

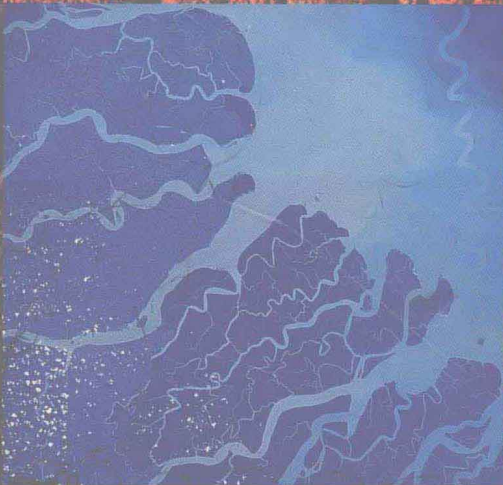
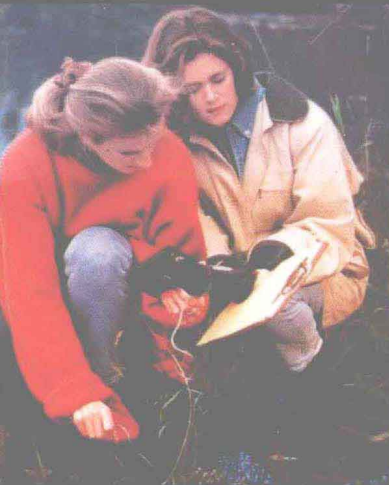
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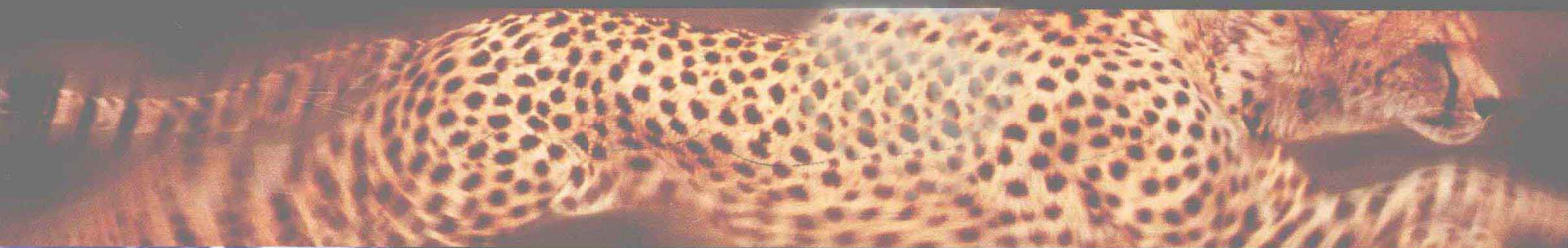
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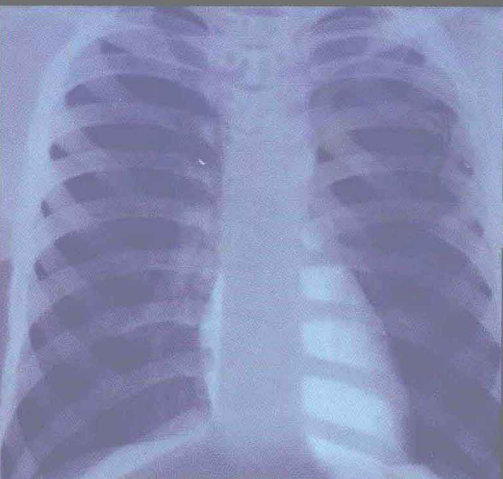
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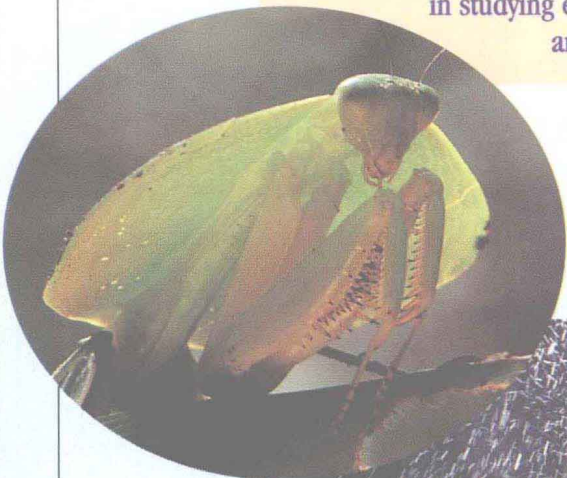
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TO THE STUDENT


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 Arane



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.

