the activities described in the section on **Classroom Applications** as a single 50-minute lesson. Others may choose to combine some of the materials outlined in the section on **Internet Resources** to create a more extensive teaching unit. The ideas presented here are offered only as a starting point for introducing the study of endangered species to students.



BACKGROUND INFORMATION

Most people have a general idea of what an endangered, **threatened**, or **extinct** species is, but biologists have rather precise definitions for each term. An endangered species is a type of animal or plant that is in immediate danger of extinction. The species usually has a small **population** and needs protection in order to survive. The mountain gorilla, the Indian python, the lady slipper orchid, and thousands of other plant and animal species throughout the world are endangered.

Biologists use the word threatened to describe species which face serious problems, but whose populations are not in immediate danger of becoming extinct. Some examples of threatened species are the African elephant, the northern spotted owl, and the eastern indigo snake.

Extinct species no longer exist or live anywhere in the world. The dodo, the passenger pigeon, and the dinosaurs are examples of extinct species.

AN OLD PHENOMENON

Extinction is not a new phenomenon. For hundreds of millions of years, extinction has been occurring naturally, as part of the evolutionary process. Some cases of extinction have been caused by natural disasters, such as volcanic eruptions. Others have been the result of environmental changes, such as shifts in climate. Sometimes extinction occurs on a very large scale, with hundreds or thousands of species becoming extinct over a relatively short period of time. An example of this is the dinosaurs and their contemporaries, victims of a mass extinction that took place at least 65 million years ago.

An Increasing Rate of Extinction

Although extinction itself is not an old phenomenon, the current rate of extinction is something new. Biologists say that at least three animal and plant species become extinct every day, a rate much higher than anything in the past 65 million years.

Why Species Become Endangered

Species become endangered for a wide variety of reasons. However, when individual cases are grouped and studied, the same broad causes appear again and again:

Rapid habitat destruction is the main reason that species become endangered. Natural changes usually occur at a slow rate, so the effects on individual species are usually slight, at least over the short term. When the rate of change is greatly speeded up, there may be no time for individual species to adapt to new conditions. The results can be disastrous. This increase in the rate of habitat destruction is directly linked to the rise in human population. As more people use more space--for homes, farms, shopping centers, and so on--there is less living space for species that cannot adapt to changing conditions. People also affect plant and animal habitats when they take wood, oil, and other products from the land.

Another people-related problem that harms wildlife is the introduction of **exotic species** - foreign species that are deliberately or accidentally introduced into new habitats by human activities. Sometimes an introduced species causes no obvious harm, but in other cases the introduced species causes serious problems. The worst of these problems is when introduced species begin to prey on native species and cause them harm.

Overexploitation is another reason species become endangered. One example of this is the case of the great whales, many of which were reduced to extremely low population sizes in the mid-20th century because of unrestricted whaling. In 1982 a number of countries agreed to put a ban on commercial whaling. As a result, some whale species that used to be endangered have made great comebacks. Many other species, however, are still at risk. Some other animal species experience high rates of exploitation because of the trade in animal parts. Currently, this trade is centered in several parts of Asia where there is a strong market for traditional medicines made from items like tiger bone and rhino horn. Other people-related problems that put plant and animal species at risk include **poaching, pollution, and over-collecting**.



CLASSROOM APPLICATIONS



PRELIMINARY LESSON PLANNING

Materials Preparation:

- Prepare and duplicate an Endangered Species Summary Sheet listing the names of 4-6 endangered species, as in the sample provided in [Appendix A](#). (Note: The activity will be more meaningful to students if you include an endangered species from their country.) Make enough copies of the Summary Sheet to give one to each student.
- Prepare a set of 4-6 Case Histories, one for each of the species listed on the Summary Sheet. A sample set of Case Histories is provided in [Appendix B](#). Duplicate enough copies of the set of Case Histories to give an individual Case History to each pair of students in the class.

Vocabulary Considerations:

Before using the Endangered Species Summary Sheet and the Case Histories in class, consider what vocabulary students will need to know to carry out the lesson successfully. Determine which vocabulary items the students are already familiar with and which items will be new for them. Some important terms and their definitions are included in the glossary in [Appendix A](#).



WARM UP ACTIVITY (APPROXIMATELY 5 MINUTES)

Purpose:

- To stimulate students' interest in the topic of endangered animal species
- To activate students' background knowledge
- To introduce students to vocabulary that will help them to successfully complete the lesson

Procedure:

1. Write the phrase *endangered species* on the board, and ask students what they think the phrase means.
2. As student volunteers give their answers, write key words from their responses on the board. If students are unfamiliar with the concept of endangered species, be prepared to provide the class with relevant information (see [Background Information](#) at the beginning of this chapter), adding words to the board as you introduce key ideas.
3. Ask students if they can name some of the reasons animals and plants become endangered. As volunteers suggest different reasons, list their answers on the board.

(Note: Do not erase the board. You will come back to it at the conclusion of the lesson.)



ACTIVITY #1 (APPROXIMATELY 25 MINUTES)

Purpose:

- To have students explore some of the reasons that plant and animal species become endangered
- To allow students to practice reading, note-taking, speaking, and listening in a meaningful way
- To give students the opportunity to use key vocabulary and concepts associated with the theme of the lesson

Procedure:

1. Distribute the Endangered Species Summary Sheet, giving one to each student. Tell the students that they are going to learn about the endangered species listed on the sheet and the problems each species is facing.
2. Put students into pairs, and give one Case History to each pair of students.
3. Explain the task to the students. They are to work in pairs, using the information in the Case History to find the information they need to fill in the required information about their assigned species. Explain that they are to take down the information in the form of brief notes.
4. Have pairs of students read the Case Histories and make notes in the appropriate boxes on the Endangered Species Summary Form.
5. Have pairs take turns giving their "summary reports" to the class. As students listen, they attempt to complete their charts with the information being reported. Encourage students to ask for repetition and clarification if necessary.



ACTIVITY #2 (APPROXIMATELY 15 MINUTES)

Purpose:

- To provide students with opportunities to use English in a meaningful way
- To reinforce key concepts and vocabulary associated with the theme of endangered species
- To give students the opportunity to be successful in English by asking them to report information discussed earlier with classmates

Procedure:

1. Tell the students to put their Case Histories away. Explain that they are going to have a class discussion, and they should use the notes they made on the Summary Sheets to answer the questions.
2. Conduct a whole-class discussion centering on the following questions:
3. What animals are a big threat to kagus? (Dogs, pigs, cats, and rats that humans have brought to New Caledonia)
4. How do these animals harm kagus? (They eat kagus and their eggs.)
5. Which species are endangered because people like to collect them? (Black lace cactus, Manus Island tree snail, Karner blue butterfly)
6. What are some of the problems that have caused leatherback sea turtles to become endangered? (loss of nesting habitats; fishing; hunting)
7. What is the main reason that Asian elephants are in trouble? (Habit destruction: there is nowhere left for them to go to find food.)
8. Which species are in trouble because of habit destruction? (All of them. Most endangered species experience some form of habit destruction.)
9. From what you know about these species, are most animals and plants endangered because of only one reason, or because of a number of reasons? (Most species are endangered for a number of reasons.)



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to discuss the relevance of lesson

Procedure:

1. Ask the students to once again name some reasons that plant and animal species become endangered.
2. As volunteers provide answers, write them on the board.
3. When all volunteers have finished giving their answers, ask the class to compare this second list with the one they made at the start of the lesson. Ask students to comment on how this list is similar or different to the one they made earlier. What new information did they learn about endangered species?
4. Wrap up the lesson by asking students if they can name the main reason why plant and animal species become endangered. (Habitat destruction is by far the biggest problem that animals and plants face today.)



EXTENSIONS

1. Have students research another endangered species and write a paragraph or two about the particular animal or plant and why it is endangered.
2. Have students do a mini-survey on endangered species. Students should interview ten people, asking them to name five endangered species. Students should also ask interviewees to specify what action, if any, they think should be taken to save endangered species. Students summarize their findings in a one-page written report, indicating whether there was any consistency among the interviewees' answers.
3. Ask groups of students to select an endangered species. Groups work together to plan presentations about the species they have selected. This can be done in the form of a poems, posters, skits, or songs.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



CHAPTER 1 APPENDICES

APPENDIX A

Endangered Species Summary Sheet					
	Description	Habitat	Range	Population	Survival Threats
Asian Elephant					
Black Lace Cactus					
Kagu					
Manus Island Tree Snail					
Leatherback Sea Turtle					
Karner Blue Butterfly					

[\(back to Classroom Applications\)](#)



APPENDIX B

Case Histories

Asian Elephant

Asian elephants used to live in the forests from Iraq to southern China. Since these forests were cut down to make room for farms and villages, the elephants have been confined to small, hilly regions where they have little contact with humans. These tiny areas of land cannot supply enough food for the elephants. An adult elephant eats about 330 pounds (150 kg) of grasses, leaves, and other vegetation each day. When forests were larger, Asian elephants migrated with the seasons. In this way, they found fresh food supplies. The plants and trees could also regenerate after the elephants left.

Today there is nowhere for the elephants to go. Experts say that the Asian elephant population is about 55,000, living on a habitat of about 190.73 square miles (494 sq km). In contrast to this, the African elephant population is about 10 times this size and lives on almost 3 million square miles (7.7 million sq. km) of available habitat.

Black Lace Cactus

This colorful plant is a favorite of collectors around the world. It is a tiny plant, only 6 inches tall. It grows alone or in small groups in desert areas near the coast of southern Texas in the United States. It is called "black lace" because the pattern of spines on each stem looks like lace.

One reason the black lace cactus is endangered is because its habitat has been destroyed. In areas where the land has been cleared to plant grass for cattle, the cacti have disappeared. Another problem is over-collecting. The plant's large pink and purple flowers are very pretty. For this reason, many people dig up the plants and take them home for their private collections. Other people dig up them up and sell them.

Kagu

Many birds sing or whistle. Others--such as myna birds and many parrots--talk. The kagu is a bird that barks! These barking birds live in the forests of New Caledonia, an island about 900 miles (1,450 km) east of Australia.

Kagus are big birds. They are 20-24 inches (51-61 cm) long and weigh about 1.9 pounds (0.9 kg). Their loud barking noise is becoming rare because only about 650 kagus are alive today.

One problem for kagus is the animals that people have brought to the New Caledonia. These dogs, pigs, cats, and rats eat kagus or their eggs. Another problem is hunting. Some people kill kagus for their meat. But, the biggest problem for kagus is the loss of habitat. The forests of New Caledonia have been cleared for mining and agriculture, leaving only a few small valleys where the kagus can live.

Manus Island Tree Snail

Manus Island, north of New Guinea, is covered with rain forest. The Manus Island tree snail, a small animal with a bright green shell, lives in the tops of the trees in this forest.

Over-collecting has been a serious problem for these small animals. Many people like to collect the shells of Manus Island tree snails because of their beautiful color. The 1.6-inch long (4 cm) shells are often used for jewelry. Another big problem for these snails is the loss of the forests where they live. Loggers are cutting down more and more trees of the Manus Island rain forest.

Little is known about the habits of this little animal. If the logging and collecting continue, soon there will be no Manus Island tree snails left to study.

Leatherback Sea Turtle

Picture a turtle that is six feet (1.8 m) long and weighs 1400 pounds (636 kg)! That's the size of a large Leatherback sea turtle, the largest turtle on earth. It is called "leatherback" because its shell is covered with a leathery-type skin.

Leatherbacks live in the warm waters of the Atlantic, Indian, and Pacific Oceans. Males spend all of their time at sea, and females come on land only when it is time to lay their eggs.

Loss of nesting habitats is a serious problem for Leatherbacks. Females build their nests on remote sandy areas along the coast. Because many coasts are being made into beaches, leatherbacks often cannot find a safe place to lay their eggs. Other problems are fishing and hunting. Leatherbacks get caught in fishing nets, and in some parts of Asia they are hunted for food and oil. Only about 100,000 females are alive today. It is hard to know the number of males since they never come ashore.

Karner Blue Butterfly

With a wingspan of about one inch (2.5 cm), Karner Blue butterflies are among the smallest of all butterflies. They are also among the rarest. They are found in the Midwestern and northeastern parts of the United States.

Many people like to collect Karner Blue butterflies because they are so beautiful. However, because numbers of Karner Blue butterflies are so low, the collection of even a few can seriously harm their population.

An even bigger problem for these butterflies is habitat loss. The only known food of the Karner blue butterfly is the wild lupine, a small blue flowering plant. Wild lupine grows best in sandy soils, in areas that are occasionally cleared by wildfires. Land development and lack of wildfire have reduced the growth of this plant. Without the wild lupine, Karner Blue butterflies cannot exist.

[\(back to Classroom Applications\)](#)



CHAPTER 2

AIR POLLUTION

Ask people to define the term **air pollution** and most of them will mention dirty air or **smog**, that harmful mixture of **mist**, **exhaust fumes** or smoke that is found in big cities all around the world. But there is much more to air pollution than dirty air. Air pollution threatens everyone and is responsible for some of the biggest environmental problems facing the world today: **acid rain**, **ozone depletion**, and the possibility of **global climate change**.

Air pollution has been selected as the theme for this second chapter of the Environmental Education volume because it is a major environmental problem that threatens the health of human beings and other living things all over the world. In this introductory lesson, students learn about some of the signs of air pollution and its harmful effects on humans. While discussing the sources and effects of air pollution, students improve their language skills by learning and using new vocabulary and concepts associated with the topic. By examining the effects of air pollution on themselves and their own community, students can begin to appreciate how important it is to maintain good air quality.

Air pollution is a huge topic. A 50-minute lesson, such as the one outlined in the section on **Classroom Applications**, provides only a brief overview of some of the issues that are involved. In this introductory lesson, students consider what they already know about air pollution: what it is, its causes, and its effects. If time allows, teachers are advised to combine or follow up this lesson with some of the materials outlined in the section on **Internet Resources** to create a more extensive teaching unit.



BACKGROUND INFORMATION

What is Air Pollution?

Air pollution is any visible or invisible substance found in the air that is not part of the normal composition of air. Some air pollution is natural and has always been a part of the earth's history. However, over the past one hundred years or so, pollution created by humans has become a major environmental problem.

Why Worry About Air Pollution?

Air pollution affects everyone. It is a threat to the health of human beings and many other living things on the planet. **Pollutants** in the air produce smog and acid rain. They also cause **cancer** and many other serious health problems. They cause ozone depletion in the upper **atmosphere**, and they increase the possibility of global climate change. Most people are familiar with visible air pollution, like smog, but some of the most dangerous air pollutants are invisible to the human eye. Since polluted air can move from region or area to another, it has the possibility of affecting nearly everyone on earth.

What Causes Air Pollution?

Air pollution is not new. Natural air pollution has been around for millions of years. Dust and a variety of gases from forest fires, volcanoes, and decaying material in rivers, oceans, and other bodies of water continually enter the atmosphere. Sometimes this natural pollution can have dramatic effects. For example, scientists believe that natural gas from plant **decay** may have been one of the main causes of global climate change in the past.

Of course, not all air pollution is produced naturally. The atmosphere contains pollutants produced by humans, and these man-made pollutants present a far more serious problem than natural air pollution. Man-made pollutants are not only sometimes more harmful, but they are usually concentrated over large cities where large populations of people live and work.

MAJOR TYPES OF AIR POLLUTION		
TYPE	SOURCES	SIGNS/EFFECTS
Ozone	<ul style="list-style-type: none"> • motor vehicles • other machines 	<ul style="list-style-type: none"> • eye problems • lung problems • respiratory problems
Carbon Monoxide	<ul style="list-style-type: none"> • motor vehicles • small engines • parking garages • tunnels • heavy traffic 	<ul style="list-style-type: none"> • headaches • dizziness • fatigue • death • heart damage
Nitrogen Oxides	<ul style="list-style-type: none"> • motor vehicles • power plants burning fossil fuels • coal-burning stoves 	<ul style="list-style-type: none"> • lung problems • acid rain • forest damage • damaged buildings and statues • smog
Particulate Matter	<ul style="list-style-type: none"> • diesel engines • power plants • industries • dust in the wind • wood-burning stoves 	<ul style="list-style-type: none"> lung problems • eye problems • discolored buildings and statues • reduced visibility
Sulfur Dioxide	<ul style="list-style-type: none"> coal-burning power plants and industries • coal-burning stoves • refineries 	<ul style="list-style-type: none"> • smog • eye problems • lung damage • kills life in lakes and rivers • acid rain • damages buildings and statues
Lead	<ul style="list-style-type: none"> • vehicles using leaded gasoline • metal refineries 	<ul style="list-style-type: none"> • brain damage • kidney damage

WHAT CAN BE DONE ABOUT AIR POLLUTION?

