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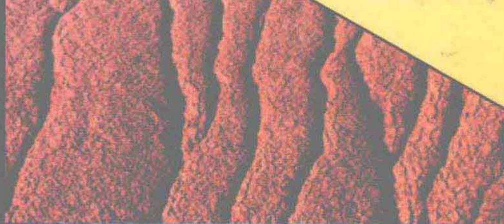

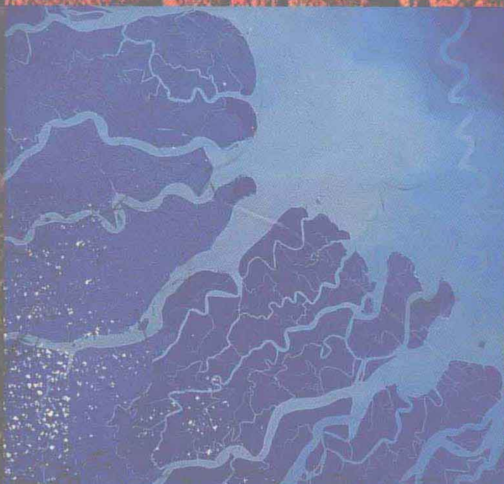

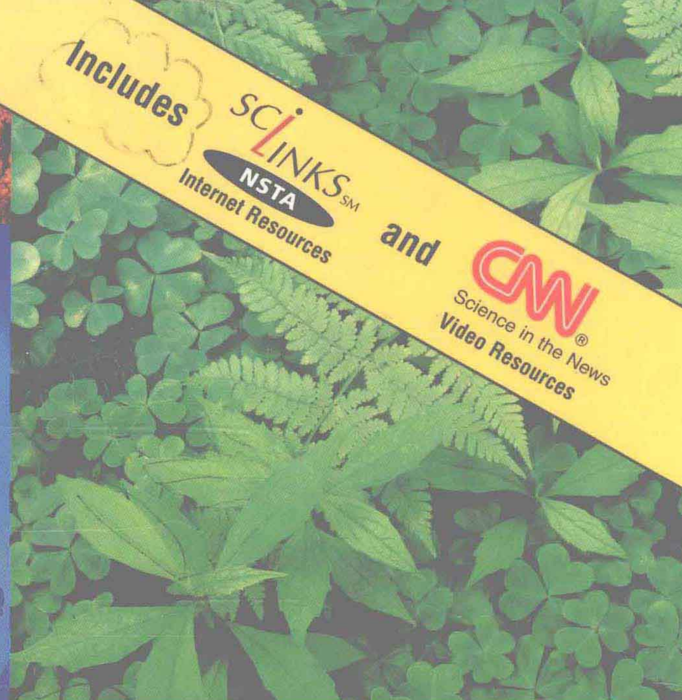

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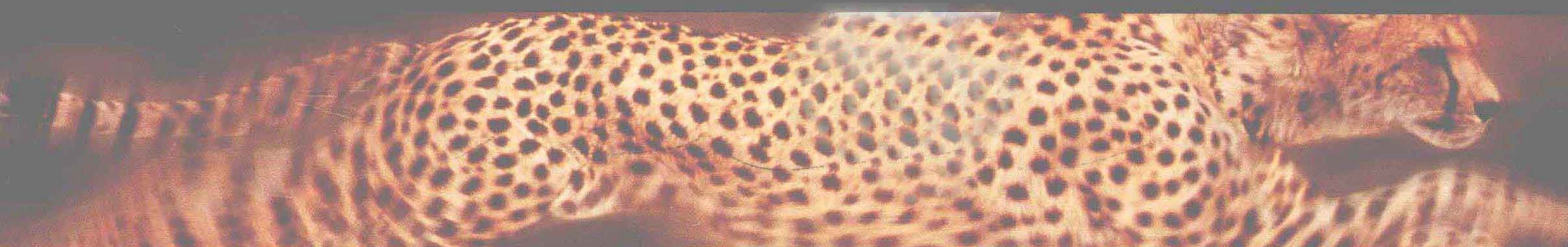