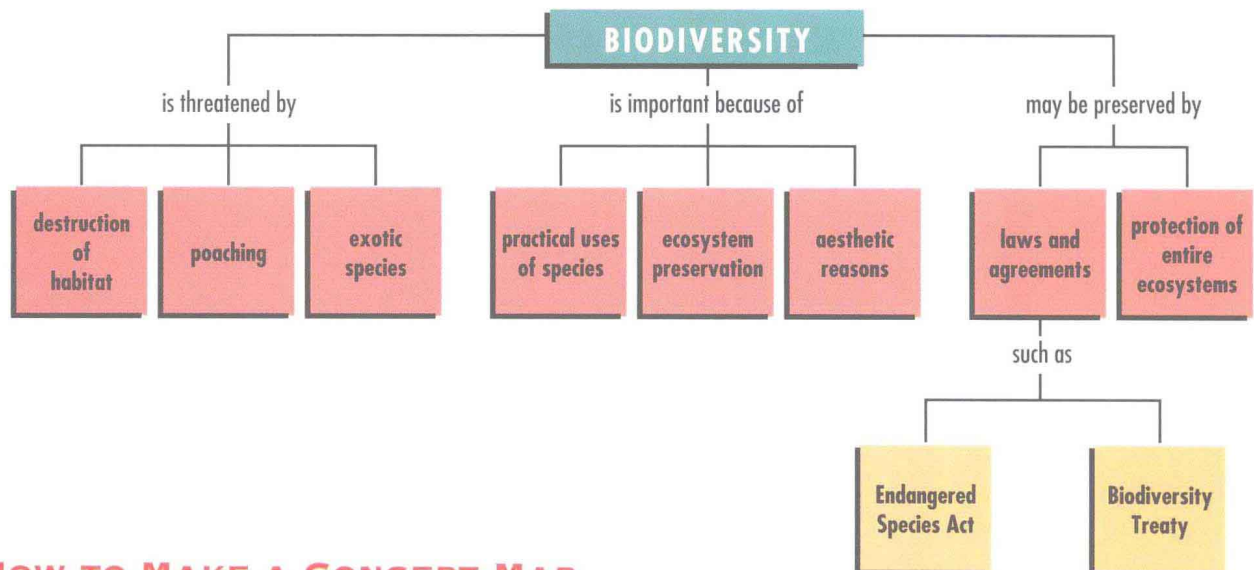
CONCEPT MAPPING

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.