Little can be done about natural pollution, but people can do something about the air pollution caused by humans. More and more people are becoming concerned about the pollutants that come from human activity, and there are a number of ways they can take action and get involved. Here are some of them:

- Reduce the amount of time you spend in cars, and increase the number of people with whom you share rides.
- Go to work or school by bicycle, public bus, or train.
- Walk to work or school if the distance is not too great.
- Use only as much electricity as you need. This will reduce the amount of air pollution produced by power plants.
- Have home and car air conditioners checked for leaks.
- Grow houseplants that will absorb certain air pollutants and improve indoor air quality.
- Plant a tree to improve the environment and absorb carbon dioxide.
- Join or organize a program to check acid rain.

CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Draw a K-W-L chart (What we KNOW, What we WANT to Know, and What we have LEARNED) on the board, overhead projector, or a large piece of paper. For a sample K-W-L chart, see [Appendix A](#).
- Prepare a set of cards (or small slips of paper) with one question written on each. Use the questions below, and make enough cards to give one question to each group of three or four students in the class. If there are more than five groups of students in your class, make duplicate copies of some of the cards.
 - What are some signs of air pollution in your community?
 - What are the causes of air pollution in your community?
 - How does air pollution affect humans?
 - How does the quality of air in your community compare to communities close to you?
 - How does the quality of the air in your community compare to places far from you?

Vocabulary Considerations:

Consider the vocabulary that your students will need to know to complete the lesson successfully. Determine which vocabulary items they already know and which items will be new for them. Some important terms, and their definitions, are included in the [glossary](#). Items listed in the glossary are written in **bold** print the first time they are mentioned in this chapter.



WARM UP ACTIVITY (APPROXIMATELY 5 MINUTES)

Purpose:

- To stimulate students' interest in the topic of air pollution
- To activate students' background knowledge of air pollution
- To allow students to express their initial ideas about air pollution
- To introduce and review key vocabulary related to the topic of air pollution

Procedure:

1. Write the phrase "air pollution" on the board. Ask students what they think the phrase means.
2. As student volunteers give their answers, write key words from their responses on the board. If students are unfamiliar with the concept of air pollution, be prepared to provide the class with some relevant information (see [Background Information](#) at the beginning of this chapter), adding words to the board as you introduce key ideas.
3. Tell the students that they already know something about air pollution, but there is probably more they want to know about it. Explain that in this lesson they are going to work together and share their ideas and questions about air pollution.



ACTIVITY #1 (APPROXIMATELY 15 MINUTES)

Purpose:

- To allow students to practice speaking, listening, and note-taking in a meaningful way
- To allow students to share their background knowledge and questions about air pollution
- To give students the opportunity to use key vocabulary and ideas associated with the topic of air pollution

Procedure:

1. Divide the class into groups of three or four students.
2. Show the class the K-W-L chart you have prepared, and explain the task to the students. They are to work together in groups. Each group should make its own copy of the K-W-L chart, writing the phrase "air pollution" in the space for the topic. Students will then discuss the topic of air pollution, and fill in the first two columns (What we KNOW and What we WANT to know) of their K-W-L charts to the best of their knowledge.

Note: The third column of the K-W-L chart (What we have LEARNED) will be used in the Cool Down Activity at the end of the lesson.

3. Students work in groups, discussing the topic and making brief notes in the appropriate columns on their K-W-L charts.
- 4.

- Volunteers from each group take turns reading their group's notes to the class. As the other students listen, encourage the listeners to ask for repetition and clarification if necessary.



ACTIVITY #2 (APPROXIMATELY 25 MINUTES)

Purpose:

- To allow students to practice speaking, listening, and note-taking in a meaningful way
- To have students identify possible sources and types of air pollution
- To reinforce and extend key concepts and vocabulary associated with the theme of air pollution

Procedure:

- Tell students to stay in their original groups. Distribute the cards you have prepared. Give each group of students a card with a different question. Tell the groups to discuss the question for two minutes and write down their ideas on a piece of paper.
- After two minutes, have groups exchange cards so that each group gets a new question. Continue this process until each group has had time to discuss each of the five questions.
- Conduct a whole-class discussion centering on the five questions. Some possible answers are listed in parentheses below.
 - What are some noticeable signs of air pollution?
(Smoke, **odors**, **stunted** or **discolored** plants and trees, damaged or discolored buildings and statues)
 - Where does the air pollution in your community come from?
(Cars, trucks, local industries, local electric power plants, dry cleaners, gas stations, **windblown dust**)
 - How does air pollution affect people?
(**respiratory** problems, headaches, eye problems, brain, heart, and lung problems)
 - How does the quality of air in your community compare to communities close to you?
(Answers will vary.)
 - How does the quality of the air in your community compare to places far from you?
(Answers will vary.)



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to discuss the relevance of lesson

Procedure:

1. Call on student volunteers to respond to the question "What have you learned about air pollution today?"
2. As volunteers provide answers, write them in the third column (What we have LEARNED) of the K-W-L chart on the board.

EXTENSIONS

- Have students write a short summary on what they have learned about air pollution.
- Have groups of students brainstorm and write up a list of ways to reduce air pollution.
- Have groups of students prepare posters on different aspects of air pollution. For example, one group might prepare a poster on signs of air pollution; another on health affects of air pollution; a third on sources of air pollution.
- Students can research air pollutants and environmental problems that threaten the atmosphere (e.g., acid rain, global warming).

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



CHAPTER 2 APPENDIX

Sample K-W-L Chart		
Topic:		
What we KNOW (K)	What we WANT to know (W)	What we have LEARNED (L)

[Back to activity 1](#)



CHAPTER 3

HUMAN POPULATION

Human population has been selected as the theme of the third chapter of this volume on Environmental Education because it is timely, provocative, and of universal importance. "Of all the issues we face as the new millennium nears, none is more important than population growth. The numbers speak for themselves" (Swerdlow, 1998, p. 4). In October 1999 the world's population reached 6 billion, and that number is growing by almost 90 million people a year.

The introductory lesson described here is designed as a starting point for teachers interested in introducing the topic of human population to their students. By reading about and discussing the topic of human population, students increase their awareness of population issues. They also learn new vocabulary and concepts associated with the topic, and they practice language skills in a meaningful way.

The lesson opens with a short "World Population Quiz." Next, students read and discuss an article describing some major issues related to population and the environment. The lesson continues with a whole-class discussion in which students share their personal views on population issues. Finally, students write a brief summary of what they have learned in the lesson. Some teachers will want to use the proposed activities as a single 50-minute lesson. Others may choose to combine some or all the activities with other materials to create a larger teaching unit.



BACKGROUND INFORMATION

On October 12, 1999, the United Nations declared that Earth's population had reached 6 billion. Of these 6 billion people, more than one-third live in either one or the other of two countries: India with its population of 1 billion, or China with its population of 1.2 billion.

World population first reached one billion in the year 1804. It took 123 years to reach go from one to two billion, but it took only 12 years to go from five to six billion. Since 1950 the population growth rates of the **less developed countries** have risen very rapidly, and they are now much higher than those of the **more developed countries**. As a result, most population growth in the past 50 years has been in the poorer areas of the world. Today 98 percent of population growth occurs in the less developed countries, where the benefits of health care, education, **family planning**, and economic opportunities are least available.

At first glance the effects of population growth on the environment seem obvious. More people use more resources, damage more of the earth, and create more pollution. As the population of a country increases, so does its **consumption**. Because of this, we might expect the poorer nations, which have the highest populations and the fastest rates of population growth, to cause the most damage to the environment. The truth is more complicated than that.

The greatest danger to the environment comes not just from poor people in developing countries who damage their resources in order to find food and housing. An equally big danger comes from the richest people, who use the most resources and create the most pollution. In addition, there are all the other people in between who increase their consumption as they try to improve their **standard of living**.

Reducing population growth rates does not solve all population problems. At the beginning of the 20th century, most of the world's people lived in the countryside. Today nearly half of them live in cities, and the fastest growing cities are in the less developed countries. As more people move to the cities, they use more resources and create more pollution. What other environmental problems could occur as more and more people crowd into cities?



CLASSROOM APPLICATIONS

PRELIMINARY LESSON PLANNING

Materials Preparation:

- Duplicate enough copies of the World Population Quiz in [Appendix A](#) to give one to each student.
- Duplicate enough copies of the article Population and the Environment in [Appendix B](#) to give one to each student.
- Duplicate enough copies of the Focus Questions in [Appendix C](#) to give one to each pair of students (or write the questions on the board or an overhead projector).

Vocabulary Considerations:

Before using the World Population Quiz and the article Population and the Environment, consider what vocabulary that students will need to know to carry out the lesson successfully. Determine which vocabulary items the students already familiar with and which items will be new for them. Some important terms, and their definitions, are included in the [glossary](#).



ACTIVITY #1 (APPROXIMATELY 10 MINUTES)

Purpose:

- To introduce and increase awareness of human population issues
- To provide an opportunity for students to assess their own prior knowledge of population issues
- To practice reading
- To stimulate discussion

Procedure:

1. Divide the class into pairs and distribute the World Population Quiz.
2. Explain to the students that they are going to take a quiz to find out what they already know about world population. Tell them that they will not be graded on the quiz. The purpose of the quiz is to let them find out for themselves what they already know about the subject of world population.
3. Make sure that the students understand the questions.
4. Students work in pairs, discussing the questions and marking their answers.
5. After the pair work, student volunteers take turns reporting their answers to the class. As volunteers report, write their answers on the board. If students disagree, ask them to report their answers to the question at hand. Do not indicate at this stage whether the students' answers are right or wrong.

- 6.
7. After students have reported their answers to all ten questions on the quiz, read off the correct answers to the class. (Answers to the World Population Quiz are provided in the Answer Key in [Appendix D.](#))
8. Ask the class the following questions, and allow student volunteers to give their answers:
 - a. Did any of the questions on the quiz surprise you? Which ones?



ACTIVITY #2 (APPROXIMATELY 15 MINUTES)

Purpose:

- To increase students' knowledge about world population issues
- To give students the opportunity to learn and use key vocabulary and concepts associated with the topic of world population.
- To practice reading
- To practice note taking

Procedure:

1. Explain to the class that they are going to continue working in pairs. Distribute one copy of the article Population and the Environment to each student.
2. Distribute one copy of the Focus Questions to each pair or students (or write the questions on the board or an overhead projector).
3. Tell the students to read the article, and then discuss it with their partners, asking and answering the Focus Questions with their partners.
4. After pairs have read the article and discussed it with their partners, have student volunteers take turns reading and answering the Focus Questions. (Answers to the Focus Questions are provided in the Answer Key in [Appendix D.](#))



ACTIVITY #3 (APPROXIMATELY 15 MINUTES)

Purpose:

- To allow students to express their personal views on issues related to population growth
- To reinforce key concepts and vocabulary associated with the theme of population growth
- To provide an opportunity for students to practice listening and speaking skills in a meaningful way

Procedure:

1. Tell the students that they are going to have a class discussion and that they should use their own background knowledge and opinions, along with what they have learned from the quiz and the article, to answer the questions.

2. Conduct a whole-class discussion centering on some or all of the following questions:
 - a. What do you think life will be like when the world's population is double what it is today?
 - b. In your opinion is world population growth a "problem"? Why or why not?
 - c. Do you think population growth in your own country is a problem? Why or why not?
 - d. Why do some people believe that big families are important?
 - e. What are some ways of reducing population growth?
 - f. What do you think is the best solution to overpopulation?
 - g. In your opinion, should governments be able to pass laws about the number of children allowed in each family? Why or why not?



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to reflect on and assess what they have learned in the lesson.
- To practice writing

Procedure:

1. Ask students to write a few sentences summarizing what they have learned in today's lesson.
2. Allow students 5 minutes or so to write their sentences.
3. After students have written their sentences, ask for volunteers to read their sentences aloud to the class.



EXTENSIONS

1. Have students work in pairs or small groups, drawing up a list of questions they have about the topic of human population. The questions can form the basis for project work or research.
2. Have students (in pairs or individually) select a highly populated country as a subject for a short report. Each student (or pair of students) researches the following information about the chosen country:
 - What is the life expectancy at birth?
 - What is the adult literacy rate?
 - What might be contributing to the high population of the country? Government policies? The country's social structure? Its economic situation? Something else?
 - In your opinion, is the high population of this country a "problem"? Why or why not?

3. Have students write a one-page reaction to the following quotation:

"We need that size of population in which human beings can fulfill their potentialities; in my opinion we are already overpopulated from that point of view, not just in places like India and China and Puerto Rico, but also in the United States and Western Europe." (George Wald, 1967 Nobel Laureate in Medicine)

4. Have students survey eight to ten people to learn their opinions on the following question: *Do you think world population growth is a serious problem? Why or why not?* Ask students to write a one-page summary of the responses they receive, and to be prepared to tell the class what they learned from the people that they interviewed.
5. Ask students to research how the population of their local community has changed over the last 100 years. Have them make a graph to illustrate the shifts (increases or decreases) in the community's population and determine the reasons for those shifts.
6. Ask students to imagine what it would be like if suddenly there were twice as many people living in their home as there are now. Have them write a paragraph explaining how their lives would be different, and how they would feel about living in such crowded conditions.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.

World Population Quiz

1. What is the current population of the world?
 - a. about four billion
 - b. about five billion
 - c. about six billion
 - d. about seven billion
2. When did the world population first reach one billion?
 - a. about 300 B.C.
 - b. about 1200 A.D.
 - c. about 1650 A.D.
 - d. about 1800 A.D.
3. In what year did the world population reach two billion?
 - a. about 1250
 - b. about 1650
 - c. about 1830
 - d. about 1930
4. How long did it take for the world population to go from two billion to three billion?
 - a. 30 years
 - b. 60 years
 - c. 120 years
 - d. 240 years
5. Each year the world population increases by:
 - a. 25 million people
 - b. 66 million people
 - c. 92 million people
 - d. 131 million people
6. At current rates, what will the world population be in the year 2050?
 - a. almost 11 billion
 - b. a little more than billion
 - c. a little more than 6 billion
 - d. almost 8 billion

7. The two most **populous** countries in the world are:
- a. The United States and Mexico
 - b. China and India
 - c. Mexico and India
 - d. China and the United States
8. On which continent is population growth the fastest?
- a. Africa
 - b. Asia
 - c. Europe
 - d. South America
9. What percentage of the world population lives in less developed countries?
- a. 26 percent
 - b. 53 percent
 - c. 64 percent
 - d. 77 percent
10. How many people in the world do not have enough clean drinking water?
- a. Almost everyone has enough clean drinking water.
 - b. 710 million
 - c. 1.6 billion
 - d. 2.1 billion

[\(back to Classroom Applications\)](#)

Population and the Environment

In 1999 the world's population reached six billion, and it is growing faster than ever before. Every three years, **global** population grows by about 270 million. This is the same as adding the whole population of the United States, the third largest country, every three years. If **current** rates continue, the world's population will double in less than 50 years.

Births and Deaths

Population is increasing rapidly because of the drop in **death rates**. Before World War II, both death rates and **birthrates** were high in developing countries. Around 1950, better health care and **sanitation** caused death rates to fall rapidly. At the same time birthrates remained high.

Population Problems

Most population growth is in the developing countries of Asia, Africa, and Latin America. Many of these countries do not have enough **resources** to support their growing populations. Most poor people in these countries live in **rural** areas. Many of these people have to **struggle** to fill the basic needs of food, clean water, and homes.

Land and Population Growth

As population grows, land is cleared for people. As land is cleared, **wildlife** and their **habitats** disappear, usually forever. The world's rain forests are disappearing at a rate of 100 acres (40 hectares) a minute. Asia has the highest rate of **deforestation**. Rates in Latin America and Africa are almost as high. Population growth is also responsible for the loss of farmland all over the world.