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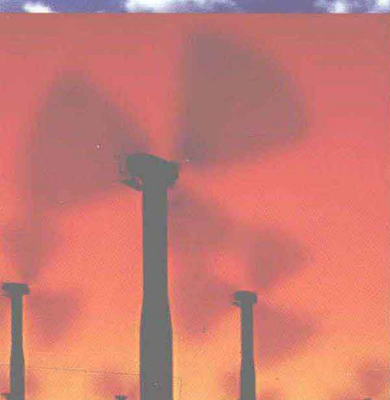

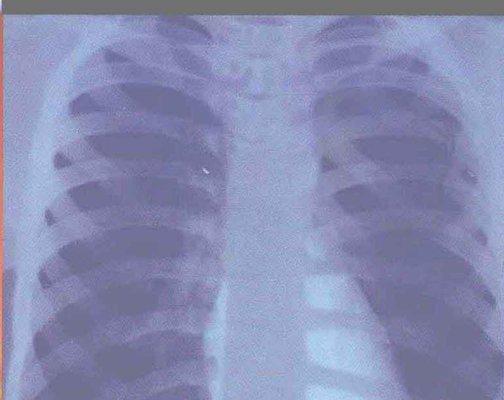

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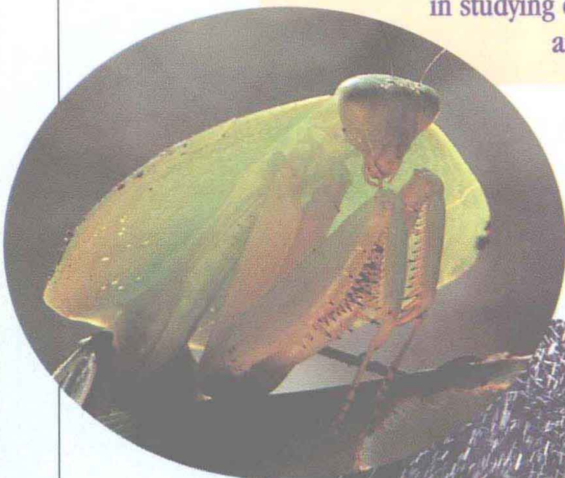
To the Student

Like all other sciences, environmental science is a process of satisfying our curiosity about why things are the way they are and about how things happen the way they do. **For example, in studying environmental science, you may discover the answers to the following questions.**



How could the demise of this seemingly unimportant insect cause severe damage to the rain forest in which it lives?

How could the watering of this lawn affect the water quality of a nearby stream?

How could a population of iguanas help save a rain forest from destruction?

How could recycling an aluminum can help save fossil fuels and reduce both air and water pollution?

How could the exhaust from these cars in New York contribute to the decline of salmon in Canada?

How could the birth of these otters indicate a healthy ecosystem?

You may not have expected to have the questions above answered in your study of environmental science. Nevertheless, the answers to these questions and many more like them help define this unusual and exciting area of study. In learning about the various aspects of our environment, you will quickly come to understand how interdependent life on Earth is.

In many cases, we know so little about environmental interactions that we can't even begin to predict long-term effects. For example, it took nearly 15 years of study before we understood the relationship between the pesticide DDT and the declining populations of bald eagles. It may take even longer to fully understand the relationship between CFCs and ozone. And what usually happens is that the answer to one question leads to a string of new questions.

Perhaps the most important question to ask at the beginning of this course is: **What do you hope to get out of this environmental science text?**

You may be interested in science and want to know more about the inner workings of our environment. Or you may be interested in learning more about human impact on the environment and what we can do to reduce the negative consequences. You may even want to know more about the environment firsthand so that you can decipher environmental issues for yourself, rather than simply accepting someone else's point of view.

CHALLENGE

Regardless of your reasons for taking this course, my challenge to you is to think for yourself. In reading this textbook, you not only will learn a lot about science, you will learn about the complex issues facing our environment. You will explore different points of view and be exposed to a variety of differing opinions. Don't feel that you have to accept any particular opinion as your own. As your knowledge and skills in environmental science grow, so will your ability to draw your own conclusions.