C O N T E N T S

CHAPTER

1

ENVIRONMENTAL SCIENCE: A GLOBAL PERSPECTIVE 2

SECTION 1.1

Understanding Our Environment 3

Solving Environmental Problems 4

What Are Our Main Environmental Problems? 5

Resource Depletion • Pollution • Extinction

A Global Perspective 9

Developed and Developing Countries

Population and Consumption 11

A Sustainable World 12

Case Study: Lake Washington: An Environmental Success Story, page 6

SECTION 1.2

Using Science to Solve Environmental Problems 13

What Is Science? 14

Observing • Hypothesizing and Predicting • Experimenting

Organizing and Interpreting Data • Using Graphics

and Sharing Information • Communicating Results

SECTION 1.3

Making Environmental Decisions 20

An Environmental Decision-Making Model 21

A Hypothetical Situation 22

How to Use the Decision-Making Model 23

Gather Information • Consider Values

Explore Consequences • Make a Decision

Highlights 25

Chapter Review 26

Investigation: An Onion Conundrum 28

Making a Difference: Chicken of the Trees, page 30

CHAPTER

2

LIVING THINGS IN ECOSYSTEMS 32

SECTION 2.1

Ecosystems: Everything Is Connected 33

What Is an Ecosystem? 34

Organisms and Species • Populations

Communities

Niche and Habitat 38

SECTION 2.2

How Species Interact With Each Other 39

Predation 39

Competition 40

Parasitism 41

Mutualism 41

Commensalism 42

SECTION 2.3

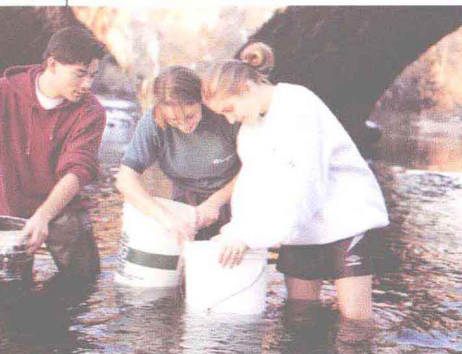
Adapting to the Environment 43

Evolution by Natural Selection 43

Coevolution 46



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



Extinction	46
<i>Case Study: Natural Selection and the Peppered Moth of England, page 44</i>	
Highlights	47
Chapter Review	48
Investigation: Showdown on the Prairie	50
<i>Making a Difference: Butterfly Ecologist, page 52</i>	

C H A P T E R

3

HOW ECOSYSTEMS WORK 54

SECTION 3.1

Energy Flow in Ecosystems	55
Life Depends on the Sun	55
An Exception to the Rule: Deep-Ocean Ecosystems	
What Eats What	57
Respiration: Burning the Fuel	57
Energy Transfer: Food Chains, Food Webs, and Trophic Levels	58
Food Chains and Food Webs • Trophic Levels	
<i>Case Study: DDT in an Aquatic Food Chain, page 58</i>	

SECTION 3.2

The Cycling of Materials	62
The Water Cycle	62
The Carbon Cycle	63
How Humans Are Affecting the Carbon Cycle	
The Nitrogen Cycle	64
Closing the Nitrogen Cycle	

SECTION 3.3

How Ecosystems Change	66
Succession	66
Secondary Succession • Primary Succession	
<i>Case Study: Fires in Yellowstone, page 68</i>	
Highlights	71
Chapter Review	72
Investigation: What's in an Ecosystem?	74
<i>Points of View: Where Should the Wolves Roam? page 76</i>	

C H A P T E R

4

KINDS OF ECOSYSTEMS 78

SECTION 4.1

Forests	79
Tropical Rain Forests	80
Plant Adaptations • Animal Adaptations	
Threats to Rain Forests	
Temperate Forests	84
Temperate Deciduous Forests	85
Plant Adaptations • Animal Adaptations	
Taiga	88
Plant Adaptations • Animal Adaptations	
<i>Case Study: Saving Costa Rican Biomes, page 84</i>	

SECTION 4.2

Grasslands, Chaparral, Deserts, and Tundra	90
Tropical Savannas	90
Plant Adaptations • Animal Adaptations	



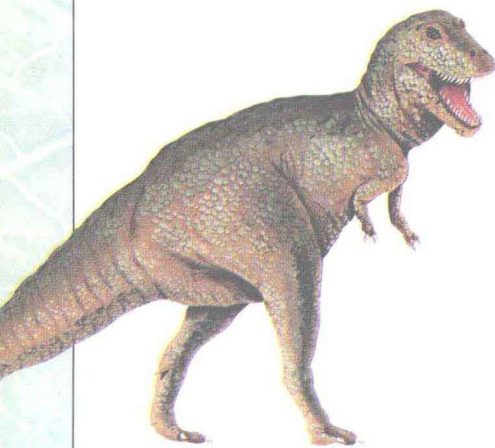
▲ To find out why jack pines depend on forest fires for survival, see page 68.



▲ 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.

Temperate Grasslands: Prairies, Steppes, and Pampas	92
Plant Adaptations • Animal Adaptations	
Threats to Temperate Grasslands	
Chaparral	94
Plant Adaptations • Animal Adaptations • Threats to Chaparral	
Deserts	95
Plant Adaptations • Animal Adaptations • Threats to Deserts	
Tundra	97
Plant Adaptations • Animal Adaptations • Threats to Tundra	

SECTION 4.3

Freshwater Ecosystems	100
Lakes and Ponds	100
Plant and Animal Adaptations	
Wetlands	102
Marshes • Swamps • Threats to Wetlands	
Rivers	103
Plant and Animal Adaptations • Threats to Rivers	