Reducing Population Growth

Many experts believe population growth needs to be controlled. Some say the best way to do this is to make sure the world's poor people can feed and care for themselves. They say better **family planning** will help couples to have fewer children. To produce more food, they say these countries should replace cash **crops** with food crops. Cash crops, such as tobacco, tea, and coffee, do not feed the local people. Farmers grow cash crops to sell to developed countries.

[\(back to Classroom Applications\)](#)



APPENDIX C

Focus Questions

1. In what year did the world's population reach 6 billion?
2. How many new people are added to the Earth each year?
3. How long will it take for world population to reach 12 billion?
4. What is the reason for the rapid increase in world population?
5. What caused death rates to fall around 1950?
6. In what parts of the world does most population growth occur?
7. Do most of the world's poor people live in cities?
8. What are some problems these poor people have?
9. In what ways does population growth affect land?
10. What do many experts say is the best way to control population growth?

[\(back to Classroom Applications\)](#)



APPENDIX D

Answer Key

WORLD POPULATION QUIZ

1. c; 2. d; 3. d; 4. a; 5. d; 6. a; 7. b; 8. a; 9. d; 10. c

FOCUS QUESTIONS

1. 1999

2. 90 million

3. Less than 50 years

4. The drop in death rates

5. Better health care and sanitation

6. In the developing countries of Asia, Africa, and Latin America

7. No. Most poor people live in rural areas.

8. Not enough food, clean water, or housing

9. As population grows, people clear more of the land for their own use. As land is cleared, wildlife disappears. Population growth also causes the loss of farmland.

10. By making sure poor people can feed and care for themselves (by means of family planning and increased food production).

[\(back to Activity 1\)](#)

[\(back to Activity 2\)](#)



CHAPTER 4

RAIN FORESTS

This chapter on rain forests will provide students with a common core of knowledge about tropical rain forests and the issues surrounding their preservation. By discussing key questions about rain forests, by reading an article presenting fundamental information about the topic, and by looking for answers to their own questions, students establish a shared body of knowledge about rain forests and their environmental effects on the world.

The topic is a broad one, and the introductory lesson outlined in the section on [Classroom Applications](#) aims not only to familiarize students with basic concepts and terminology related to rain forests, but also to alert learners to the importance of saving the rain forests. The activities presented in Chapter 4 may be used in one lesson or presented as part of a more extensive teaching unit in combination with the related [Internet Resources](#). After reading about, discussing, and exploring the topic further, students will be prepared to make their own judgments of how rain forests affect them and everyone in their world.



BACKGROUND INFORMATION

The topic of rain forests is a controversial one that will attract students' attention. Do we save the rain forests and help solve many of the world's problems, or do we just let the rain forests continue to be burned and cut so people can have jobs and farms? Such questions stimulate discussion and the expression of personal opinions. This wide-reaching topic not only relates to economic and political issues, but it is also a global environmental issue that affects everyone on the planet.

The topic of rain forests cuts across all areas of the curriculum, and information about rain forests is available from a wide variety of sources including the Internet, books, newspaper and magazine articles, television programs, and documentary films. It is a broad topic which presents many opportunities for development of new vocabulary and language concepts.

Tropical rain forests are located in 33 different countries, most of them around the **equator**. In the past fifty years, more than half of these forests have disappeared. Experts say they are disappearing at the rate of more than 100 acres per minute. Almost everyone and everything in the world has something to gain from saving rain forests. Some areas that are most strongly affected by rain forests include:

Medicine

Scientists already know that more than 1,300 rain forest plants in the Amazon have some value as medicine. However, so far no more than 10 percent of all the plant and animal **species** in the world's rain forests have been studied for their possible medical benefits. Of the few that have been studied, less than one percent have been tested for their value as a cancer treatment.

Weather

Rain forests help control the world's climate. In rain forests, it rains a lot and is very hot. The heat makes the rainwater **evaporate** back into the air. About 50 percent of the rain in some rain forests comes from evaporation. The clouds that cover the rain forests around the equator reflect the sun and keep the rain forests from getting too hot. When rain forests are burned and cleared, the carbon is released. This process, called the "**greenhouse effect**," causes the weather to become much hotter.

Soil Erosion

Rain forests help to prevent **soil erosion** and **water pollution**. The roots of the forest plants hold soil in place and help to absorb rainfall in areas that could be damaged by floods.

These are just a few of the important benefits of rain forests. These benefits are often overlooked, especially in developing countries where poor farmers often move into forestland because they have no other choice. Also, many governments support forest clearing to make room for mining, cattle, or export crops.

The loss of tropical forest areas affects many people: the forest people who lose their homes, the farmers whose lands are destroyed by soil erosion, the people whose water becomes polluted, the people who lose their homes in floods, and others. By saving the rain forests, we are saving a lot more than trees.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate the article “Some Questions and Answers about Rain Forests” provided in [Appendix A](#). Make enough copies to give one to each student.
- (Optional) Gather a selection of magazine photos of people, plants, and animals who live in tropical rain forests, or find a book or magazine with illustrations of tropical rain forest scenes.

Vocabulary Considerations:

Before using the article “Some Questions and Answers about Rain Forests” in class, consider what vocabulary that students will need to know to carry out the lesson successfully. Determine which vocabulary items the students are already familiar with and which items will be new for them. Some important terms, and their definitions, are included in the [glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 5 MINUTES)

Purpose:

- To stimulate students' interest in the topic of rain forests
- To activate students' background knowledge
- To introduce students to vocabulary that will help them successfully complete the lesson

Procedure:

1. Write the phrase "Rain Forests" on the board, and ask for student volunteers to say what they know about rain forests. Make brief notes about their answers on the board.
2. (Optional) Show the students the tropical rain forest pictures you have gathered. Circulate the pictures among the class.
3. Tell the students they probably have a lot of questions about rain forests.
4. Ask for volunteers to ask one or two questions.
5. Have students work in groups of three or four and write down at least three questions they have about rain forests.
6. Ask students to put aside (but not destroy) the questions they have written.



ACTIVITY #1 (APPROXIMATELY 20 MINUTES)

Purpose:

- To introduce some fundamental questions related to the topic of rain forests
- To allow students to anticipate the content of the reading
- To give students practice speaking and listening in a meaningful way
- To allow students to express and share their background knowledge about rain forests

Procedure:

1. Write the following nine questions--in the exact same order they are listed below--on the board, or display the questions on an overhead projector. Tell the students that these questions are some of the ones that people most often ask about rain forests. Go over the questions with the students to make sure they understand them and there are no vocabulary problems.
 - How many plant and animal species live in the world's rain forests?
 - Why are they called "rain forests"?
 - Why are rain forests important?
 - Do people live in rain forests?
 - Are all rain forests located in hot, tropical areas?

- Why are the world's rain forests disappearing?
 - Once a rain forest has been destroyed, can it grow back?
 - How old are the world's rain forests?
 - Where are the **tropical** rain forests located?
2. Tell students to continue working in their groups. Ask them to discuss the questions and suggest possible answers for each.
 3. After students have discussed the questions for about 15 minutes, elicit possible answers from the class. At this stage, do not tell any students whether their answers are right or wrong. Encourage the students to guess without worrying whether their answers are correct. Elicit as many different responses as possible to each question.



ACTIVITY #2 (APPROXIMATELY 20 MINUTES)

Purpose:

- To expose students to some key concepts related to rain forests
- To give students the opportunity to read and use key vocabulary associated with rain forests
- To have students practice reading, speaking and listening in a meaningful way

Procedure:

1. Distribute the article "Some Questions and Answers about Rain Forests," giving one to each student.
2. Call the students' attention to the nine questions on the board: the same nine questions they discussed in Activity 1 (above). Explain that the article provides answers to the questions. Their task is to match each question to one of the answers in the article.
3. Students work individually, matching the questions with the answers and writing each question on the appropriate question line (headed "Q...") in the article.
4. When students have finished matching the questions with the answers, ask them to compare their answers with those of another student or students.
5. Volunteers take turns reading the questions aloud and suggesting which answer is the most appropriate match for each question. Ask students to justify their responses, using phrases or sentences from the answers in the article. (An answer key for this exercise can be found in [Appendix B.](#))



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to discuss the relevance of the lesson

Procedure:

1. Ask students to get together in the groups they were in at the beginning of the lesson. Ask them to look again at the questions they wrote in the warm-up activity (above). Their task is to determine what answers, if any, the article gives to their questions. The questions may be answered directly, by inference, or not at all.
2. Volunteer's read their group's questions to the class and report on answers provided by the article.
3. Ask the class the following questions, and allow individual volunteers to give their answers:
 - a. What did you learn from the article?
 - b. Do you believe saving rain forests is necessary and important? Why or why not?
 - c. What efforts, if any, should be made to save the world's rain forests?



EXTENSIONS

- Students' remaining questions for which no answers have been provided can form a topic for individual or group project work or library research.
- Students can use reference materials to research an animal, plant or tribe that lives in a rain forest area. They then put together a folder containing all their research notes and finished materials. Finished materials can consist of a variety of materials including newspaper or magazine articles, fictional stories, poems, cartoons, photographs, drawings, and any other relevant items.
- Students can choose a rain forest animal and collect information (habitat, food supply, special characteristics, enemies, etc.) about the animal using the Internet and/or printed sources. Each student writes and illustrates a report on his or her chosen animal.
- Students can create a rain forest dictionary. Assign each student or group of students a rain-forest term. Students must look up the definition of the word, use it in a sentence, and draw a picture to illustrate it.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



Some Questions and Answers About Rainforests

Question 1: _____

Answer: No. A rain forest is any forest where the heavy rainfall leads to thick **vegetation**. Tropical rain forests are located in hot, tropical areas, but there are also some cool rain forests, including one in southeast Alaska. When people say "Save the rain forests," they usually mean tropical rain forests: **jungles** that have hot, **humid** weather all year.

Question 2: _____

Answer: Tropical rain forests grow around the equator, between the **Tropic of Cancer** in the north and the **Tropic of Capricorn** in the south. The largest rain forests are in Brazil, the Democratic Republic of the Congo (formerly called Zaire), and Indonesia. There are other, smaller tropical rain forests in Southeast Asia, Hawaii and the Caribbean Islands.

Question 3: _____

Answer: Because they are wet! Tropical rain forests receive between 160 and 400 inches (400-1000 centimeters) of rain each year. Because rain forests are near the equator, their temperatures stay near 75-80 degrees Fahrenheit (24-27 degrees Celsius) all year-round.

Question 4: _____

Answer: Yes. There are about 14 million people in the world's rain forests. Some of them are **indigenous** people who have lived in tropical rain forests for thousands of years. Some have never seen **outsiders** before. As the forests are destroyed, the homes and culture of these people disappear. Many die as they catch modern diseases.

Question 5: _____

Answer: Rain forests have been **evolving** for 70 to 100 million years. They contain plants and animals that live nowhere else on earth. When a rain forest is destroyed, the plants and animals which have lived there for millions of years are also destroyed.

Question 6: _____

Answer: Most scientists say there are about one million different species of plants and animals in the rain forests. A typical 4-square mile area of rain forest contains up to 1,500 species of flowers, 750 species of trees, 400 of birds, 150 of butterflies, 125 of **mammals**, 100 or **reptiles**, and 50 of **amphibians**.

Question 7: _____

Answer: Rain forests are disappearing for many different reasons. In some countries, especially those of South America, rich landowners own most of the farmland. Poor farmers have to use tropical forestland to grow food for their children. Some farmers use forestland to grow cash crops, such as coffee or pineapples. Other activities that are destroying rain forests include mining, logging, farming and cattle ranching.

Question 8: _____

Answer: Rain forests are essential to everyone on earth. They help control the world's climate. Burning and clearing rain forests releases **carbon**, and this causes the weather to become much hotter. This is called the "greenhouse effect". Rain forests also reduce floods and help to prevent **droughts**, soil erosion, and **air pollution**. Rain forests are the world's most important source of new medicines. Many medicines, such as aspirin and heart disease treatments, come from rain forest plants. It is possible that a cure for **cancer** or **AIDS** will be found in a tropical rain forest someday.

Question 9: _____

Answer: A rain forest cannot be replaced. When a rain forest has been destroyed, it is gone forever. Once the **web** of **interdependence** has been broken, plants, and animals have no way to rebuild their complex communities.

[\(back to Classroom Applications\)](#)



APPENDIX B

Answer Key:
Some Questions and Answers About Rainforests

Q 1: Are all rain forests located in hot, tropical areas?

Q 2: Where are the tropical rain forests located?

Q 3: Why are they called "rain forests"?

Q 4: Do people live in rain forests?

Q 5: How old are rain forests?

Q 6: How many plant and animal species live in the world's rain forests?

Q 7: Why are the world's rain forests disappearing?

Q 8: Why are rain forests important?

Q 9: Once a rain forest has been destroyed, can it grow back?

[\(back to Classroom Applications\)](#)



CHAPTER 5

OCEANS AND COASTS

This chapter outlines a 50-minute lesson that explores the present state of the world's oceans and coasts and the important role that humans play in maintaining the life and health of oceans and coastal areas. The lesson begins with a warm-up activity in which students discuss the importance of saving the world's oceans. Then, they listen to a reading and complete a task sheet about the state of the world's oceans and coasts. Next, they review the reading and have a class discussion on causes and types of **marine pollution**. The lesson ends with an activity in which students list ways their own activities affect the oceans and then brainstorm actions they can take to reduce marine pollution.

Through listening, speaking, and reading activities centered on the topic of marine pollution, students improve their language skills by learning and using new vocabulary and concepts related to the topic. Some teachers may choose to present the activities described in the section on **Classroom Applications** in a single 50-minute lesson. Others may wish to combine the activities with some of the materials outlined in the section on **Internet Resources** to create a longer lesson or a more extensive unit of several related lessons.



BACKGROUND INFORMATION

State of the World's Coasts

Most of the world's coasts are **polluted**.

The two biggest and most serious causes of coastal **pollution** are **sewage** disposal, and **sedimentation** from land-clearing and construction projects.

Pollution is changing coastal **habitats** and destroying fish and other **wildlife**.

State of the World's Oceans

The open ocean is cleaner than the world's coastal areas because most **pollutants** come from land and remain in water near the coastal areas.

Pollution from **litter** and chemicals is present in all the world's oceans, from coastal areas to the open ocean.

Most of the trash and pollutants produced by human activities end up in the world's oceans. Sometimes these materials are directly drained or dumped into the ocean, either on purpose or, as in the case of **oil spills**, by accident. Some pollutants (e.g., chemicals in smoke) first enter the **atmosphere** and later end up in the ocean. A lot of marine pollution comes from rivers and streams that empty into the oceans. These rivers carry sewage, industrial waste, overflow from city streets, **fertilizers** and pesticides from farms, and sedimentation.

Types of Marine Pollution

There are six major types of pollution that affect the world's oceans and coasts: sewage, litter, **petroleum**, **synthetic** chemicals, **toxic** metals, and **radioactive** materials.

SEWAGE dirties the water with **organisms** that cause diseases. People can become seriously ill from eating **contaminated** shellfish or by swimming in polluted water.

LITTER that people leave on land is the source of most of the plastic that ends up in coastal areas and oceans. **Non-biodegradable** plastics not only hurt fish, birds, **seals**, and other sea animals, but they also destroy the natural beauty of beaches.

PETROLEUM enters the oceans from oil spills or in the form of urban or industrial waste. This oil dirties beaches, kills animals, and causes problems for marine organisms.

SYNTHETIC CHEMICALS in the form of **pesticides** and industrial chemicals affect all forms of life in the oceans, causing **tumors**, birth defects and other damage.

TOXIC METALS are present in only small amounts, except in a few remote areas.

RADIOACTIVE MATERIALS are present everywhere. Most of these are natural, but a few are caused by the testing of nuclear weapons.



CLASSROOM APPLICATIONS

PRELIMINARY LESSON PLANNING

Materials Preparation:

- Duplicate enough copies of the task sheet Is It True That...? in [Appendix A](#) to give one to each student.
- Duplicate enough copies of the article The World's Oceans and Coasts in [Appendix B](#) to give one to each student.