Karen Arms

SAFETY SYMBOLS

The following safety symbols will appear in this text when you are asked to perform a procedure requiring extra precautions. Once you have familiarized yourself with these safety symbols, turn to pages 426–429 for safety guidelines to use in all of your environmental science laboratory work.

WEAR APPROVED CHEMICAL SAFETY GOGGLES. Wear goggles when working with a chemical or solution, when heating substances, or when using any mechanical device.

WEAR A LABORATORY APRON OR LABORATORY COAT. Wear a laboratory apron or coat to prevent chemicals or chemical solutions from contacting skin or street clothes.

WEAR GLOVES. Wear gloves when working with chemicals, stains, or wild (unknown) plants or animals.

SHARP/POINTED OBJECT. Use extreme care with all sharp instruments, such as scalpels, sharp probes, and knives. Do not cut objects while holding them in your hand; always place them on a suitable work surface. Never use double-edged razors in the laboratory.

ELECTRICAL HAZARD. To avoid electric shock, never use equipment with frayed cords. Tape electrical cords to work surfaces to ensure that equipment cannot fall from a table. Also, never use electrical equipment around water or with wet hands or clothing. When disconnecting an electrical cord from an outlet, grasp the plug rather than the cord.

DANGEROUS CHEMICAL/POISON. Always wear appropriate protective equipment, including eye goggles, gloves, and a laboratory apron, when working with hazardous chemicals. Never taste, touch, or smell any substance, and never bring it close to your eyes unless specifically instructed to do so by your teacher. Never return unused chemicals to their original containers. Do not mix any chemicals unless your teacher tells you to do so. Also, never pour water into a strong acid or base because this may produce heat and spattering. Instead, add the acid or base slowly to water. If you get any acid or base on your skin, flush the area with water, and contact your teacher right away. Finally, report any chemical spill to your teacher immediately.

FLAME/HEAT. Whenever possible, use a hot plate for heating rather than a laboratory burner. Use test-tube holders, tongs, or heavy gloves to handle hot items. Do not put your hands or face over any boiling liquid. When heating chemicals, be sure the containers are made of heat-proof glass. Also, never point a heated test tube or any other container at anyone. Be sure to turn off a heat source when you are finished with it.

GLASSWARE. Inspect glassware before use; never use chipped or cracked glassware. Do not attempt to insert glass tubing into a rubber stopper without specific instructions from your teacher. Clean up broken glass with tongs and a brush and dustpan. Discard the pieces in a labeled "sharps" container.

PLANTS. Do not ingest any plant part used in the laboratory, especially seeds. Do not rub any sap or plant juice on your skin, eyes, or mucous membranes. Wear disposable polyethylene gloves when handling any wild plant. Wash hands thoroughly after handling any plant part. Avoid the smoke of burning plants. Finally, do not pick wildflowers or other plants unless instructed to do so by your teacher.

LIVE ANIMALS. Do not touch or approach any animal in the wild. Always obtain your teacher's permission before bringing any animal into the school building. Handle animals only as your teacher directs. Always treat animals carefully and with respect.

BIOHAZARD. Wear appropriate personal protection, including disposable neoprene gloves and other gear provided by your teacher. Clean your work area with disinfectant before you begin and after you complete the investigation. Do not touch your face or rub your skin, eyes, or mucous membranes. Wash your hands thoroughly after use. Dispose of materials as instructed by your teacher.

Also read the General Guidelines for Laboratory Safety on pages 426–429.