SECTION 4.4

Marine Ecosystems	105
Estuaries	105
Plant and Animal Adaptations • Threats to Estuaries	
Coral Reefs	107
Animal Adaptations • Threats to Coral Reefs	
The Ocean	108
Plant Adaptations • Animal Adaptations • Threats to Oceans	
Polar Ecosystems	111
The Arctic • The Antarctic • Threats to Polar Ecosystems	

Highlights	113
Chapter Review	114
Investigation: Identify Your Local Biome	116
<i>Points of View: The Future of the Arctic National Wildlife Refuge, page 118</i>	

C H A P T E R 5

WATER 120

SECTION 5.1

Our Water Resources	121
Water, Water Everywhere, But	122
Surface Water	123
Rivers of Controversy • Dams	
Groundwater	126
Aquifers Are Running Low	
Solutions to Water Shortages	128
Desalting the Sea • Towing Water • Water Conservation	
<i>Case Study: The Ogallala Aquifer: An Underground Treasure, page 126</i>	

SECTION 5.2

Freshwater Pollution	131
Point Pollution	132
Nonpoint Pollution	133
Wastewater Treatment Plants	134
Pathogens	136
How Water Pollution Affects Ecosystems	136
Artificial Eutrophication	137
Thermal Pollution	137
Cleaning Up Water Pollution	138

The Special Problem of Groundwater Pollution	139
Bottled Water	139
<i>Case Study: The Fight Over Pigeon River, page 134</i>	

SECTION 5.3

Ocean Pollution	140
How Pollutants Get Into Oceans	140
Preventing Ocean Pollution	141
Who Owns the Oceans?	

Highlights	143
Chapter Review	144
Investigation: How Safe Is Our Groundwater?	146
<i>Making a Difference: High School Chemist, page 148</i>	

C H A P T E R

6

AIR	150
------------	-----

SECTION 6.1

What Causes Air Pollution?	151
Air Pollution on Wheels	153
Controlling Air Pollution From Vehicles	
Industrial Air Pollution	154
Controlling Air Pollution From Industries	
Thermal Inversions	155
Smog	156

SECTION 6.2

Effects on Human Health	157
Chronic Bronchitis and Asthma	157
Emphysema and Lung Cancer	157
Indoor Air Pollution	158
Radon Gas • Asbestos	
<i>Case Study: Air Pollution in Poland, page 158</i>	

SECTION 6.3

Acid Precipitation	161
How Acid Precipitation Affects Ecosystems	162
International Conflict and Cooperation	163
Highlights	165
Chapter Review	166
Investigation: How Does Acid Precipitation Affect Plants?	168
<i>Points of View: Are Electric Cars the Cure for Air Pollution? page 170</i>	

C H A P T E R

7

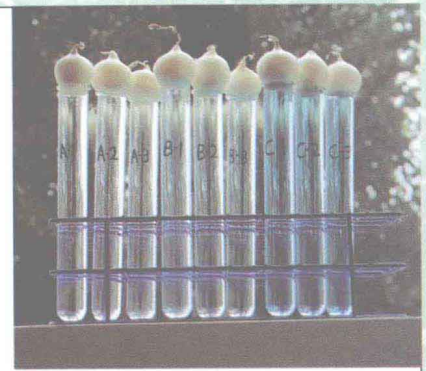
ATMOSPHERE AND CLIMATE	172
-------------------------------	-----

SECTION 7.1

The Atmosphere	173
How Photosynthesis Changed the Atmosphere	174
The Five Layers	175

SECTION 7.2

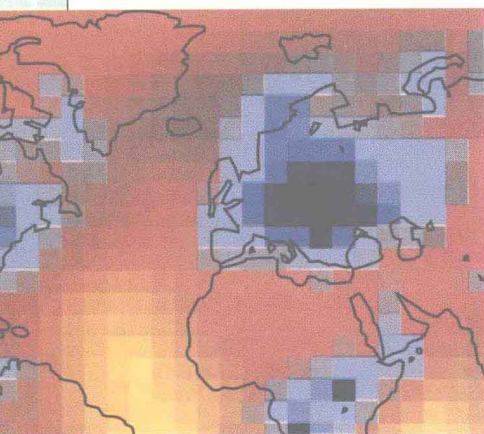
Climate	176
What Determines Climate?	176
Latitude • Atmospheric Circulation Patterns	
Ocean Circulation Patterns • Local Geography	
Seasonal Changes in Climate	179



▲ 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.