Vocabulary Considerations:

Before using the task sheet Is It True That...? and the article The World's Oceans and Coasts, consider what vocabulary students will need to know in order to carry out the lesson successfully. Determine which vocabulary items are already familiar to students, and which will be new to them. Some important terms and their definitions are included in the [glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of marine pollution
- To activate students' background knowledge about the topic
- To allow students to express their own ideas about the importance of the world's oceans
- To introduce and review key vocabulary related to the topic

Procedure:

1. Write the phrase "marine pollution" on the board. Ask students what they think the phrase means.
2. As student volunteers give their answers, write key words from their responses on the board.
3. Ask students to describe some examples of marine pollution they have seen (e.g., plastic bottles, balloons, old shoes, petroleum). The examples can come from the students' personal experience or from the news media (e.g., pictures they have seen in newspapers or magazines).
4. Ask students why the world's oceans are important. (They are necessary for the survival of life on earth. They provide places for sea plants and animals to live. They are a major source of food for animals and people. Ships carrying raw materials (e.g., lumber, oil) and manufactured goods (e.g., furniture, automobiles) use them as highways to go from country to country and from continent to continent. They are a source of income to millions of people around the world. They affect the world's climate. The land areas near oceans serve as vacation areas for many people.)



ACTIVITY #1 (APPROXIMATELY 15 MINUTES)

Purpose:

- To allow student to share their background knowledge about marine pollution
- To give students an opportunity to assess their own prior knowledge of marine pollution
- To expand students' knowledge about the sources and effects of marine pollution
- To have students practice reading, listening, and speaking in a meaningful way
- To stimulate discussion

Procedure:

1. Divide the class into pairs and distribute the task sheet Is It True That...?
2. Explain to the students that they are going to listen to a short article about the world's oceans and coasts. Before listening to the article, they are to work together with their partners, reading each sentence on the task sheet and indicating whether the sentence is T (true), F (false), or they are U (unsure) about it. Tell students they will not be graded on the task sheet. The purpose of the task sheet is to let them find out for themselves what they already know about ocean and coastal pollution.

3. Make sure students understand the sentences on the task sheet.
4. Pairs of students work together, reading and discussing the items on the task sheet, and marking the items T (true), F (false), or U (unsure).
5. After students have finished marking their task sheets, tell the class you are now going to read aloud an article called "The World's Oceans and Coasts." The students' task is to listen to the article and check the answers on their task sheets.
6. Read the article The World's Oceans and Coasts to the students. While listening, students check the answers on their task sheets and listen for additional information.

If time allows (and if students show interest in hearing the article again), read the article a second time.
7. Have students take turns reporting their answers to the ten items on the task sheet. An answer key to the task sheet is in [Appendix C](#).
8. Distribute one copy of the article The World's Oceans and Coasts to each student. Allow students 2-3 minutes to read the article. Answer any questions they may have about the vocabulary or ideas contained in the article.



ACTIVITY #2 (APPROXIMATELY 20 MINUTES)

Purpose:

- To reinforce key concepts and vocabulary associated with the topic of marine pollution
- To provide students with opportunities to use spoken English in a meaningful way
- To give students the opportunity to be successful in English by asking them to report information they have listened to, read about, and discussed earlier with their classmates

Procedure:

- Tell students they are going to have a class discussion, and they should use the information in the article The World's Oceans and Coasts and their own background knowledge to answer the questions.
- Lead a whole class discussion centering on the following questions:
 - Why is the open ocean fairly clean compared to coastal areas? (Because most pollution sources are on land)
 - Why does so much of the world's population live on coasts or along rivers that flow into the sea? (Because oceans and rivers are good sources of food and transportation)
 - What kind of litter is found in all the world's oceans? (Plastic)
 - Where does all the plastic litter come from? (Human activities on land)
 - Why is ocean plastic pollution a problem? (It destroys the beauty of beaches and coastal waters, and it kills fish, seals, birds, and other sea animals.)
 - What other kinds of pollution affect oceans and coasts?(Sewage, toxic waste, such as industrial chemicals, trash from land and sea disposal, oil spills)



COOL DOWN ACTIVITY (APPROXIMATELY 15 MINUTES)

Purpose:

- To give students an opportunity to see how their own activities and those of other people in their communities affect the oceans
- To encourage students to think about actions they can take to deal with marine pollution
- To conclude the lesson

Procedure:

1. Write the following question on the board:

What are some ways your own activities might affect the oceans and coasts?

2. Elicit answers to the question from the class. As volunteers give their answers write them on the board. (NOTE: Students who live near the coast may more easily see the connection between their own activities and marine pollution. For students who live inland, it may be helpful to remind them that much of the trash that ends up on beaches was originally litter left on city streets, and that the water in polluted rivers and streams empties into the ocean.)

3. Write the following question on the board:

What are some things you can do to reduce marine pollution?

4. Have students work in groups, brainstorming actions they can take—as individuals or as part of a group—to reduce marine pollution, and taking brief notes on their answers. (For example, students might: examine their own daily habits to see how they affect the environment (e.g., recycling plastic containers, picking up litter on the beach or city streets); talk to others about the problem of marine pollution; read about sources of pollution in their community and attempts to control these sources; join a group working to protect the environment; participate in a beach clean-up).
5. Volunteers from each group take turns reading their group's notes to the class. As each volunteer reads, write the suggested actions on the board.



EXTENSIONS

1. Have students write a brief personal statement about marine pollution: what they have learned about it in this lesson and what they plan to do about the problem.
2. Have students research the effects of pollution on oceans and coasts. Divide the class into six teams. Assign each team a different type of pollution (litter, air pollution, bacterial/solid waste, spilled oil, industrial, or chemical pollution). Teams research the pollution's effect on oceans and coasts. Encourage students to use newspaper articles, recent magazines, and websites in their research.
3. Have students use the Internet to identify and contact special interest groups which support new legislation to preserve oceans and coasts.
4. Have students write a one-page reaction to the following proverb: "The Earth was not given to us by our ancestors, but lent to us by our children."

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



Task Sheet: *Is It True That...?*

Read each sentence and indicate whether it is true (T), false (F), or you are unsure (U) about it.

1. _____ Oceans cover about 50 percent of the earth's **surface**.
2. _____ More than 80 percent of living **organisms** live in oceans.
3. _____ Most ocean life lives in the open ocean, far away from the coastal areas.
4. _____ About ten percent of the world's **population** lives in coastal areas.
5. _____ Most fish are caught more than 200 miles from **shore**.
6. _____ The number of people who live near the world's coasts is **decreasing**.
7. _____ The open ocean is cleaner than the coastal areas.
8. _____ Shipping activities are a major cause of ocean **pollution**.
9. _____ Plastic **litter** is found in all the world's oceans.
10. _____ Most ocean plastic pollution comes from fishing and other activities at sea.

[\(back to Classroom Applications\)](#)



The World's Oceans and Coasts

The world's oceans cover 74 percent of the earth. They are home to more than 80 percent of all the living **organisms** on the planet. Oceans are **vital** to life on Earth.

Most ocean life lives along the world's coasts. Three billion people—half of the world's **population**—live in coastal areas. Fishermen around the world catch more than 99 percent of their fish less than 200 miles (320 kilometers) from **shore**.

Today most coastal areas are **polluted**. This is especially true near cities. People have always lived near the coasts. Some people live there in order to be near food and transportation. Others want to enjoy the natural beauty of the shore.

These days, coastal populations around the world are increasing. Buildings and roads are replacing natural **habitats**. Pollution is destroying fish and other **wildlife**. More **sewage** and **toxic** waste are running into coastal waters. More plastics and other forms of trash are ending up on beaches and in coastal waters.

Compared to the coastal areas, the open ocean is fairly clean. Most ocean pollution comes from shipping activities or from the **atmosphere**, but there is one kind of pollution that is found in all the world's oceans: plastic **litter**. Plastic items such as bottles and food containers wash down rivers, enter the ocean, and can even be found in faraway Antarctica. These plastics not only destroy the beauty of beaches, but they kill fish, birds, **seals**, and other animals. The major source of this ocean plastic pollution is human activities on land.

[\(back to Classroom Applications\)](#)



APPENDIX C

Answer Key

Task Sheet: *Is It True That...?*

1. F

2. T

3. F

4. F

5. F

6. F

7. T

8. T

9. T

10. F

[\(back to Classroom Applications\)](#)



CHAPTER 6

CLIMATE CHANGE

This chapter outlines a 50-minute lesson that focuses on the theme of climate change. The lesson begins with a warm-up activity in which students review the key term "climate change" and participate in a brief class survey to stimulate their interest in the topic of global warming. Students then read and discuss a short article on climate change. Next, they carry out a ranking task that encourages them to reflect more deeply on the effects of global warming. Finally, students write a brief paragraph summarizing what they have learned in the lesson and share their summaries with the class.

As students read, write, and talk about climate change, they improve their language skills by learning and using new vocabulary and concepts related to the topic. Some teachers may choose to present the activities described in the section on [Classroom Applications](#) as a single 50-minute lesson. Others may prefer to combine the activities with some of the materials outlined in the section on [Internet Resources](#) to create a longer lesson or a more extensive unit of several related lessons. The issue of climate change, especially as it relates to global warming, is complex and controversial. There are many questions about the topic, from its causes to its full effects, which cannot be fully covered in a 50-minute lesson. Teachers who want their students to explore the topic more deeply can use the sequence of activities described here as an introductory lesson.



BACKGROUND INFORMATION

The Intergovernmental Panel on Climate Change (IPCC), a United Nations group that was created to give scientific advice on climate change, published its Second Assessment Report in December 1995. According to the IPCC report, there is a great deal of evidence indicating that certain human activities are causing the warming of the Earth's atmosphere. The report says that unless steps are taken to prevent further global warming, the average surface temperature on Earth will rise by about 1 to 3 degrees Centigrade by the year 2100. This predicted change is larger than any climate change the Earth has experienced in the past 10,000 years.

There is some uncertainty about the effects of climate change, but many experts believe that global warming would cause the following:

Health -- Tropical diseases such as yellow fever and malaria would spread to a wider area.

Wildlife -- Many animal and plant species would become extinct because warmer temperatures would cause their habitats to change or disappear.

Oceans -- Sea levels would rise and cause flooding in coastal areas and very serious damage in low-lying countries such as Bangladesh.

Agriculture -- Growing seasons in Canada, Finland, Japan and other countries in the Northern Hemisphere would become longer. However, sizes of wheat, corn and other soybean crops would become smaller, causing food shortages in some areas of the world.

Forests -- Parasites from tropical areas would extend their range and attack forests in temperate zones. Some tree species in temperate zones would become extinct.

Rangelands -- Drought and erosion would become worse, and increase fires would become a problem.

Islands -- If the oceans rise, some small islands, including the Caribbean Islands and **archipelagos** in the Pacific, might disappear.

The main cause of the recent increases in global temperature is **greenhouse gases**, especially **carbon dioxide**, released by coal- and oil-fired power stations, factories, automobiles, trucks, offices, and private homes. As world population and economies grow, more and more greenhouse gases are released. As more and more of these gases enter the **atmosphere**, they trap the Earth's heat and add to global warming.

Until recently, some people argued that no action should be taken against global warming until we know exactly what effects it will have on the environment. However, scientists have shown that major changes in the atmosphere have already taken place, and that these changes will damage the environment. Furthermore, we do not know if these changes are permanent or only temporary. One fact is certain: the longer we delay action against global warming, the more difficult it will become to take effective steps.

In order to prevent further global warming, we would have to immediately reduce carbon dioxide **emissions** by 50-70%. Experts say it would be impossible to do this. However, it is possible to keep amounts of carbon dioxide below danger levels, even though we would still experience an increase in the Earth's temperature. To do this, we have to reduce worldwide carbon dioxide emissions gradually until they are much lower than the current level.

To achieve the goal of keeping carbon dioxide levels below danger levels, the 180 countries that participated in the 1992 United Nations Conference on Environment and Development ("Earth Summit") were invited to sign the United Nations Framework Convention on Climate Change. The goal of the Convention is to eventually stabilize amounts of greenhouse gases at safe levels. The developed countries that are members of the Convention agreed to take steps to reduce their emissions to 1990 levels by the year 2000.

At the climate treaty negotiations held in Kyoto in December of 1997, the parties to the United Nations Framework on Climate Change reached agreement on a historic agreement, the "Kyoto Protocol," for reducing greenhouse gas emissions after the year 2000. The protocol calls for protecting the environment by improving the way energy is produced and consumed, among other measures. According to the agreement, developed countries are legally required to reduce their emissions of greenhouse gases by at least 5% compared to 1990 levels by the period 2008-2012.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate copies of the article Climate Change in [Appendix A](#) to give for each student.
- Duplicate copies of the task sheet Global Warming: Reaching a Consensus in [Appendix B](#) for each student.

Vocabulary Considerations:

Before using the article Climate Change and the task sheet Global Warming: Reaching a Consensus, consider what vocabulary students will need to know in order to carry out the lesson successfully. Determine which vocabulary items are already familiar to students, and which will be new to them. Some important terms and their definitions are included in the glossary in [Appendix A](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of climate change
- To activate students' background knowledge about the topic
- To allow students to express their own ideas about the topic
- To introduce and review key vocabulary related to the topic

Procedure:

Write the phrase "climate change" on the board. Ask the class, "What words do you associate with the phrase 'climate change'?" As student volunteers give their answers, write their responses on the board. (The numerous possible student responses include temperature, rainfall, wind, **greenhouse effect**, global warming, weather, atmosphere, carbon dioxide, and sunlight.)

Before asking the next question, write the following three words on the board: Yes, No, Unsure.

Conduct an informal class survey. Ask students, "Do you believe the Earth's climate is getting warmer?" Read off the three words (Yes, No, Unsure) you have written on the board, one at a time, and ask students to raise their hands if it is their answer. Put tally marks under (or next to) each word.

Tell the students that they have probably already heard something about global warming, but there is probably a lot more they would like to know about it. Explain that in this lesson they are going to read an article called "Climate Change" and then work together to share their ideas about climate change, especially the effects of global warming.



ACTIVITY #1 (APPROXIMATELY 15 MINUTES)

Purpose:

- To expose students to some key concepts related to the topic of climate change
- To give students the opportunity to read and use key vocabulary associated with the topic
- To have students practice reading, speaking and listening in a meaningful way

Procedure:

1. Write the following focus questions on the board:
 - *What do you think was the most interesting part of the article?*
 - *Was there anything in the article that really surprised you?*
 - *Why are many people worried about climate change?*
 - *According to the article, how do humans cause climate change?*
2. Divide the class into groups of four or five students and distribute the article *Climate Change*, to each student.
3. Call student's attention to the focus questions on the board. Explain the task to the class. Students are to read the article, and then discuss it in their group, asking one another the focus questions.
4. After pairs have read the article and discussed it in their groups, ask the class the focus questions, one by one. Allow two or three student volunteers to answer each question.



ACTIVITY #2 (APPROXIMATELY 20 MINUTES)

Purpose:

- To have students practice reading, speaking and listening in a meaningful way
- To have students examine some of the reasons people have for being concerned about global warming
- To encourage students to reflect on and make value judgments about the effects of global warming
- To give students the opportunity to express their own points of view about the effects of global warming
- To allow students to work together and listen to their classmates' ideas about the effects of global warming

Procedure:

1. Distribute the task sheet *Global Warming: Reaching a Consensus*, giving one to each student.
2. Explain the task to the students. Working individually, they are to read the task sheet and ranking the reasons from 1 (the reason they feel is the most important) to 7 (the reason they feel is the least important). Then they are to work together in their groups (the same groups they worked with in Activity #1), discussing the items, sharing their ideas, and trying to reach a group **consensus** on how to rank each statement. Finally, they should decide who in their group will present the group's final rankings to the class.
3. Students carry out the task described in Step 2.
4. Students from each group take turns reporting their group's ranking of the seven items on the task sheet. Encourage students to give reasons why their groups ranked the items as they did.



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To encourage students to reflect on what they have learned
- To give students an opportunity to discuss the relevance of the lesson
- To practice writing
- To conclude the lesson

Procedure:

1. Ask students to write a paragraph summarizing what they have learned in today's lesson and explaining whether or not they believe global warming is a serious issue.
2. Give students five minutes or so to write their paragraphs.
3. After students have written their paragraphs, ask for volunteers to read their paragraphs aloud to the class.



