

RACE TO SAVE



RACE TO SAVE THE PLANET



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Study Guide/2001 Edition

Keyed to *Living in the Environment*, Eleventh Edition,
and *Environmental Science*, Eighth Edition

By Edward C. Wolf



From
The Annenberg/CPB Collection

RACE TO SAVE THE PLANET

STUDY GUIDE
2001 EDITION

Edward C. Wolf

Part of a college-level telecourse that includes
Living in the Environment:
Principles, Connections, and Solutions or
Environmental Science: Working with the Earth
written by G. Tyler Miller, Jr., and published
by Brooks/Cole Publishing Company

Produced by WGBH-TV, Boston



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the *Race to Save the Planet* telecourse. This thirteen-unit
telecourse consists of ten one-hour public television
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environmental science textbooks, and additional
supplementary readings.

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For more information about telecourse licenses and
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Race to Save the Planet
PBS Adult Learning Service
1320 Braddock Place
Alexandria, VA 22314-1698
1-800-ALS-ALS-8

For information about *Race to Save the Planet*
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Preface: The *Race to Save the Planet* Telecourse

Course Overview

When roaming bands of hunting-gathering peoples first settled in permanent communities in the Middle East about 12,000 years ago, there were no more than a few million human beings on earth. Today, there are 6 billion of us, and our numbers increase by 80 million each year. That extraordinary growth, a sign of our success as a species, has been both cause and effect of profound revolutions in the relationship between humanity and the earth.

In recent years, the collective impacts of *Homo sapiens* have come under increasing scrutiny as evidence of fundamental changes in the natural patterns and processes of the earth becomes unmistakable. Changes of the sort associated with the passing of geological eons now unfold within human lifetimes. The industrial, agricultural, and energy technologies that sustain our societies have environmental impacts whose consequences can no longer be ignored. The contamination of air and water, extinction of plant and animal species, loss of productive soil, accumulation of waste, and change in the composition of the atmosphere itself lend special urgency to the task of responding to environmental problems. The environment has become a regular topic on networks and in newspapers, and environmental concerns touch every community around the world. Informed citizenship now requires a grasp of environmental issues.

Race to Save the Planet, an introductory course in environmental science consisting of ten one-hour programs, an introductory environmental science textbook, supplementary readings, and this Study Guide, will help you understand how scientists investigate global environmental changes, why disagreement exists about responses to those changes, and how different communities and societies address environmental challenges. Each program is designed to stand alone as well as to fit into the overall focus and scope of the course, which begins with a look at the long sweep of human history and concludes with a summary of

the opportunities and challenges with which societies will contend beyond the year 2000.

Race to Save the Planet visited 29 countries around the world to build a global perspective on environmental change. The course introduces fundamental concepts of matter, energy, and ecology, then applies these concepts to a range of contemporary concerns—from the landfill crisis in the United States to the destruction of tropical rain forests. You will see how different societies have responded to common problems and how experimental solutions are being tested. You will gain an appreciation for the complexity of environmental problems such as global climate change and the sophistication of the scientific tools being used to understand them. The course components are designed to work together to enrich your understanding of contemporary environmental concerns, innovative responses, and hard choices for the future—and to emphasize the solutions that can begin in your own home, college, and workplace.

Course Objectives

The *Race to Save the Planet* telecourse is designed to help you

- understand how human impacts on earth have changed through history and why environmental concerns have recently become so prominent.
- recognize the major environmental challenges facing modern societies and understand the choices and trade-offs these challenges pose.
- grasp the scientific principles underlying basic phenomena of environmental change.
- understand the technologies associated with major environmental problems and the technologies that may help solve these problems.

- distinguish the environmental impacts of industrial and developing societies, and understand why different types of societies perceive different problems and pursue different solutions.
- broaden your familiarity with world geography and international affairs.
- understand how the issues discussed in the telecourse are connected to the decisions and choices you make in your personal life.

Course Components

Race to Save the Planet consists of the following components:

- Ten one-hour television programs
- This Study Guide
- One of two textbooks, chosen by the instructor: *Living in the Environment* (11th edition, 2000) or *Environmental Science: An Introduction* (8th edition, 2001), both written by G. Tyler Miller, Jr., and published by Brooks/Cole Publishing Company
- Supplementary texts, to be assigned by the instructor: *State of the World 2000*, by Lester R. Brown et al., published by W. W. Norton & Company, Inc., and *Taking Sides: Clashing Views on Controversial Environmental Issues*, edited by Theodore D. Goldfarb and published by The Dushkin Publishing Group, Inc.

Together, the course components introduce broad concepts and scientific terms fundamental to ecology; they also examine major environmental issues through a variety of case studies.

The Television Programs

The ten one-hour television programs, corresponding with Units 3 through 12 of the telecourse, explore important ecological concepts and how different communities and societies in 29 countries around the world address environmental challenges. The programs include docu-

mentary footage, interviews, simulation, computer graphics, and animation.