SECTION 7.3

Greenhouse Earth 180

- The Greenhouse Effect 180
- More Carbon Dioxide in Our Atmosphere 181
- Where Is the Extra Carbon Dioxide Coming From? 182
- Greenhouse Gases and the Earth's Temperature 183
- A Warmer Earth 184
 - Weather Patterns • Agriculture • Sea Levels
- Slowing the Temperature Change 185
- Case Study: *Computer Models and Earth's Future*
Climate, page 182

SECTION 7.4

The Ozone Shield 186

- Ozone Eaters 186
 - Breaking Apart CFCs
- The Ozone Hole 187
 - The Effects of Ozone Thinning
- Stopping the Ozone Eaters 188
- Highlights 189
- Chapter Review 190
- Investigation: Global Warming in a Jar 192
- Making a Difference: Ozone Scientist, page 194*

C H A P T E R

8

LAND 196

SECTION 8.1

The City 197

- The Urban-Rural Connection 198
- Urbanization 199
 - The Urban Crisis • Suburban Sprawl
- Land-Use Planning 201
- Mass Transportation 202
- Inner-City Renovation 202
- Open Spaces 203

SECTION 8.2

How We Use Land 204

- Harvesting Trees 205
 - Deforestation • Reforestation • Protecting Forests
- Ranching 208
 - Problems on the Range • Maintaining the Range
- Mining 210
 - The Effects of Mining • Responsible Mining

SECTION 8.3

Public Land in the United States 213

- This Land Belongs to You and Me 214
 - Managing Our Public Land
- Wilderness 215
 - Troubled Lands • "People Control" in Wilderness Areas
- Case Study: *Public Lands for the Asking, page 216*
- Highlights 219
- Chapter Review 220
- Investigation: Mining for Peanuts 222
- Making a Difference: Big-City Farmer, page 224*

FOOD226

SECTION 9.1

Feeding the People of the World227

- What People Eat228
- Why People Go Hungry228
- The Green Revolution229
- Political Changes230

SECTION 9.2

Agriculture and Soil231

- Farming231
 - Fertile Soil232
 - Topsoil Erosion: A Global Problem234
 - Desertification235
 - Soil Conservation236
 - Sustainable Agriculture238
 - Preventing Salinization238
 - Old and New Foods239
- Case Study: Aquaculture: A Different Kind of Farming, page 236*

SECTION 9.3

Pest Control240

- Drawbacks of Pesticides242
 - Health Concerns • Pollution and Persistence
 - Pesticide Resistance
- Biological Pest Control243
 - Predators and Pathogens • Plant Defenses • Chemicals From Plants Disrupting Insect Breeding

- Highlights245
 - Chapter Review246
 - Investigation: The Case of the Failing Farm248
- Points of View: Genetically Engineered Food, page 250*



▲ 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.

BIODIVERSITY252

SECTION 10.1

Biodiversity at Risk253

- A World Rich in Biodiversity254
 - How Are Humans Causing Extinctions?254
 - Habitat Destruction • Hunting • Exotic Species
 - The Value of Biodiversity258
 - Saving Species Preserves Ecosystems
 - Practical Uses of Species • Ethical and Aesthetic Reasons
- Case Study: Whooping Cranes: Regaining Lost Ground? page 256*

SECTION 10.2

Public Policy261

- The Endangered Species Act261
 - Developers vs. Environmentalists?
 - Worldwide Efforts to Prevent Extinctions264
 - Prevention of Poaching • The Biodiversity Treaty
- Case Study: The Snail Darters and the Dam, page 264*

▼ 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.