EXTENSIONS

1. Have students research the topic of global warming and carry out a debate. A good source for information about both sides of the scientific argument about global warming is *Global Warming: An Explanation, Weather Eye*. See: <http://weathereye.kgan.com/expert/warming/index.html>
2. Ask students to research the causes of global warming and create a brochure on how we can slow down the process of global warming.
3. Have students take a look at the actual text of the Convention on Climate Change negotiated by 150 nations in the period 1991-92. (The convention text is available at <http://www.unfccc.de/>. For a beginner's guide to the convention, see http://unfccc.int/essential_background/background_publications_htmlpdf/items/1661.php) Discuss these questions: What does signing the convention require nations to do? By which year? What effect will these actions have on global warming?
4. Have students research the greenhouse effect and create a flow chart to show how the greenhouse effect causes additional global warming.
5. Have students do a mini-survey on global warming. Students interview ten people to find out their answers to the following questions: Do you believe global warming is a serious problem? Why or why not? Students then write a one-page summary of the responses and tell the class what they learned from the people they interviewed.
6. Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



APPENDIX A

Climate Change

A lot of people today, including many scientists, are concerned about climate change. But what exactly is climate, and why are so many people worried about it changing?

What is climate?

Climate is the average weather in a particular area over a length of time. For example, if we take 30 years of daily temperature **readings** of a city and average them, the result is what **climatologists** call a "climate normal." If you listen to an evening weather report, the reporter might say something like, "Today the temperature reached 34 degrees. That's 3 degrees higher than the normal temperature of 31." Climatologists obtained that normal temperature of 31 degrees by taking 30 years of temperature readings for that day and averaging them. The climate of a place is the averages of the different weather conditions (temperature, rainfall, wind) of that place.

Why are people worried about climate change?

Since the climate is the averages of weather conditions, each new weather condition that is different from the normal will make a small change in the climate. When the new condition is only a single **random** event (like one very hot day in the middle of winter), there is no reason to be concerned. If, however, we start to have a lot of **abnormal** weather conditions, we start to think that we are experiencing climate change. Many people are concerned about climate change because they are afraid it will cause serious problems for life on our planet, such as melting of the **polar icecaps** and the spreading of tropical diseases.

What causes climate change?

We are only beginning to understand why climate changes, but we know that the main causes are natural. Changes in the amount of energy released by the sun are one cause. Clouds are another cause. Humans also cause climate to change. Have you ever noticed that cities are usually warmer than the countryside around them? That is because factories and cars produce more heat, and also because **asphalt** and **cement absorb** heat better than plants and trees. Cities also produce a lot of air pollution that contributes to climate change. Humans also cause climate change in rural areas when they clear forests and plant crops. Different colored crops can change the amount of energy that is absorbed by vegetation. All this human activity on the surface of our planet can cause climate change.

[\(back to Classroom Applications\)](#)



APPENDIX B

Global Warming: Reaching a Consensus

The list below presents some of the reasons people have for being concerned about global warming. First rank the reasons from 1 (most important) to 7 (least important). Then work with three or four other students and try to reach a group consensus on how to rank the statements. Be prepared to present your group's final rankings to the class.

___ **Forests would be destroyed.** Global warming would cause parasites from tropical areas to extend their range and attack forests in temperate zones. Some tree species in temperate zones would become extinct.

___ **Some food crops would become smaller.** Global warming would lengthen the growing seasons in Canada, Finland, Japan and other countries in the Northern Hemisphere. However, wheat, corn and other soybean crops would become smaller.

___ **Rangelands would be harmed.** Global warming would increase problems of drought and erosion, and increased fires would become a problem.

___ **Sea levels would rise.** Global warming would cause sea levels to rise and cause flooding in coastal areas and very serious damage in low-lying countries such as Bangladesh.

___ **Tropical diseases could spread.** Global warming could cause tropical diseases such as yellow fever and malaria to spread to a wider area.

___ **Some animal and plant species would become extinct.** Global warming would cause many animal and plant species to become extinct because warmer temperatures would cause their habitats to change or disappear.

___ **Some islands might disappear.** Global warming would cause the world's oceans to rise, and some small islands, including the Caribbean Islands and archipelagos in the Pacific, might disappear.

[\(back to Classroom Applications\)](#)



CHAPTER 7

ENERGY CONSERVATION

In this chapter students explore the uses of some common sources of energy and ways that individuals can conserve energy. The 50-minute lesson begins with a warm-up activity in which students discuss the meaning of the concept of **energy conservation** and why it is important to conserve energy. Next, students work in groups to brainstorm ideas and complete a chart outlining the ways people use some common energy sources. Then, individual students fill out a questionnaire to examine their own behavior and find out how energy efficient they are as individuals. The lesson concludes with a short writing activity in which students reflect on what they have learned in the lesson and list some actions they plan to take to conserve energy.

Through listening, speaking, reading, and writing activities on the topic of energy conservation, students improve their language skills by learning and using new vocabulary and concepts related to the topic. Some teachers may decide to present the activities described in the section on [Classroom Applications](#) in one 50-minute lesson. Other teachers may prefer to combine the activities with some of the materials outlined in the section on [Internet Resources](#) to develop a longer lesson or a more extensive unit of several related lessons.



BACKGROUND INFORMATION

Sources of Energy

Energy is often defined as the capacity to do work or the ability to make things move. It is the power that humans use to produce heat and drive machines, and it is an important part of our everyday life. Electrical energy turns on lights and computers, cools refrigerators, heats toasters, and brings pictures to television screens. Burning gasoline produces energy that powers the engines of motor vehicles such as cars, trucks, and buses.

The main sources of energy in the world are **fossil fuels**—coal, oil, and natural gas—and wood. (Most electricity, another major source of energy, is produced by coal-burning **plants**.) Some other sources of energy include wind power, water, **solar energy**, and **nuclear energy**.

Environmental Problems

Using some energy **resources** creates environmental problems. Today fossil fuels supply about 90% of the world's energy needs. Burning fossil fuels for energy releases **carbon** into the air and contributes to the **greenhouse effect**. Burning fossil fuels also releases other chemicals that create **smog** and **acid rain**. These two forms of **pollution**—smog and acid rain—damage human health and the environment, including **wildlife**, water, and **vegetation**. The more energy people use, even in such everyday acts as turning on a light, taking a hot shower, or driving a car, the more pollution they help to cause.

Using fossil fuels means using them up. They are **nonrenewable** sources of energy; nature cannot re-create them at the very fast rates at which people are using them up today. At sometime in the future, all of these nonrenewable sources of energy will run out. The world will need to use other, **renewable**, energy sources such as wind power, wave power, **geothermal power**, solar energy, and **hydroelectricity**.

Using wood for energy also create environmental problems. More than two-thirds of the people in developing countries depend upon wood as their primary source of energy. Each year over 28 million acres of tropical forest are cleared for fuel needs, crop production, and cattle ranching. Forests are disappearing so quickly that they do not have time to re-grow. This deforestation also contributes to the greenhouse effect.

Using nuclear energy causes other problems. Producing nuclear energy results in unwanted and dangerous **by-products**. When atoms are split to produce nuclear energy, **hazardous** nuclear waste is produced. It is not always easy to dispose of this nuclear waste safely.

Energy Conservation

Because using some energy resources creates environmental problems, energy conservation is important. Energy conservation means using energy without waste. Some common examples of energy conservation include turning off the lights when leaving a room, setting the thermostat lower in the winter, wearing a sweater to keep warm around the house, and riding a bicycle or walking instead of driving a car.

Some people think energy conservation means keeping their house too cold in the winter or too hot in the summer. But it is not necessary to be uncomfortable when conserving energy or using it more efficiently. We can conserve energy in a number of different ways: by doing without, by changing the way we live and the way goods and services are produced, and by using energy efficiently. When we practice intelligently, energy conservation may not even be noticed.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate enough copies of the chart "Some Sources of Energy" in [Appendix A](#) to give one copy to each group of three or four students.
- Duplicate enough copies of the questionnaire "Are You an Energy Saver?" in [Appendix B](#) to give one to each student.

Vocabulary Considerations:

Before using the chart "Some Sources of Energy" and the questionnaire "Are You an Energy Saver?" consider what vocabulary your students will need to know in order to carry out the lesson successfully. Which vocabulary items are your students already familiar with and which items will be new for them? Some important terms and their definitions are included in the [glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of energy conservation
- To introduce and review key vocabulary related to the topic
- To activate students' background knowledge about the topic

Procedures:

1. Write the phrase "energy conservation" on the board, and ask the class what they think the term means.
2. As student volunteers give their answers, write key words from their responses on the board. If students are unfamiliar with the concept of energy conservation, be prepared to provide the class with relevant information (see [Background Information](#) at the beginning of this chapter), adding words to the board as you introduce key ideas.
3. Ask students why it is important to **conserve** energy. (Using some energy sources causes environmental problems. For example, clearing forests too rapidly does not give them enough time to re-grow. Burning fossil fuels creates smog and acid rain and also contributes to the greenhouse effect.) As volunteers suggest different reasons, list their answers on the board.
4. Explain to the class that in today's class they are going to be talking about some different sources of energy and some ways that people can conserve energy.



ACTIVITY #1 (APPROXIMATELY 20 MINUTES)

Purpose:

- To explore some of the ways people use energy sources
- To practice speaking, listening, and note-taking in a meaningful way
- To share ideas and discuss what the students already know about energy sources
- To give students the opportunity to use key vocabulary and ideas associated with the topic

Procedure:

1. Divide the class into groups of three or four students.
2. Distribute one copy of the chart *Some Sources of Energy* to each group.
3. Explain the task to the students. They are to work together in their groups and talk about the ways people use each of the energy sources listed on the chart. (For example, some people use wood to heat their homes.) Explain that each group should choose a "secretary" to write their group's answers in the appropriate column or columns on the chart.
4. Students work in groups, filling in the charts. As groups talk and fill in the charts, make a copy of the chart on the board.
5. After groups have completed their charts, ask for volunteers to give "summary reports" of their group's answers to the class. As students read out their reports, write on the board their answers in the appropriate columns on the chart.

6. After all reports have been given, encourage the class to add any other ideas they may have thought about as the reports were being given. As students give new responses, add their ideas to the chart on the board.



ACTIVITY #2 (APPROXIMATELY 10 MINUTES)

Purpose:

- To increase students' awareness of how they as individuals can conserve energy
- To encourage students to evaluate their own behavior in relation to energy conservation
- To practice reading in a meaningful way

Procedure:

1. Explain to the class that they are now going to have a chance to examine their own behavior and find out how energy efficient they—as individuals—are.
2. Distribute the questionnaire "Are You an Energy Saver?" giving one copy to each student.
3. Explain the task to the students. They are to work individually, reading each question and marking their answers by putting a check mark in the appropriate column. When they have finished answering the questions, they should add up their score according to the scoring system at the bottom of the questionnaire.



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To allow students to reflect on and assess what they have learned in the lesson
- To practice writing

Procedure:

1. Ask students to write one or two paragraphs, summarizing what they have learned in this lesson and listing some actions they plan to take to conserve energy.
2. Allow students 5 minutes or so to write their paragraphs.
3. After students have finished writing their paragraphs, ask for volunteers to read their sentences aloud to the class.



EXTENSIONS

1. Have individual students or groups of students each create a poster on ways to conserve energy.
2. Have the class create and perform a skit on the pros and cons of energy conservation.
3. Have students write a one-page essay on the energy source they would choose as the one "best" source of energy for the world. Tell them that their essays should include and explain the reasons for their choice.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



APPENDIX A

Some Sources of Energy		
<p>Here is a list of some common energy sources. What are some ways we use each source? Work with the people in your group and talk about the different ways people use each source. (For example, some people use wood to heat their homes.) Write your answers in the appropriate column or columns.</p>		
Wood	Water	Solar Energy
Fossil Fuels	Wind	Nuclear Energy

[\(back to Classroom Applications\)](#)



APPENDIX B

Are You an Energy Saver?			
How often do you . . .	Always	Sometimes	Never
1. avoid heating or cooling unused rooms of your home?			
2. turn off the lights when you are the last person to leave a room?			
3. use cool water, whenever possible, instead of warm or hot water?			
4. ride your bike or walk to school?			
5. turn off the TV when not in use?			
6. turn off the radio when not in use?			
7. close drapes , shutters , or window shades on cold, cloudy days to keep the cold air out?			
8. recycle plastic?			
9. recycle cans?			
10. recycle paper			
11. recycle glass?			
12. wash only full loads in a washing machine or dishwasher?			
13. close drapes, shutters, or window shades on very hot days to keep the cool air in?			
14. replace high wattage light bulbs with lower wattage ones where bright lights are not needed?			
15. put on a sweater when your home feels cold, instead of turning up the heat?			
<p>Scoring:</p> <p>Always = 2 points Sometimes = 1 point Never = 0 points</p> <p style="text-align: center;">Your Score:</p> <p>25-30 Congratulations! You're a super energy saver!</p> <p>15-24 Very good. You're doing a lot to save energy.</p> <p>5-14 You need to become more energy efficient.</p> <p>0-4 You <i>really</i> need to become more energy efficient.</p>			

[\(back to Classroom Applications\)](#)



CHAPTER 8

THE OZONE LAYER

This chapter focuses on the theme of ozone **depletion**. The 50-minute lesson begins with a warm-up activity in which students explore the phrase "**ozone layer**". Then, working in pairs, students share their prior knowledge of ozone-related issues by taking a brief *Ozone Quiz*. Students then read and discuss a short article, *All about Ozone*, and re-evaluate their answers to the quiz. Next, students participate in a class discussion that encourages them to reflect more deeply on the problem of ozone depletion. Finally, if time allows, students can write a few sentences summarizing their own ideas about ozone depletion and what, if anything, they feel should be done about it.

Through reading about and discussing the topic of ozone depletion, students improve their language skills as they learn and use new vocabulary and concepts related to the topic. Some teachers may choose to present the activities described in the section on [Classroom Applications](#) in a single 50-minute lesson. Others may wish to combine the activities with some of the materials outlined in the section on [Internet Resources](#) to create a longer lesson or a unit of several related lessons.



BACKGROUND INFORMATION

Ozone Depletion

The ozone layer is a thin shield in the upper atmosphere that protects life on Earth from the sun's **ultraviolet (UV) rays**. In the 1980s, scientists discovered that the ozone layer was being **depleted**. This depletion allows more UV **radiation** to reach the Earth's surface. This is dangerous because overexposure to UV radiation can lead to very serious health problems, such as skin **cancer** and **cataracts**.

"Good" and "Bad" Ozone

Ozone naturally occurs in two layers of the **atmosphere**: the **troposphere** and the **stratosphere**. The troposphere is the layer that surrounds the Earth's surface. The ground-level ozone in the troposphere is "bad" ozone. It is an air pollutant and contributes to urban **smog**. The stratosphere is above the troposphere. The ozone in the stratosphere is "good" ozone. It protects life on Earth by absorbing some of the sun's UV rays. When people talk about the "ozone layer," they are usually referring to the "good" ozone in the stratosphere, which lies between 10 and 20 miles (15 and 30 kilometers) above the Earth.

The Causes of Ozone Depletion

Until recently, **chlorofluorocarbons** (CFCs) were used widely in industry and elsewhere as **refrigerants**, **insulating foams**, and **solvents**. In fact, they are still widely used in air conditioners, refrigerators, and in some kinds of plastics. Strong winds carry CFCs into the stratosphere in a process that can take as long as 2 to 5 years. When CFCs break down in the stratosphere, they release **chlorine**, which attacks ozone.

What is Being Done About the Problem?

Countries around the world have recognized the problem of ozone depletion. In 1987 governments around the world signed a treaty called the Montreal Protocol to **phase out** the production and use of **ozone-depleting substances**.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate enough copies of the Ozone Quiz in [Appendix A](#) to give one to each student.
- Duplicate enough copies of the article All About Ozone in [Appendix B](#) to give one to each student.

Vocabulary Considerations:

Before using the Ozone Quiz and the article All about Ozone, consider what vocabulary students will need to know in order to carry out the lesson successfully. Determine which vocabulary items students are already familiar with, and which will be new to them. Some important terms and their definitions are included in the [glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of ozone depletion
- To activate students' background knowledge about the topic
- To allow students to express their ideas about the importance of the ozone layer
- To introduce and review key vocabulary related to the topic

Procedures:

1. Write the phrase "the ozone layer" on the board. Ask the class what they think the phrase means.
2. As student volunteers give their answers, write key words from their responses on the board.
3. Ask students if they can give some reasons why the ozone layer is important.
4. As volunteers suggest different reasons, list their answers on the board.
5. Ask students if they can name some reasons the ozone layer is in trouble.
6. As students suggest reasons, list their answers on the board.