The Study Guide

Ten of the thirteen Study Guide units correspond directly to the ten television programs, and three additional print-only units complete the course. Two print-only units precede the television programs, and a final print-only unit concludes the course. The Study Guide is designed to prepare you to view each television program critically and to help you evaluate your understanding of what you have seen. It also integrates the program material with the textbook and reinforces themes that unify the telecourse.

The Study Guide is not a substitute for the assigned and supplementary readings and may not cover all the material your instructor will expect you to master in each unit. Be sure you understand clearly what additional material, if any, you are responsible for in each unit. Use the Study Guide as a tool to organize your study and aid your comprehension of the television programs, not as a crutch to support you through the course.

Each unit of the Study Guide includes four major sections:

1. Before You View the Television Program

- **Learning Objectives**—a list of six to ten objectives that highlight concepts and content you should be sure to master.
- **Reading Assignment**—chapter(s) from the textbook your instructor has selected to use with the course.
- **Unit Overview**—a short summary of the television program and reading assignment, emphasizing major themes of the unit.
- **Glossary of Key Terms and Concepts**—a selection of terms and concepts helpful as background before viewing the television programs.

2. After You View the Television Program

- **Consider What You Have Seen**—a discussion of the themes and highlights of the corresponding television program, designed to help you see connections within each unit and among units.
- **Take a Closer Look at the Featured Countries**—a brief profile of each of the countries included in the program, with special emphasis on the unit topic, accompanied by maps.
- **Examine Your Views and Values**—several open-ended questions to promote critical thinking and reflection and to help you relate material from the unit to your own life.

3. Test Your Comprehension

- **Self-Test Questions**—ten to fifteen multiple-choice and short-answer questions based on the content of the television program, with answers listed in the Appendix.
- **Sample Essay Questions**—five essay questions like those your instructor may assign on exams that will require you to apply concepts learned in the reading assignment to cases and examples from the accompanying television program.

4. Get Involved

- **References**—a short bibliography of books and articles that you can consult for further information on the unit topic.
- **Organizations**—an illustrative list of nonprofit and independent organizations involved with the issues featured in the unit.

The Textbook

This Study Guide has been developed for use with either of two textbooks by G. Tyler Miller, Jr.: *Living in the Environment* (11th edition, 2000) or *Environmental Science: An Introduction* (8th edition, 2001), both published by Brooks/Cole Publishing Company. Either of these texts can serve as an integral part of the telecourse. The assigned textbook readings for each unit present fundamental concepts and principles illustrated by the television programs and provide definitions and illustrations that clarify those concepts. Your

instructor will test your comprehension of both the programs and the textbook readings.

You may find that the television programs have a somewhat different emphasis than the text material. The Study Guide will help you link the programs with the textbook.

The Supplementary Texts

Your instructor may choose to assign either or both of the following texts to reinforce the material presented in the television programs and the primary text.

- *State of the World 2000*, by Lester R. Brown et al. (New York: W. W. Norton & Company, Inc., 2000), is the latest in a series of annual reports from Worldwatch Institute that inspired the development of the *Race to Save the Planet* television series. Subtitled "A Worldwatch Institute Report on Progress Toward a Sustainable Society," *State of the World* provides an up-to-date and thoroughly documented overview of the earth's ecological health.
- *Taking Sides: Clashing Views on Controversial Environmental Issues*, edited by Theodore D. Goldfarb (Guilford, Conn.: The Dushkin Publishing Group, Inc., 1997), is a collection of essays providing opposing viewpoints on a number of contemporary environmental issues. Many of the issues in *Taking Sides: Clashing Views on Controversial Environmental Issues* bear directly on material in *Race to Save the Planet*, and the exploration of antithetical views will help you sharpen your critical thinking skills. Taking Sides ® is a registered trademark of The Dushkin Publishing Group, Inc.

If neither of these supplementary texts is assigned by your instructor, you may wish to purchase them (or check them out from a library) and read them on your own as you take the telecourse. Suggested readings from both books are included in the References section at the end of each Study Guide unit.

To order copies of *State of the World 2000*, contact:

W. W. Norton & Company, Inc.
Attn: Laurie Garner
500 Fifth Avenue
New York, NY 10110
(212) 354-5500

To order copies of *Taking Sides: Clashing Views on Controversial Environmental Issues*, contact:

The Dushkin Publishing Group, Inc.
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Guilford, CT 06437
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(800) 243-6532

Taking the Race to Save the Planet Telecourse

Find out the following information as soon after registration as possible.

- What books are required for the course.
- If and when an orientation session has been scheduled.
- When *Race to Save the Planet* will be broadcast in your area.
- When course examinations are scheduled (mark these on your calendar).
- If any additional on-campus meetings have been scheduled (plan to attend as many review sessions, seminars, and other meetings as possible).

To learn the most from each unit:

1. Before viewing the television program, read the "Before You View the Television Program" section of the corresponding unit in the Study Guide, paying particular attention to the Learning Objectives and the Glossary of Key Terms and Concepts.