SECTION 10.3

The Future of Biodiversity 267

Saving Individual Species 267

 Captive-Breeding Programs • Botanical Gardens

 Germ-Plasm Banks

The Ecosystem Approach 268

What About Human Needs? 270

Highlights 271

Chapter Review 272

Investigation: Backyard Diversity 274

Points of View: Owls vs. Loggers, page 276

C H A P T E R

11

ENERGY 278

SECTION 11.1

Fossil Fuels to Electricity 279

Electricity: Energy on Demand 280

Fossil Fuels 281

 Dwindling Supplies of Fossil Fuels

 Renewable and Nonrenewable Energy Resources

SECTION 11.2

Nuclear Energy 283

How Nuclear Energy Works 283

Advantages of Nuclear Energy 284

So Why Aren't We Using More Nuclear Energy? 285

 Safety Concerns

Nuclear Fusion 286

SECTION 11.3

A Sustainable Energy Future 287

Energy Conservation 287

Energy for the Future 288

Solar Energy 288

Wind Energy 291

Hydroelectricity 292

Geothermal Energy 292

Biomass 293

 Waste to Energy

Liquid Fuels From Biomass 294

Hydrogen 294

Case Study: A Super-Efficient Structure, page 288

Highlights 295

Chapter Review 296

Investigation: Solar Design 298

Making a Difference: Environmental Activist, page 300

C H A P T E R

12

WASTE 302

SECTION 12.1

Solid Waste: The Throwaway Society 303

All Wastes Are Not Equal 305

What We Throw Away 306

Where Our Trash Goes 306

 Landfills • Incinerators

SECTION 12.2

Solid Waste: Options for the Future310

- Producing Less Waste310
- Recycling311
 - “Buy Recycled” • Composting
- Changing the Materials We Use313
 - Degradable Plastics?

Case Study: Paper or Plastic? page 312

SECTION 12.3

Hazardous Waste316

- Laws Governing Hazardous-Waste Disposal317
 - The Superfund Act317
- How Can We Manage Hazardous Wastes?318
 - Produce Less • Reuse • Conversion Into Nonhazardous Substances • Incineration • Land Disposal
- Hazardous Waste at Home321
 - What About Motor Oil?

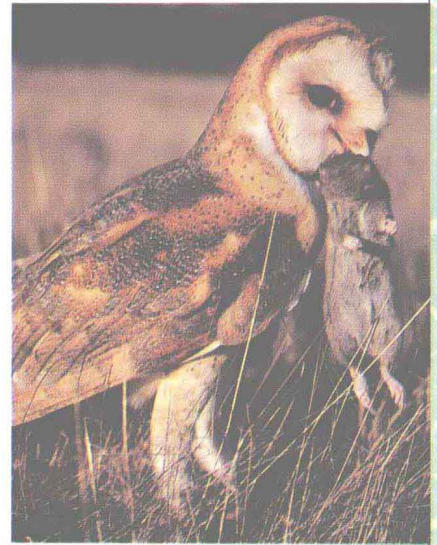
Case Study: Love Canal: A Toxic Nightmare, page 318

Highlights323

Chapter Review324

Investigation: Does Fast Food Have to Be Wasteful?326

Points of View: Should Nuclear Waste Be Stored at Yucca Mountain? page 328



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

C H A P T E R

13

POPULATION GROWTH330

SECTION 13.1

How Populations Change in Size331

- How Fast Can a Population Grow?332
- What Limits Population Growth?334

Case Study: Overshooting the Carrying Capacity, page 332

SECTION 13.2

A Growing Human Population336

- From Hunting and Gathering to Agriculture336
- The Population Continues to Grow338
- The Demographic Transition338
- A Demographically Divided World341

Case Study: The Stories Behind the Statistics, page 338

SECTION 13.3

Problems Related to Population Growth342

- A Shortage of Fuelwood342
- Water That Kills343
- The Urban Crisis344
- Social Unrest344
- Environmental Refugees345
- Solving Problems Related to Population Growth346
 - Overconsumption in Developed Nations