ACTIVITY #1 (APPROXIMATELY 10 MINUTES)

Purpose:

- To increase interest in and awareness of the problem of ozone depletion
- To give students an opportunity to share their prior knowledge of ozone-related issues
- To practice reading
- To stimulate discussion

Procedure:

1. Divide the class into pairs and distribute copies of the Ozone Quiz.
2. Explain to the students that they are going to take a quiz to find out what they already know about ozone. Tell them they will not be graded on the quiz. The purpose of the quiz is to let them find out for themselves what they already know about ozone.
3. Make sure the students understand the questions.
4. Working in pairs, students discuss the questions and mark their answers.
5. Next, ask for student volunteers to take turns reading and reporting their answers to the questions. As volunteers report, write their answers (**T**, **F**, or **U**) on the board. If any students disagree with the answers given, ask them to report their answers. Include those answers on the board but do not indicate whether any of the students' answers are right or wrong. (Note: Do not erase the quiz answers on the board. You will come back to them at the end of the next activity.)
6. After students have reported their answers to all ten questions on the quiz, tell the class they will now have a chance to read an article that provides the correct answers to the questions.



ACTIVITY #2 (APPROXIMATELY 15 MINUTES)

Purpose:

- To allow students an opportunity to assess their prior knowledge of ozone-related issues
- To increase students' knowledge of ozone-related issues
- To give students the opportunity to learn and use key vocabulary and concepts associated with the topic
- To practice reading

Procedure:

1. Explain to the class that they are going to continue working in pairs. Distribute one copy of the article All About Ozone to each student.
2. Tell the students to read the article and discuss it with their partners. They should also refer to the questions on the Ozone Quiz and confirm or modify their original answers as necessary.

3. After pairs have read the article, discussed it with their partners, and reviewed their answers to the Ozone Quiz, ask for volunteers to give their answers to the quiz items. As students report their answers, refer to the board and the list of answers produced in **Activity #1**. As students provide the correct answers, circle them (**T** or **F**) on the board. Encourage students to explain their answers and to read aloud the sentence in the article that confirms their answer. (Answers to the Ozone Quiz are provided in the Answer Key in [Appendix C.](#))



COOL DOWN ACTIVITY (APPROXIMATELY 15 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to reflect on and assess what they have learned
- To allow students to practice listening and speaking skills in a meaningful way

Procedure:

1. Tell the students that they will now have a class discussion and that they should use their background knowledge and opinions, along with what they have learned from the article and quiz, to answer the questions.
2. Conduct a class discussion centered on some or all of the following questions:
 1. Did anything in the quiz surprise you? What and why?
 2. Did anything in the article surprise you? What and why?
 3. What did you learn from the quiz?
 4. What did you learn from the article?
 5. In your opinion, is ozone depletion a problem of worldwide importance? Why or why not?
 6. Do you think ozone depletion is a problem in your own country? Why or why not?
 7. Have you ever seen or bought any products that had a label saying they were "environmentally friendly" or "ozone friendly"? What products? Where did you see or buy them?
 8. Can you suggest any ways of reducing damage to the ozone layer?
 9. What do you think is the best solution to the problem of ozone depletion?
3. (Optional) If time allows, ask students to write a few sentences summarizing their ideas about ozone depletion and what, if anything, they feel should be done about it. Volunteers can read their sentences to the class.



EXTENSIONS

1. Have students create a "news program" about the ozone situation. Students can include information about what the ozone layer is, its importance, the materials and actions that contribute to ozone depletion, and actions people can take to improve the situation. Record the news program on audiotape or videotape.

2. Have students use the Internet to find articles about ozone depletion. Ask them to write a brief summary of one or two of the articles and read their summaries to the class.
3. Have students create a brochure, listing actions people can take to protect the ozone layer and themselves from the dangers of overexposure to ultraviolet radiation.
4. Have students conduct a poll of eight to ten people to find out their answers to the following question: *Are you concerned about the problem of ozone depletion? Why or why not?*

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.

Ozone Quiz

Read each sentence and circle the letter that shows whether the statement is true (T), false (F), or you are unsure (U) about it.

1. **Ozone** is a gas. T F U
2. All ozone is bad for people's health. T F U
3. The ozone layer is in the part of the atmosphere that is closest to Earth. T F U
4. Ultraviolet (UV) rays can cause skin cancer and other health problems. T F U
5. Chlorine can **damage** ozone. T F U
6. In order to make ozone, UV rays are necessary. T F U
7. The ozone hole is a huge hole in the Earth. T F U
8. The ozone hole was discovered more than one hundred years ago. T F U
9. "Environmentally friendly" products destroy ozone. T F U
10. **Environmentalists** think we need more research to save the ozone layer. T F U

[\(back to Classroom Applications\)](#)



All About Ozone

The Ozone Layer

Between 10 and 20 miles (15 and 30 kilometers) above the Earth is a thin layer of gas called the ozone layer. Ozone at ground level is dangerous to breathe, but miles up in the sky it protects the Earth from the dangerous, ultraviolet rays (UV rays) of the sun. UV rays cause skin cancer, cataracts, and other health problems.

A Natural Cycle

UV rays are needed to make ozone. So in parts of the world where there is more sunlight, there is more ozone in the atmosphere. This natural cycle worked very well until human-made chemicals began to destroy the ozone.

Ozone Destroyers

Chlorine is the main destroyer of ozone. In industry, chlorine is mixed with other chemicals to make chlorofluorocarbons (CFCs). In nature, chlorine mixes with other chemicals to make **chloromethane**. CFCs are used in **aerosols**, refrigerators, car air-conditioners, and in making some kinds of plastics. Chloromethane is released by **rotting vegetation**, **manure**, and **indigestible** gases.

The Ozone Hole

In 1985 scientists discovered a huge "hole" in the ozone layer above **Antarctica**. If the hole gets bigger and ozone continues to be depleted, there are great dangers. Many more people will get skin cancer from exposure to UV rays. Also, the UV rays will add to **global warming** caused by the **greenhouse effect**.

Ozone Depletion in the Arctic

Ozone depletion is a problem in Arctic too. In 1997 satellites showed that ozone levels over the **North Pole** were 40 percent lower than what they had been in 1982. However, the loss near the North Pole is not as serious as it is over the **South Pole**.

Reducing CFCs

Since the late 1980s, steps have been taken to reduce the use of chemicals and gases that destroy the ozone layer. Ninety countries have already agreed to phase out CFCs. You may have seen products carrying "environmentally friendly" or "ozone friendly" labels to show that they do not contain CFCs. DuPont, the world's largest maker of air-conditioners and refrigerators, has developed new chemicals that do 90 percent less harm than CFCs, but environmentalists say that is not good enough. They say we need more research to find chemicals that are totally safe.

[\(back to Classroom Applications\)](#)



Answer Key: Ozone Quiz

1. T
2. F (Ozone at ground level is bad for people's health, but ozone in the stratosphere protects people from the dangerous ultraviolet rays of the sun.)
3. F (The ozone layer is in the stratosphere, 10 to 20 miles above the Earth.)
4. T
5. T
6. T
7. F (The ozone hole is a huge hole in ozone layer, in the upper atmosphere above Antarctica.)
8. F (Scientists discovered the ozone hole in 1985.)
9. F ("Environmentally friendly" products protect ozone.)
10. T

[\(back to Classroom Applications\)](#)



CHAPTER 9

RECYCLING AND REUSING

This chapter deals with **recycling** and **reusing** items in order to save the environment. The 50-minute lesson begins with a warm-up activity in which students explore the concepts of recycling and reusing. In groups, students then examine and discuss five objects they have selected, and create lists of new and unusual uses for each item. Next, students think of other objects that are or can be recycled or reused. The lesson concludes with a writing activity in which students reflect on what they have learned and individually write up a list of ways on how they can recycle or reuse items in order to help save the environment.

Through the listening, speaking, and writing activities in this lesson, students improve their language skills by learning and using new vocabulary and concepts associated with the theme of recycling and reusing. The four activities outlined in the section on [Classroom Applications](#) may be presented in a single 50-minute lesson. The activities may also be combined with some of the materials described in the section on [Internet Resources](#), to create a longer lesson or a unit of related lessons.



BACKGROUND INFORMATION

What is Recycling?

Recycling is collecting and treating **waste products** and **discarded** materials so that they can be used again to **manufacture** new products. **Aluminum**, glass, and paper are some commonly recycled materials. Recycling usually involves four steps:

1. **Collecting:** In the collecting stage, used materials like glass, paper, and plastic are collected and taken to a **recycling center**.
2. **Sorting:** This is the stage where materials are separated by type. This is necessary because each material must be recycled in a different way.
3. **Reclaiming:** This is the stage in which something is done to the collected materials. Materials that are reusable are separated from those that are not. For example, metals are often **melted** at this stage.
4. **Reusing:** In this stage, the reclaimed materials are used in new products.

Recycling is sometimes a synonym for reusing, especially reusing things in new ways. For example, people might talk about recycling old **warehouses** as **condominiums**, or recycling old **jars** as **vases**.

What is Reusing?

Reusing simply means to use something again. In the four-step recycling process, outlined above, reusing means using reclaimed materials in new products. However, reusing can also refer to the practice of using something again—especially in a new way—without changing it in any fundamental way. For example, people might reuse an old coffee container as a **planter** for a small tree or as a holder for paintbrushes.

What Are Some Examples of Recycling?

Some examples of recycling are:

- Turning used paper back into **pulp** and then making new paper from that pulp;
- **Shredding** old automobile **tires** and adding the pieces to **asphalt**;
- Melting aluminum cans, turning the metal into **sheets**, and using the sheets to make new cans;
- Melting discarded plastic items and using the plastic to make new furniture, toys, and videocassettes;
- **Crushing** glass bottles and jars into small pieces and melting them down to make new glass;
- Crushing and melting old automobiles and using the **steel** to make new cars.

How Do Recycling and Reusing Help the Environment?

Recycling and reusing help the environment by saving space, energy, and **natural resources**, and by reducing air and water **pollution**.

How Do Recycling and Reusing Save Space?

When people recycle or reuse things that they would normally throw away, they save outdoor space. Fewer waste products and discarded materials are thrown into crowded city **dumps** and **expanding landfills**. More outdoor space is left open for nature, instead of being filled with great mountains of **trash**.

How Do Recycling and Reusing Save Energy?

Making new products from **raw materials** requires a lot of energy. Recycling used materials so that they can be used again does not require as much energy. For example, when we turn used paper into pulp to make new paper, crush old glass bottles to make new glass, and melt aluminum cans to make new cans, we save energy because the recycling process uses much less energy than it would take to make new paper, glass, or aluminum cans from raw materials. Reusing saves even more energy than recycling, since no energy is required when we simply use things again without changing them.

How Do Recycling and Reusing Save Natural Resources?

Recycling is important because fewer raw materials are used and natural resources are saved. Because the recycling process uses old materials to make new products, fewer raw materials are needed. Recycling also saves natural resources because it saves some of the coal, natural gas, wood, or water that would have been used to manufacture new products. Reusing old products instead of buying new ones also saves resources, because no raw materials are needed to create the new products they would have bought.

How Do Recycling and Reusing Help to Reduce Air and Water Pollution?

Recycling reduces air and water pollution because the recycling process requires less energy. This reduces the amount of air pollution produced by **power plants** and the amount of water pollution produced by chemicals used in the manufacturing process. Reusing reduces air and water pollution even more, because no energy is required to reuse items, and reusing items does not involve the manufacturing process.

CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Locate an old glass jar.
- Gather a variety of objects such as paper clips, paper cups, aluminum cans, old pencils, plastic bottles, old socks, empty detergent bottles, used greeting cards, and bottle caps. Gather enough objects so that each group of 3 or 4 students in your class can choose and work with at least 5 different objects.
- Prepare and duplicate enough copies of the worksheet "New Uses for Old Things", provided in [Appendix A](#), to give one to each group of 3 or 4 students.

Vocabulary Considerations:

Before using the worksheet "New Uses for Old Things", consider which words students will need to know in order to carry out the lesson successfully. Determine which vocabulary items are already familiar to students, and which will be new to them. Some important terms and their definitions are included in the [Glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 5 MINUTES)

Purpose:

- To introduce the topic of recycling and reusing
- To stimulate students' interest in the topic
- To activate students' background knowledge about the topic
- To introduce vocabulary that will allow students to successfully complete the lesson

Procedure:

1. Draw two columns on the board. Write the word "recycling" at the top of one column, and the word "reusing" at the top of the other. Ask students what they think each word means.
2. As volunteers give their answers, write key words from their responses in the appropriate column on the board. If students are unfamiliar with the concepts of recycling and reusing, be prepared to provide the class with relevant information (see [Background Information](#) at the beginning of this chapter), adding words to the board as you introduce key ideas. If students are already familiar with these concepts, go on to step 3.

3. Conduct a brief, whole-class discussion centering on the following questions:

1. Do you recycle or reuse anything? Why or why not?
2. If you recycle anything, what kinds of things do you recycle?
3. If you reuse anything, what kinds of things do you reuse?
4. How do recycling and reusing help the environment?



ACTIVITY #1 (APPROXIMATELY 25 MINUTES)

Purpose:

- To encourage students to share ideas on how they can reuse common objects
- To develop students' creative thinking skills
- To stimulate discussion
- To have students practice generating verbs and verb phrases
- To have students practice listening, speaking, and note-taking

Procedure:

1. Display the empty jelly jar to the class. Say: "As you can see, this is an old, used jelly jar. What are some new and unusual ways you can think of to use this jar?"
2. As volunteers respond, number and write the different answers on the board. (Some possible answers are: use it to store **leftovers**; use it to store pens and pencils; wash and reuse it as a drinking glass; fill it with water and use it to water plants; use it hold small coins; turn it upside-down and use it as a cookie cutter; use it as a small vase to hold flowers.)
3. Divide the class into groups of 3 or 4 students and distribute one copy of the worksheet "New Uses for Old Things" to each group.
4. Place the various objects you have collected (paper clips, paper cups, etc.) on a table.
5. Explain the task to the students. Each group will select 5 different items from the table. Groups will then discuss each of the 5 objects they have chosen, and think of at least 5 new and unusual uses for each item. Groups should use the worksheet "New Uses for Old Things" to record their answers. Tell students that if they need to **alter** a particular object to use it in a new way, they should include a brief note on how the object will need to be altered.
6. Groups select their items and then examine and discuss the items, and fill in their worksheets.
7. When groups have completed the worksheets, ask volunteers from each group to display their group's objects and read aloud their group's ideas for reusing of each item.
8. (Optional) If time allows, write the name of each item on the board, and under the name of each item list all the possible uses suggested by the students.



ACTIVITY #2 (APPROXIMATELY 10 MINUTES)

Purpose:

- To reinforce the meaning of the terms recycle and reuse
- To give students the opportunity to express and share their own ideas about other materials and objects that can be recycled or reused
- To practice listening and speaking

Procedure:

1. Ask the class to name as many materials or objects they can think of that are (or can be) recycled and/or reused. Encourage all ideas (excluding, of course, the objects the students examined and discussed in Activity #2).
2. As volunteers give their answers, write the names of the items on the board, indicating whether they can be recycled and/or reused. For example: Metal can be recycled. Clothing can be reused. Accept and write down all ideas, even those that may seem bizarre or very original.



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To conclude the lesson
- To give students an opportunity to reflect on and assess what they have learned
- To practice writing

Procedure:

1. Ask students to look at the list of recycling and reusing ideas on the board, and to think about what they have learned in the lesson. Then ask them to work individually and write a list of at least five ways that they as individuals plan to recycle materials or reuse objects in order to help save the environment. They may choose from the ideas on the board and/or write new ideas of their own.
2. Allow students about 5 minutes to write their lists.
3. After students have finished writing their lists, ask for volunteers to read their ideas aloud to the class.



EXTENSIONS

1. Students can work individually or in pairs to create posters to promote recycling, and reusing.
2. Students can work in groups to create and perform commercials for recycling and reusing.