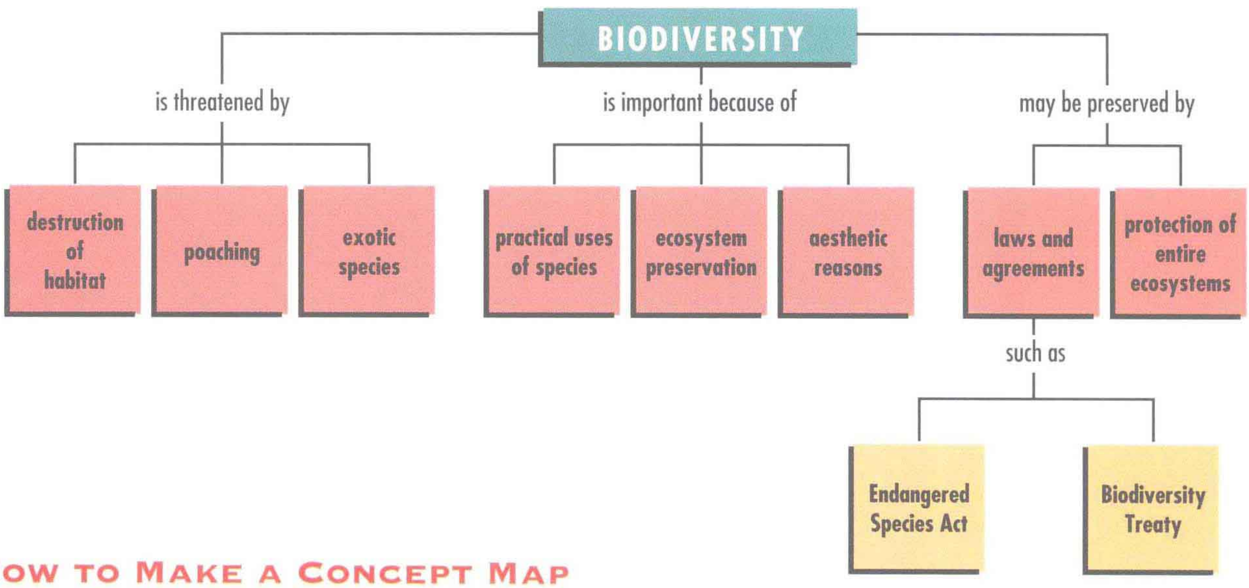
CONCEPT MAPPING

This book will introduce you to new ideas and information about environmental science. A concept map can help you understand these ideas by showing you how they are connected to each other.

A WAY TO CONNECT IDEAS

Concept mapping is a visual method of establishing relationships between concepts, so it helps you to see the "big picture." In a concept map, ideas are expressed as words or phrases that are connected by lines explaining their relationships. By understanding these relationships, you will also be better able to remember the concepts.

Practice is the key to good concept mapping—the more you do it, the better you'll become at relating concepts and ideas to each other. Your concept map may look different from those drawn by your classmates, even if you're mapping the same concepts. That's okay—different people may see different relationships between concepts.



HOW TO MAKE A CONCEPT MAP

1. DETERMINE THE MAIN IDEAS OR CONCEPTS.

Make a list of the main concepts or topics in the material for which you are making a concept map. For your first few maps, you might find it helpful to write each concept on a separate piece of paper. This way, you can arrange the concepts in as many ways as you like in order to find the correct relationships. After you've done a few concept maps this way, you can go directly from writing your list to actually making the map.

2. PLACE THE CONCEPTS IN ORDER FROM THE MOST GENERAL TO THE MOST SPECIFIC.

Put the most general concept at the top of your concept map. Then look at the other concepts and determine how they relate to the most general one. On your map, arrange the concepts in order from general to specific, keeping in mind that some concepts may be equally specific. When you have mapped all of the concepts, draw a circle or box around each one.

3. DETERMINE THE RELATIONSHIPS BETWEEN THE CONCEPTS.

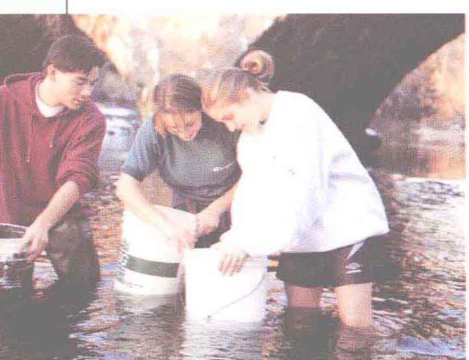
On your map, connect all of the related concepts with lines. On each connecting line, write a linking word or short phrase that explains the relationship.

TRY A CONCEPT MAP!

Look again at the example on this page. Then draw a concept map using the following terms: fish, all living things, plants, insects, trees, animals, flowers, Earth, birds. Find as many links between the concepts as possible.

CONTENTS

▲ To learn how mussels have been useful in studying river pollutants, turn to page 3.