Highlights347

Chapter Review348

Investigation: What Causes a Population Explosion?350

Points of View: Should Population Growth Be Limited? page 352



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

TOWARD A SUSTAINABLE FUTURE 354

SECTION 14.1

International Cooperation 355

The Earth Summit: Promise and Problems 355

Wealthy and Poor Nations 359

Case Study: A Whale of an International Controversy, page 356

SECTION 14.2

Environmental Policies in the United States 360

Environmental Impact Statements 361

Influencing National Policy 362

State Environmental Policies 362

Local Communities 363

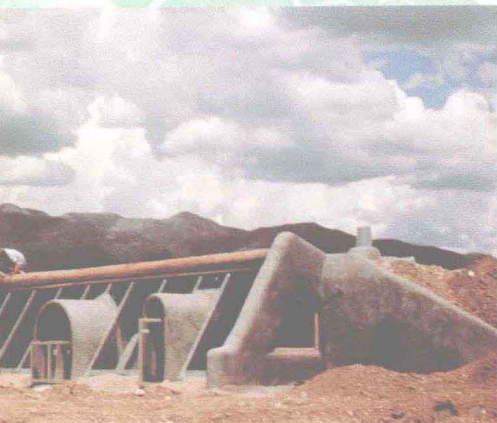
Into the Future 364

Highlights 365

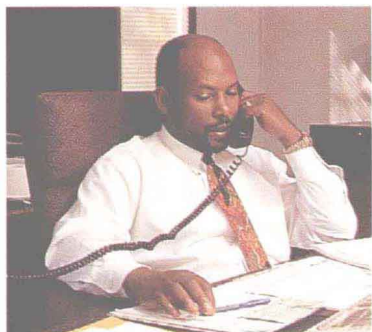
Chapter Review 366

Investigation: Be an Environmental Journalist 368

Making a Difference: Building Toward the Future, page 370



▲ 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.

ENVIRONMENTAL CAREERS

Environmental Filmmaker 372

Research Wildlife Biologist 374

Landfill Manager 376

Fish and Wildlife Trooper 378

Environmental Lawyer 380

Environmental Educator 382

Climate Researcher 384

Any Job Can Be Environmental 386

ECOSKILLS

Introduction 388

Boosting Your Home's Energy Efficiency 389

Eliminating Pests Naturally 390

Environmental Shopping 392

Making Your Own Compost Heap 394

Creating a Wildlife Garden 396

Planting a Tree 398

Building a Bat House 400

Flushing Less Water 404

For More Ecoskills Projects 405

REFERENCE SECTION

Environmental Atlas 406

Environmental Economics 423

SI Conversions 424

General Guidelines for Laboratory Safety 425

Chemistry Review 429

Glossary 431

Index 439

Credits 446

INVESTIGATIONS

An Onion Conundrum	28
Showdown on the Prairie	50
What's in an Ecosystem?	74
Identify Your Local Biome	116
How Safe Is Our Groundwater?	146
How Does Acid Precipitation Affect Plants?	168
Global Warming in a Jar	192
Mining for Peanuts	222
The Case of the Failing Farm	248
Backyard Diversity	274
Solar Design	298
Does Fast Food Have to Be Wasteful?	326
What Causes a Population Explosion?	350
Be an Environmental Journalist	368

FEATURES

CASE STUDIES

Lake Washington: An Environmental Success Story	6
Natural Selection and the Peppered Moth of England	44
DDT in an Aquatic Food Chain	58
Fires in Yellowstone	68
Saving Costa Rican Biomes	84
The Ogallala Aquifer: An Underground Treasure	126
The Fight Over Pigeon River	134
Air Pollution in Poland	158
Computer Models and Earth's Future Climate	182
Public Lands for the Asking	216
Aquaculture: A Different Kind of Farming	236
Whooping Cranes: Regaining Lost Ground?	256
The Snail Darters and the Dam	264
A Super-Efficient Structure	288
Paper or Plastic?	312
Love Canal: A Toxic Nightmare	318
Overshooting the Carrying Capacity	332
The Stories Behind the Statistics	338
A Whale of an International Controversy	356

POINTS OF VIEW

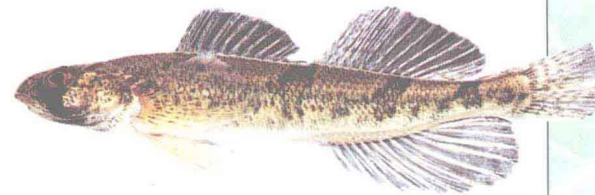
Where Should the Wolves Roam?	76
The Future of the Arctic National Wildlife Refuge	118
Are Electric Cars the Cure for Air Pollution?	170
Genetically Engineered Foods	250
Owls vs. Loggers	276
Should Nuclear Waste Be Stored at Yucca Mountain?	328
Should Population Growth Be Limited?	352

MAKING A DIFFERENCE

Chicken of the Trees	30
Butterfly Ecologist	52
High School Chemist	148
Ozone Scientist	194
Big-City Farmer	224
Environmental Activist	300
Building Toward the Future	370



▲ 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.