3. Students can conduct a survey of 5-10 people asking them questions such as:

- Do you recycle at home? Why or why not?
- What sorts of things do you recycle?
- How can we get more people to recycle at home.
- Students keep a tally of the answers, write up a brief summary, and present their summary to the class.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



APPENDIX A

New Uses for Old Things					
Work in groups. In the spaces at the top of each column below, write the names of the 5 objects your group has selected. Then use your imagination. Think of at least 5 new and unusual uses for each object. List the uses in boxes 1-5 under the name of the object. If you will need to alter the item for use, explain how.					
	Item 1:	Item 2:	Item 3:	Item 4:	Item 5:
1.					
2.					
3.					
4.					
5.					

[\(back to Classroom Applications\)](#)



CHAPTER 10

WASTE MANAGEMENT

The lesson in this chapter centers on the theme of **waste** management. The lesson begins with a warm-up activity in which students are introduced to key vocabulary related to the theme. Then students work in small groups and complete a short quiz to assess their background knowledge about the topic of waste management. After completing and discussing the quiz, students read and discuss a list of waste reduction habits. The lesson concludes with a short writing activity in which students list the waste reduction measures they will adopt and/or try to persuade their families to adopt.



BACKGROUND INFORMATION

People today often discard items that years ago would have been repaired or saved for other uses. In fact, many modern products (e.g., **disposable** razors and **non-refillable** pens) are designed for a relatively short life that ends in a wastebasket.

How to manage waste in an environmentally sound manner is a complex and sometimes controversial issue. There is no single, simple solution to the solid waste problem. The use of a variety of waste management practices is recommended to reduce waste management problems most effectively and safely. There are three levels to the **hierarchy** of waste management: first, source reduction; second, **recycling**; and third, **combustion** and **landfill**.

Source reduction means reducing the amount and the **toxicity** of the waste that is produced. Individuals and families can participate in source reduction by buying more products that are **durable** and **non-disposable**, and more products that have fewer **toxic components** and less packaging. Reusing items that we usually throw out is a good way to reduce the waste disposal problem. Manufacturers have a big role to play in source reduction. They should be encouraged to produce products that have less packaging and fewer toxic components.

Recycling is the second level of waste management. Reuse of materials not only saves energy and **natural resources**, but it prevents potentially useful materials from being buried in landfills or burned in **combustors**.

Waste combustion and landfills are the third level of waste management. Combustion has two great benefits: it reduces the bulk of waste, and it also produces energy. Source reduction and recycling help to make combustion and landfills safer and more efficient by reducing both the quantity and the toxicity of waste, and by removing **recyclable** materials that might be difficult to burn or that could cause harmful **emissions**. Landfills are needed to handle waste that cannot be recycled or safely burned. Also, ash from waste combustion must be sent to specially designed landfills.

Waste reduction, recovery, treatment, and recycling processes are becoming more efficient, but no matter how efficient they become, there will be some amount of waste needing landfills. People can, however, greatly reduce this amount by becoming aware of how they contribute to the solid waste problem and by changing their habits to promote more efficient use and reuse of resources.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate enough copies of the quiz How Much Do You Know About Waste? in [Appendix A](#) to give one copy to each group of 3-4 students.
- Duplicate enough copies of the list Waste Reduction Habits in [Appendix B](#) to give one to each student.

Vocabulary Considerations:

Before using the quiz How Much Do You Know About Waste? and the list Waste Reduction Habits, consider what vocabulary students will need to know in order to carry out the lesson successfully. Determine which vocabulary items are already familiar to students, and which will be new to them. Some important terms and their definitions are included in the [Glossary](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of waste management
- To activate students' background knowledge
- To introduce students to key vocabulary related to the topic of the lesson

Procedures:

1. Write the word waste on the board and ask the class what they think the word means. As student volunteers give their answers, write key words from their responses on the board. (One possible definition of waste is "things that are thrown out when they are used up or no longer needed".)
2. Ask the class if they know any synonyms for the noun waste. As student volunteers give their answers, write the synonyms on the board. (Possible answers include **garbage**, **trash**, **rubbish**, **litter**, **refuse**, **scrap**, and **junk**.)
3. Ask students to name some examples of things that they throw away at school or at home. Write the students' examples on the board.
4. Discuss with the class where all this waste or garbage might go:
5. What happens to waste when it leaves your home or school?
6. Where does it go?
7. Write the words **dump**, landfill, and combuster on the board. Explain that a dump is a place where garbage is taken and left, a landfill is a place where garbage is buried, and combuster is a place where garbage is burned.



ACTIVITY #1 (APPROXIMATELY 15 MINUTES)

Purpose:

- To allow students to share their background knowledge about waste management
- To give students an opportunity to assess their background knowledge about waste management
- To expand students' knowledge about waste management
- To have students practice reading, listening, and speaking in a meaningful way
- To stimulate discussion

Procedures:

1. Divide the class into groups of 3-4 students and give each group a copy of the quiz How Much Do You Know About Waste? in [Appendix A](#).
2. Explain the task to the students. They are to work together in their groups, reading and discussing the items on the quiz, and deciding what they think is the correct answer to each question. Tell the students they will not be graded on the quiz. The purpose of the quiz is to allow them to discover how much they already know about the waste.
3. Make sure students understand the questions on the quiz.
4. Groups of students work together, reading and discussing the questions on the quiz, and choosing their answers.
5. After groups have finished discussing the questions on the quiz and choosing their answers, student volunteers take turns reporting their group's answers to the class. As volunteers report, write the answers on the board. If students disagree, ask them to report their answers to the questions at hand, and write their answers on the board as well. Do not indicate at this stage whether the students' answers are right or wrong.
6. After students have reported their answers to all ten questions, read off the correct answers to the class. (The answers are provided in the Answer Key in [Appendix C](#).)
7. Ask the class the following questions, and allow student volunteers to give their answers:
8. Did any of the answers to the questions on the quiz surprise you? If so, which ones?
9. What, if anything, did you learn from this quiz?



ACTIVITY #2 (APPROXIMATELY 15 MINUTES)

Purpose:

- To give students an opportunity to evaluate their own daily habits related to waste reduction
- To increase students' awareness of everyday habits that reduce the amount of solid waste produced
- To have students practice reading, listening, and speaking in a meaningful way
- To stimulate discussion

Procedures:

1. Distribute the list Waste Reduction Habits in [Appendix B](#). Give one copy to each student.
2. Tell students to silently read the items on the list. Answer any questions the students may have about the vocabulary used in any of the items.
3. Ask students to work together in groups of 3-4. Groups should discuss each habit on the list, using the following questions as a basis of discussion of each habit:
 4. How does the habit help to reduce waste?
 5. Do you regularly employ this habit? Why or why not?
6. When students have finished the group discussion, go over the items on the list one by one, and ask for student volunteers to explain how the particular habit helps to reduce waste.



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To give students an opportunity to decide which waste reduction habits are adaptable to their own lives and the lives of their family
- To practice writing
- To conclude the lesson

Procedures:

1. Ask students to write a paragraph or two summarizing what they have learned in today's lesson, explaining whether or not they believe waste reduction is a serious issue for themselves and their families, and listing some habits they will adopt themselves and/or try to persuade their families to adopt.
2. Allow students 5 minutes or so to write their paragraphs.
3. After students have finished writing, ask for volunteers to read their paragraphs aloud to the class.



EXTENSIONS

1. Ask students to work in groups to compile their own original lists of waste reduction habits.
2. Students can be asked to create posters to promote the idea of waste reduction.
3. Have students carry out a litter cleanup at a local park or recreational area.
4. Have students survey eight to ten people to find out their answers to the question: "Do you and your family do anything to reduce waste production? If so, what do you do?" Ask students to write a one-page summary of the responses they receive, and to be prepared to tell the class what they learned from the people they interviewed.

Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



How Much Do You Know About Waste?

1. Washing and reusing plastic bags is unhealthy. True or false?
2. The use of personal computers has reduced paper consumption. True or false?
3. What is the best shopping bag to use at a supermarket?
 - a. A plastic bag.
 - b. A paper bag.
 - c. Your own reusable bag from home.
4. How can you reuse paper that has been printed on one side?
 - a. Use it in your printer or fax machine (print on the blank side)
 - b. Use the blank side for scratch paper.
 - c. Both a and b.
5. Large mailing envelopes that have been used before can be reused for mailing. True or false?
6. Latex paint cannot be recycled into new paint. True or false?
7. Used tires can be used to make roads. True or false?
8. What are tin cans made of?
 - a. Tin.
 - b. Steel.
 - c. Aluminum.
 - d. All of the above.
9. Most Paper is made from trees. What other materials can be used to make paper?
 - a. Hemp.
 - b. Rice.
 - c. Cloth rags.
 - d. All of the above.
10. Plastic can be recycled. True or false?
11. What can people who work in offices do to use less paper?
 - a. Use e-mail.
 - b. Make two-sided copies.
 - c. Share reports and printed information.
 - d. All of the above.
12. Why is it important to reuse clothing, furniture, toys, electronic equipment, and other materials?
 - a. It saves money.
 - b. It helps save natural resources.
 - c. It helps save energy.
 - d. All of the above.

[\(back to Preliminary Lesson Planning\)](#)

[\(back to Activity 1\)](#)



Waste Reduction Habits

1. Buy paper products made from recycled paper.
2. Buy paper products made from unbleached paper.
3. When using dangerous cleaning products, buy and use only the amount you need for the task.
4. Buy refillable pens, lighters, flashlights, and cameras.
5. Reuse plastic containers and glass jars to store pencils, crayons and other items.
6. Share magazines with friends.
7. Reuse envelopes and file folders.
8. Use both sides of writing paper.
9. Keep plastic bags and reuse them at home or at stores.
10. Repair, rather than replace, broken items.

[\(back to Preliminary Lesson Planning\)](#)

[\(back to Activity 2\)](#)



APPENDIX C

Answer Key: How Much Do You Know About Waste?

1. False. (When plastic bags have been washed and dried thoroughly, they can be reused safely again and again.)
2. False. (The use of personal computers has actually increased the amount of paper that people consume.)
3. c. Your own reusable bag from home. (People can save the trees used to make paper bags and the energy use to make plastic ones, by taking their own shopping bags to the store.)
4. c. Both a and b. (Reusing paper reduces the need to buy more paper.)
5. True. (You can reuse a mailing envelope by sealing it with tape, glue, or some other means.)
6. False. (Many cities recycle latex paint and use it to paint public buildings or cover up graffiti.)
7. a. True. (Used tires are often shredded and mixed with asphalt to make roads that last longer and need less repair.)
8. b. Steel. (People called steel cans "tin cans" for a long time, but they are actually made of steel.)
9. d. All of the above. (Before the twentieth century, most paper was made from cloth rags.)
10. True. (Many types of plastic are recycled into furniture, carpets, clothing, and other items.)
11. d. All of the above.
12. d. All of the above.

[\(back to Classroom Applications\)](#)



COMMENTS

We invite you to send us your comments and suggestions regarding *Language and Civil Society*. If possible, please include your name, country, and job title in your message. We are interested in knowing more about our readership. Thank you!

Email us!



INTERNET RESOURCES

ORGANIZATIONS

Alliance to Save Energy (ASE) <http://ase.org/>

Green Schools Program <http://ase.org/programs/green-schools-program>

California Energy Commission <http://energy.ca.gov/>

Energy Quest for kids <http://www.energyquest.ca.gov/>

Discovery Education for Teachers <http://www.discoveryeducation.com/teachers/>

K-5 Science <http://www.discoveryeducation.com/search/page/k-5/science/-/-/index.cfm>

6-8 Science <http://www.discoveryeducation.com/search/page/6-8/science/-/-/index.cfm>

9-12 Science <http://www.discoveryeducation.com/search/page/9-12/science/-/-/index.cfm>

Environmental Defense Fund <http://www.edf.org/home.cfm?>

Environmental Protection Agency (EPA) <http://www.epa.gov/>

EPA for Students and Educators <http://www.epa.gov/epahome/students.htm>

National Aeronautics and Space Administration <http://www.nasa.gov>

For Educators <http://www.nasa.gov/audience/foreducators/index.html>

National Wildlife Federation <http://nwf.org/>

Kids page <http://nwf.org/Kids.aspx>

Ranger Rick Magazine Online <http://nwf.org/Kids/Ranger-Rick.aspx>

New York Times Learning Network Lesson Plans for Science <http://learning.blogs.nytimes.com/category/science/>

Population Connection <http://www.populationconnection.org/site/PageServer>

Educator Page <http://www.populationeducation.org/>

Take Part <http://www.takepart.com/about>

ClimateCrisis <http://www.climatecrisis.net/>

SaveMyOceans <http://www.savemyoceans.com/>

Rainforest Action Network (RAN) <http://ran.org/>

Educator Resource Page <http://ran.org/category/resource-class/educator-resources>

The Rainforest Alliance <http://www.rainforest-alliance.org/>

Kid's Corner <http://www.rainforest-alliance.org/kids>

Sea World <http://www.seaworld.org/index.asp>

Sea World Teacher's Page <http://www.seaworld.org/just-for-teachers/guides/index.htm>

United Nations Development Programme (UNDP) <http://www.undp.org/>

United Nations Environment Programme (UNEP) <http://www.unep.org/>

Youth and Children Page <http://www.unep.org/tunza/>

United States Census Bureau <http://www.census.gov/>

Census in Schools <http://www.census.gov/schools/>

Census for Kids [http://www.census.gov/schools/census for kids/index.html](http://www.census.gov/schools/census_for_kids/index.html)

United States Geological Survey (USGS) <http://www.usgs.gov/>

USGS and Science Education <http://education.usgs.gov/>

World Resources Institute

Education Page <http://www.wri.org/topics/education>

World Wildlife Fund <http://wwf.panda.org/>

Our Earth [http://wwf.panda.org/about our earth/](http://wwf.panda.org/about_our_earth/)

FULL TEXT DOCUMENTS

Convention on Climate Change

Full text of the United Nations Framework Convention on Climate Change negotiated over 1991 and 1992 by 150 nations and signed at and after the 1992 Earth Summit in Rio de Janeiro. <http://www.unfccc.de/>

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Full text of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (known as CITES), an international agreement banning commercial international trade in an agreed list of endangered species.

<http://www.cites.org/>

Endangered Species Act

Full text of the current version of the U.S. Endangered Species Act: <http://www.biologicaldiversity.org/campaigns/esa/>

ICPD '94: Summary of the Programme of Action

Summary report of the 115-page Programme of Action on population and development that was finalized at the International Conference on Population and Development in Cairo, Egypt, September 5-13, 1994.

<http://www.un.org/ecosocdev/geninfo/populatin/icpd.htm#intro>

REFERENCES

- Air and Waste Management Association (1991). *Environmental Resource Guide: Air Quality*. Pittsburgh, PA: Air and Waste Management Association.
- American Lung Association (1989). *Health Effects of Ambient Air Pollution*. New York, NY: American Lung Association.
- Chiras, D.D. (1993). *Environmental Science: Action for a Sustainable Future*. Redwood City, CA: Benjamin/Cummings.
- Environment Canada (1999). *Understanding the Ozone Layer*.
See: <http://www.ec.gc.ca/default.asp?lang=en>
- Facing the Future. *A Brief History of World Population* (1999). See: <http://www.facingthefuture.org/default.aspx>
- Group of Experts on the Scientific Aspects of Marine Pollution (1992). *The State of the Marine Environment*. Nairobi: Union Nations Environment Programme.
- Horowitz, Dan (1996). Air Pollution and Health. *Greenbeat*, May.
- Lewis, S. (1990). *The Rainforest Book: How You Can Save the World's Rainforests*. Washington, D.C.: Natural Resources Defense Council.
- Martin, S. (1991). *Tropical Rainforests*. London: Macmillan Publishers.
- Miles, B. (1991). *Save the Earth*. New York: Alfred A. Knopf.
- National Aeronautics and Space Administration: Goddard Space Flight Center Atmospheric Chemistry Data & Resources (1999). *Ozone and the Atmosphere*.
See: http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/ATM_CHEM/ozone_atmosphere.html
- National Wildlife Federation. (1997). *Fact Sheets and News Releases on Threatened and Endangered Species*.
See: <http://eelink.net/EndSpp.old.bak/factsheet.html>
- Nilson, G. (1990). *The Endangered Species Handbook*. Washington, DC: Animal Welfare Institute.
- Ortleb, E.P., D'Arcy, N., Pepple, D., & Robinson, D. (1990). *Energy and the Environment*. St. Louis, MO: Milliken Publishing Company.
- Pedersen, A. (1991). *The Kids' Environment Book*. Santa Fe, New Mexico: John Muir Publications.
- Pennsylvania Department of Environmental Protection (1999). *The Environmental Shopper*.
See: http://www.prc.org/resources_shopping.html
- Population Reference Bureau (1999). *World Population Data Sheet*. Washington, DC: Population Reference Bureau.
- Rainforest Action Network (1997). *Facts About the Rainforests*.
See: <http://ran.org/>
- Rainforest Action Network (n.d.). Questions Most Often Asked by Kids.
- Swerdlow, J. (1998). Population. *National Geographic*, October, pp. 2-5.
- Texas General Services Commission State Energy Conservation Office (1997). *Using Energy Wisely*. See: <http://www.infinitepower.org/>
- United Nations Population Information Network (n.d.). *Population Growth and Structure*. See: <http://www.undp.org/>

United States Bureau of the Census (1999). *World Population Information*. See: <http://www.census.gov/ipc/www/idb/>

United States Environmental Protection Agency (1990). *Let's Reduce and Recycle: Curriculum for Solid Waste Awareness*. Washington, DC: United States Government Printing Office.