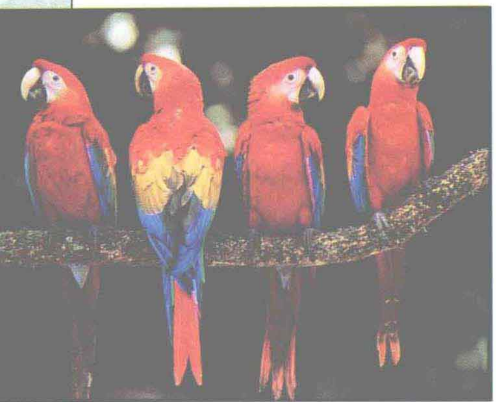


CHAPTER 1

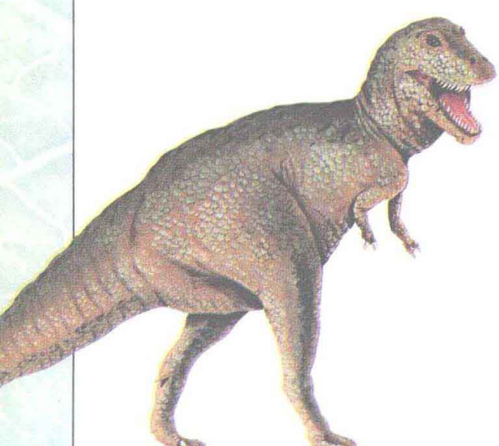
CHAPTER 2

▲ To find out why jack pines depend on forest fires for survival, see page 68.

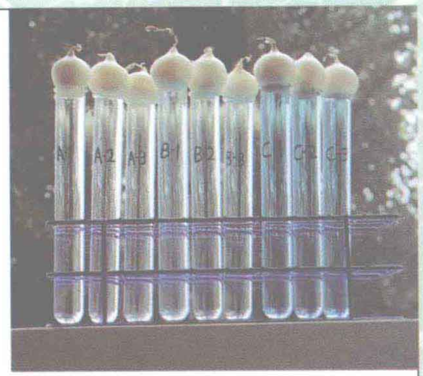
▲ This plant is close to stardom. Curious? Turn to page 94.



▲ These macaws are part of the most diverse ecosystem on Earth. Read more on page 80.

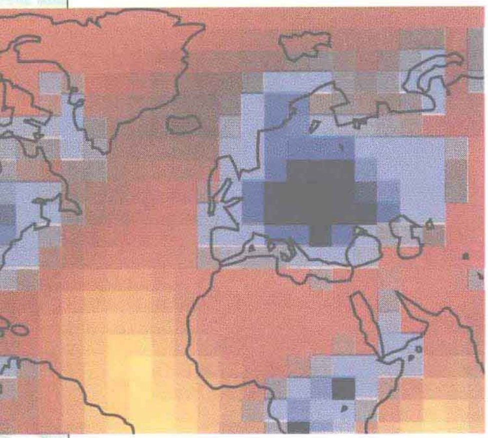


▲ The water you drink may have quenched the thirst of a dinosaur. Find out more on page 121.

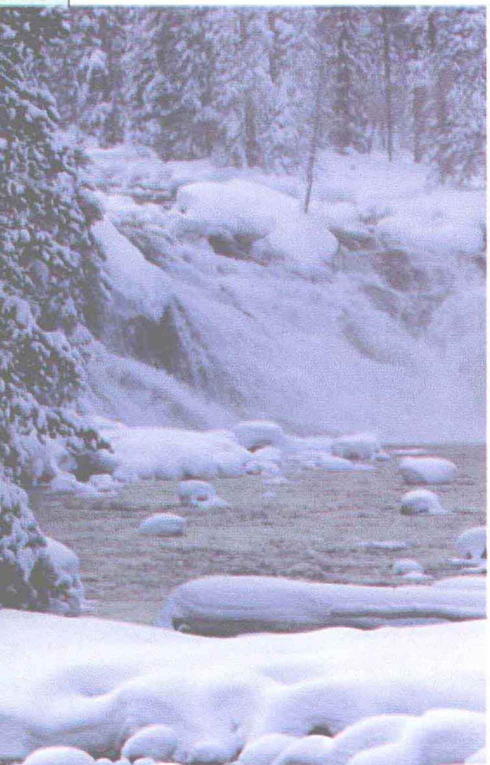


▲ Don't cry for these onions. They've found a solution! Learn why on page 28.

▲ How can working together to plant trees help the Earth's atmosphere? Find out on page 185.



▲ Turn to page 182 to find out how computers are being used to study global warming.



▲ Who owns this beautiful area? You do! Discover why on page 213.

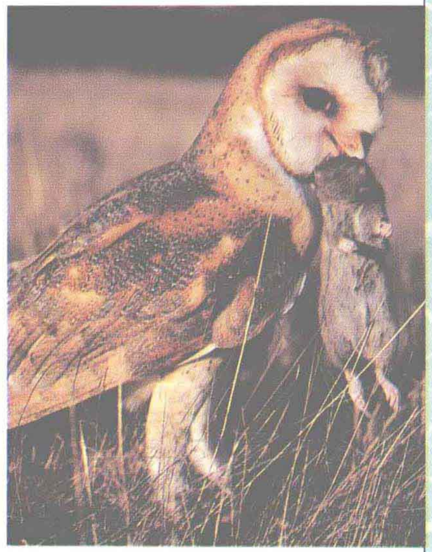
▲ These students are mining for peanuts. Sound like a challenge? Turn to page 222 for details.

▲ What can be done to stop these rampaging beasts? Turn to page 240 for details.

▼ Chances are, an endangered species lives near you. Learn more on page 262.

▲ Imagine spending class in the grass. Turn to page 274 to find your excuse!

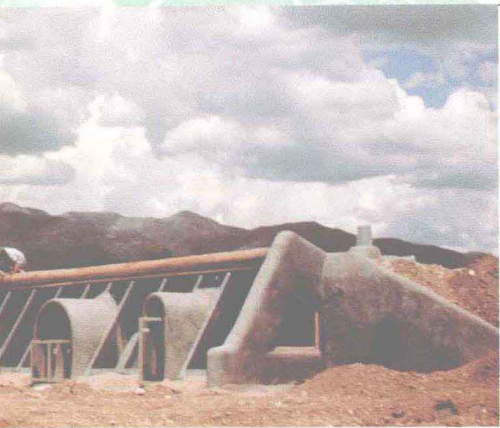
▲ Farms that harvest the wind? See page 291.



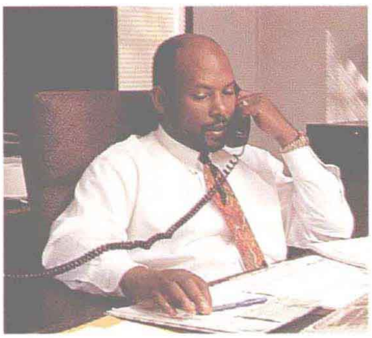
▲ **Why doesn't the world contain more owls? Find out what limits population growth on page 334.**

CHAPTER 13

▲ **What population-related problem does this picture illustrate? Find out on page 342.**



▲ A house built of old tires and soda cans? See page 370.



▲ Play in the dirt and get paid for it! James Bailey tells you how on page 376.

▲ Why build a house for bats in your yard? Find out on page 400.

Chapter 14

Environmental Careers

EcoSkills

Reference Section

INVESTIGATIONS

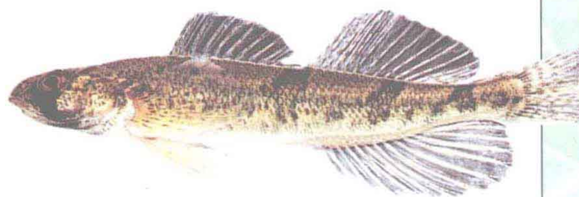
FEATURES

CASE STUDIES

POINTS OF VIEW

MAKING A DIFFERENCE

▲ Take a shot at revolutionizing the fast-food industry on page 326.



▲ This fish almost cost taxpayers 50 million dollars. Find out how on page 264.

▲ Wolves set free in your backyard? You decide on page 76.