United States Environmental Protection Agency (1992). *What You Can Do to Reduce Air Pollution*. See: <http://www.epa.gov/>

United States Environmental Protection Agency (1999). *Good Up High, Bad Nearby*.
See: <http://www.epa.gov/oar/oaqps/gooduphigh/>

United States Environmental Protection Agency. (1994). *Save Our Species*.
See: <http://www.epa.gov/espp/poster/>

United States Fish and Wildlife Service, Region 3 (March 1994). *Endangered Species Facts*.
See: <http://eelink.net/EndSpp.old.bak/kblue.html>

World Conservation Monitoring Center. (1999). *Species Under Threat*.
See: <http://www.unep-wcmc.org/species/index.htm>

World Resources Institute (1999). *Facts about Population, Poverty, and Land Degradation*.

World Resources Institute (1994). *Teacher's Guide to World Resources: Oceans and Coasts*. Washington, DC: World Resources Institute.

GLOSSARY

Abnormal: different from what is usual; not normal

Absorb: take in

Adapt: to develop and change in order to survive in a particular habitat

Aerosol: a small metal container from which liquid can be forced out using high pressure.

AIDS: abbreviation for acquired immune deficiency syndrome, a disease which causes people to die because they cannot fight the illnesses they develop

Alter: to change in some way

Antarctica: the most southern continent of the world and very cold.

Arctic: the most northern part of the world and very cold.

Archipelago: a group of small islands

Atom: the smallest piece of a substance that can exist alone or can combine with other substances to form a chemical chain

Aluminum: a silvery gray metal, which is light in weight, easy to shape, does not rust, and is widely used in manufacturing.

Asphalt: a hard black substance that is used to make the surface of roads.

Acid rain: rain that contains acid put out into the air by industry and damages trees and plants

Air pollution: the dirtying or spoiling of the atmosphere

Atmosphere: the mixture of gases that surrounds the earth

Biodiversity: the entire variety of life on earth

Birthrate: the number of births for every 1000 people in a particular area during a given time

Cancer: a serious disease in which the body's cells increase too fast, producing a growth that may cause death

Carbon: a chemical element found in coal, graphite, and diamonds

Carbon dioxide: a poisonous gas that is produce when gasoline is burned in the air

Carbon monoxide: a poisonous gas that is produced when gasoline is burned in the air

Cataract: a growth on a person's eye causing a slow loss of sight.

Cement: gray powder used in building, which becomes hard like stone when mixed with water and allowed to dry

Chlorine: a greenish-yellow gas that has a strong odor and is often used to disinfect water

Chlorofluorocarbons: gases (commonly referred to as "CFCs") that are used in aerosols, refrigerators, and in making some plastics

Chloromethane: a clear, colorless, naturally occurring gas that is difficult to smell.

Combustion: the act of catching fire and burning

Combustor: a facility for controlled burning of solid waste to reduce its volume and weight, and, often, to produce energy

Condominium: a building that consists of separate apartments, each of which is owned by the people living in it; a single apartment in one of these buildings

Consumption: the using up of something

Consensus: general agreement

Conservation: the controlled use and systematic protection of natural resources

Conserve: to use carefully, avoiding waste

Contaminated: impure, dirty, infected, and polluted

Crop: a plant or plant product such as grain, fruit, or vegetables grown by a farmer

Crush: to break into very small pieces or powder..

Current: belonging to the present time

Cycle: a number of related events that happen again and again in the same order.

Damage: to harm, hurt, or destroy..

Decay: to destroy or be destroyed slowly through chemical and other changes

Decrease: reduce, lessen, and become smaller...

Deforestation: the cutting down and clearing away of all trees/forests in a particular area

Deplete: to reduce the amount of something..

Depletion: a reduction in the amount of something

Development: the building of houses and factories on land

Discolored: having a changed or spoiled color..

Discarded: thrown away or gotten rid of

dust: dry powder made up of very small pieces of dirt

Disposable: intended to be thrown away after use

Drought: a long period of dry weather when there is not enough water

Drape: a heavy piece of hanging cloth that can be pulled across to cover a window or door.

Dump: a place for throwing away waste material

Durable: lasting for a long time

Endangered: in danger of extinction in the foreseeable future

Environment: all the living and nonliving things that surround and affect an animal or plant

Equator: an imaginary line around the earth; equal in distance from the North and South Poles.

Emission: a substance released into the air

Erosion: the slow destruction of the earth's surface by wind, rain, or acid

Efficient: working well and without waste

Emission: the sending out of gas, heat, light, sound, etc

Environment: the natural world of land, sea, and air in which people, plants, and animals live..

Energy conservation: using energy without waste

Energy: the power that can produce heat and drive machines

Evaporate: to change from liquid into a vapor or mist

evolve: to develop slowly by a long continuous

Exotic species: foreign species that have been introduced into a new habitat

Extinct: no longer existing or living

Extinction: the complete disappearance of an animal or plant species

Expanding: increasing in size

Exhaust fumes: heavy, strong-smelling gases that escape from car engines and other machines

Fatigue: overtiredness, weariness

Foam: a thick substance made of very small bubbles of something.

Formerly: in earlier times

Fossil fuels: coal, oil, and natural gas formed from the remains of ancient plants and animal life

Garbage: any material considered worthless or unnecessary and usually thrown away, for example, spoiled food, used containers, and broken items

Geothermal power: energy produced by the internal heat of the earth

Global climate change: the predicted change in the earth's climate change brought about by the accumulation of pollutants in the atmosphere.

Global warming: an increase in the world's temperature, caused by an increase in carbon dioxide around the Earth

Global: of or concerning the whole world

Greenhouse effect: the warming of the planet caused by chemicals that trap heat in the air; some causes include car exhaust, factory smoke, and burning rain forests

Graffiti: drawings or writing on a wall, often of a rude, humorous or political nature

Habitat: the environment in which a particular animal or plant species lives

Humid: warm and wet

Hemisphere: half of the earth.

Hazardous: likely to harm people and other living things

Hemp: plant used for making strong rope or a rough cloth

Hierarchy: a system of organization in which the members are ranked from higher to lower

Hydroelectricity: electricity produced by the power of moving water, for example the water in a river

Indigestible: difficult for a person's stomach to digest.

Insulating: covering or protecting something so that heat, cold, sound, etc. cannot get in or out.

Interdependence: the idea that everything in nature is connected and cannot survive without the help of other plants, animals and other things (e.g. the sun, soil, water, and air) around it

Kidney: one of the two organs that separate waste from your blood

Lead: a soft heavy gray metal

Lung: one of the two organs that you use to breathe

Less developed countries: all of Africa, all of Asia except Japan, the Transcaucasia and Central Asian countries of the former Soviet Union, all of Latin America and the Caribbean, and all of Oceania except Australia and New Zealand.

Litter: trash, garbage, rubbish

Load: the amount that a certain machine can hold.

Landfill: a place where waste and trash are buried between layers of dirt.

Leftovers: food that remains uneaten after a meal.

Latex: a whitish substance produced by certain kinds of trees and used to make rubber

Litter: waste materials that have been carelessly discarded in an inappropriate place

Landfill: a specially engineered site for disposing of solid waste on land, constructed so that it will reduce hazard to public health and safety

Mist: very small drops of water floating in the air

Mammal: a warm-blooded animal (including humans) that nourishes its young with milk secreted by mammary glands and has skin usually more or less covered with hair

Marine pollution: the dirtying or spoiling of oceans and coastal areas.

Malaria: a very common tropical disease caused by the bite of a certain mosquito.

Manufacture: to make goods in large quantities, especially by machine..

Melt: to make something become liquid by heating it.

Manure: waste matter from animals that is put into the soil to produce better crops.

Nitrogen oxides: gases made up a nitrogen and oxygen

Non-biodegradable: breaking down or decomposing of materials by bacteria.

Nuclear energy: energy produced by breaking up atoms

Nonrenewable: something that cannot be replaced as it is used or lost

Natural resources: the land, forests, and mineral wealth that a country possesses...

North Pole: the most northern point on the surface of the Earth

Natural resources: the land, forests and mineral wealth that a country possesses

Non- disposable: not intended to be thrown away after use

Non- refillable: cannot be filled again

Odor: a smell, especially an unpleasant one

Ozone: a colorless gas that is formed when pollutants react with sunlight and that is a major cause of smog

Ozone depletion: the reduction in the ozone gas that lies about 12 to 25 miles above the earth and that prevents the sun's harmful rays from reaching the earth

Organism: a life form

Outsider: a person who is not a member of a particular group

Oil spill: a shipping accident that causes petroleum to be spilled into the ocean

Ozone: a poisonous form of oxygen

Ozone-depleting substances: chemicals that destroy ozone

Ozone layer: the layer of gases that prevents dangerous rays from the sun from reaching the Earth

Particulate matter: very small pieces of dust and other matter, including small drops of liquids

Pollutant: any substance that makes the air, water, or soil dirty or harmful

Poaching: illegally taking protected animals or plants

Pollution: the dirtying or spoiling of air, land, or water

Population: the number members of a species living in a particular area

Prey: to hunt for and take by force

Pesticide: a chemical substance used to kill harmful animals or insects

Petroleum: a mineral oil obtained from below the surface of the earth, and used to produce petrol

Pollutant: any substance that dirties or spoils the air, land, or water

Pollution: the dirtying or spoiling of air, land, or water

Polluted: dirtied, spoiled, contaminated

Population: the number of members of a particular species living in a particular area

Plant: a building or group of buildings for the manufacture of a product; a factory

Pollution: the dirtying or spoiling of air, land, or water

Planter: a container for a plant or small tree

Pollution: the dirtying or spoiling of land, air, or water

Power plant: a large building in which electricity is made

Pulp: wood and other vegetable materials that have been softened and are used to make paper

Refinery: a factory for purifying metals, oil, or sugar

Respiratory: connected with breathing

Rain forest: a thick evergreen forest with at least 100 inches (254 cm) of rainfall a year; may be tropical (e.g., Amazon) or temperate (e.g., Pacific Northwest)

Range: the geographical area naturally occupied by an animal or plant species

Regenerate: to replace lost or damaged parts by growth

Reintroduction: to place members of a species in their original habitat

Reptile: an animal, such as a snake, with rough skin whose blood changes temperature according to the temperature around it

Radioactive: containing or giving off nuclear radiation

Random: without any pattern

Rangeland: a large area of grassy land

Reading: figure shown by a measuring instrument

Recycle: to treat something that has already been used so that it can be used again

Renewable: that gets some more in its place as it used or lost

Resource: something that a place possesses and that can be used

Radiation: rays of heat and light given off by the sun

Refrigerant: a substance used to provide cooling, either as the working substance of a refrigerator, or by direct absorption of heat

Raw materials: natural substances that are used to make industrial products

Reclaim: to do something to materials that have been collected for recycling, in order to separate the materials that are reusable from those that are not

recycle: to collect and treat waste products so that they can be used again to manufacture new products; to use again, especially in a new way; to recondition and adapt to a new use or function

Recycling center: a place where people can bring materials they have collected for recycling

Reuse: to use something again

Rag: an old cloth

Recyclable: is treated so that it can be used again

Recycle: to treat something that has already been used so that it is fit to be used again

Refillable: can be filled again

Refuse: discarded material considered to have no worth or use

Reuse/Reusable: to use again; can be used again

Rubbish: anything that is thrown out or discarded

Smog: pollution from cars and factories that mixes with the air and forms dirty air that is harmful to plants, animals, and humans

Stunted: prevented from reaching full growth or development

Sulfur dioxide: a colorless gas that is one of the major causes of smog

Species: a group of animals or plants that have one or more characteristics in common

Sanitation: means for protecting public health, especially by removing and treating waste

Standard of living: the degree of wealth and comfort in everyday life that a person, a group, or a country has

Struggle: to use great effort

Soil erosion: the wearing away, by wind, water, or acid, of the top covering of the earth

Species: a group of animals or plants of the same kind

Seal: a large sea animal with tail and broad flat limbs for swimming; seals live mostly on cool seacoasts

Sediment: solid material that settles at the bottom of a liquid

Sewage: the waste material and water from people's houses and from factories carried away in large pipes under the ground

Shore: the land along the edge of a sea or other large area of water

Settle: to go and live somewhere

Surface: the outside or top of something

Synthetic: man-made, artificial

Shutter: a wooden or metal cover that can be unfolded in front of a window

Smog: pollution from cars and factories that mixes with the air and produces dirty air that is harmful to plants, animals, and humans

Solar energy: energy produced from sunlight

Smog: pollution from cars and factories that mixes with the air and forms dirty air that is harmful to plants, animals, and humans

Solvent: a substance, usually a liquid that can change a solid substance into a liquid

South Pole: the most southern point on the surface of the Earth

Stratosphere: the region of the atmosphere, above the troposphere, where the ozone layer is located

Sheet: a broad area or piece of something thin

Shred: to cut or tear into small or narrow pieces

Sort: to separate according to type

Steel: iron made harder or stronger by mixing it with other substances

Scrap: discarded industrial waste material that is often suitable for recycling

Scratch paper: paper for preliminary or hasty writing, notes, or sketches

Shred: to cut or tear into small pieces

Tropic of Cancer: an imaginary line around the earth, parallel to and north of the equator

Tropic of Capricorn: similar to the Tropic of Cancer, but to the south of the equator

Tropical: of the hot region of the earth that lies between the Tropic of Cancer and the Tropic of Capricorn

Vegetation: plant growth

Toxic: poisonous

Tumor: a mass of diseased cells in the body

Temperate zone: a geographical area where the weather is neither too hot nor too cold

Tropical: relating to the very hot and wet areas of the world

Trash: rubbish, waste material, garbage

Troposphere: the layer of the atmosphere is closest to the surface of the Earth

Task: a piece of work that is assigned and has to be done

Toxic components: poisonous ingredients or parts

Toxicity: the degree to which something is poisonous

Trash: material that is considered worthless, unnecessary that is usually thrown away

Unbleached: not made white or lighter than the natural color

Vase: a container usually used to hold flowers

Visibility: the degree of clearness with which objects can be seen under given weather conditions

Windblown: moved around by the air or wind

Wildlife: wild animals and plants, especially animals living in a natural state

Wattage: the amount of electrical power in a light bulb or other electrically-powered tool or appliance

Warehouse: a large building for storing things, especially things that are going to be sold

Waste products: items that are no longer useful or wanted because they are damaged or worthless

Waste: material that has been discarded because it has worn out, is used up, or is no longer needed, such as packaging, newspapers, used writing paper, and broken appliances

First Edition, 1999

Editors: Damon Anderson, Melvia Hasman

Internet editor and Web designer: Susan Zapotoczny

Graphic designer: Pat Gipple

Second Edition, 2011

Edited by Jacqueline Gardy for print and web, 2011

Graphic designer: Jacqueline Gardy

Office of English Language Programs

U.S. Department of State

Bureau of Educational and Cultural Affairs

Washington, DC

<http://exchanges.state.gov/education/engteaching/>

When citing individual volumes or chapters of this electronic journal, please cite the author(s) of that section of Language and Civil Society.

English Teaching Forum is available online at: <http://exchanges.state.gov/forum/>