2. Read the textbook assignment listed in the Study Guide and any supplementary material assigned by your instructor. Chapter outlines, lists of key concepts, and summaries will help you identify the important information.
3. View the program, keeping the Learning Objectives in mind. Be an active viewer. Some students find that taking notes while viewing the programs is helpful. If your area has more than one public television station, there may be several opportunities for you to watch the program. Many public television stations repeat a program at least once during the week it is first shown. The films may also be available on videocassettes at your school, or you can tape them at home if you own a VCR. If you don't have a VCR, you can make an audiocassette of the program for review.
4. Read the "After You View the Television Program" section of the Study Guide, to review and expand on what you have seen.
5. In the "Test Your Comprehension" section, take the self-test questions and complete any other questions, activities, or essays assigned by your instructor.
6. Keep up with the course on a weekly basis. Each unit of the course builds upon knowledge gained in previous units. Stay current with the programs and readings. Make a daily checklist and keep weekly and term calendars, noting your scheduled activities such as meetings or examinations as well as blocks of time for viewing programs, reading, and completing assignments.
7. Keep in touch with your instructor. If possible, get to know him or her. You should have your instructor's mailing address, phone number, and call-in hours. Your instructor would like to hear from you and to know how you are doing. He or she will be eager to clarify any questions you have about the course.

RACE TO SAVE THE PLANET

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PART I

THE AGE OF
GLOBAL CHANGE



UNIT 1

The Age of Global Change



VERONICA L. YOUNG

The Naam movement in Sub-Saharan Africa fosters local leadership and community work during the long dry season to promote more abundant crops and wipe out hunger —“faim”—in the region.

Can we move nations and people in the direction of sustainability? Such a move would be a modification of society comparable in scale to only two other changes: the agricultural revolution of the late Neolithic and the Industrial Revolution of the past two centuries. These revolutions were gradual, spontaneous, and largely unconscious. This one will have to be a fully conscious operation, guided by the best foresight that science can provide—foresight pushed to its limit. If we actually do it, the undertaking will be absolutely unique in humanity's stay on earth.

William D. Ruckelshaus, "Toward a Sustainable World." *Scientific American*, Sept. 1989.

GETTING STARTED

Learning Objectives

After completing the assigned readings, you should be able to

- explain the principle of exponential growth and cite two real-world cases that demonstrate this type of growth.
- explain the distinction between "renewable" and "nonrenewable" resources and list examples of each.
- describe the two major categories of pollution and the two principal approaches to pollution control.
- paraphrase and explain the implications of the law of conservation of matter.
- paraphrase and explain the implications of the first law of thermodynamics, the "law of conservation of energy."
- paraphrase and explain the implications of the second law of thermodynamics, the "law of energy quality degradation."
- define energy efficiency and net useful energy.
- explain how typical uses of energy in daily life demonstrate the two laws of energy.

- list some of the characteristics of what textbook author Miller calls "sustainable-earth societies."
- summarize your own worldview and say whether it more closely resembles the "throw-away" or the "sustainable-earth" worldview discussed in the reading assignment.

Reading Assignment

In this unit you may read the Study Guide and the text reading assignment in any order you prefer. You will have to complete the textbook assignment before taking the self-test questions at the end of the unit, however. Unit 2, like this unit, provides space in which to fill in your own definitions of fundamental concepts after you complete the reading assignment. In Units 3 through 12, schedule time to complete the assigned reading and the first section of the Study Guide ("Before You View the Television Program") *before* the accompanying program is broadcast or shown in class.

Choose the material from either textbook as your reading assignment. Your instructor might assign additional readings as well.

Living in the Environment

Chapter 1, "Environmental Problems, Their Causes, and Sustainability" (esp. Section 1-7)

Chapter 2, "Critical Thinking: Science, Models, and Systems" (esp. Section 2-1)

Chapter 3, "Matter and Energy Resources: Types and Concepts"

Chapter 29, "Environmental Worldviews, Ethics, and Sustainability"

Environmental Science

Chapter 1, "Environmental Problems and Their Causes" (esp. Section 1-7)

Chapter 2, "Economics, Politics, Ethics, and Sustainability" (esp. Sections 2-7 and 2-8)

Chapter 3, "Science, Systems, Matter, and Energy"

The references listed at the end of this unit may help you begin thinking about the earth and the future in a new way and begin to develop your own perspective on the age of global change.

Glossary of Key Terms and Concepts

The glossary section of Units 3 through 12 in this Study Guide includes terms and concepts it will be helpful for you to understand before watching the accompanying television program. Many of these terms are not defined in the reading assignments; you should get acquainted with them before viewing the programs so that you don't need to spend time flipping through the Study Guide while you watch.

The reading assignment for this unit introduces fundamental principles that you will use throughout this course. Be sure that you have a thorough grasp of the following concepts before you begin the units accompanied by television programs. You will find complete definitions and explanations in your textbook, and you might find it helpful to paraphrase the explanations in your own words in the space provided.

1. The Dynamics of Growth

exponential growth (and its consequences)

2. Types of Resources

renewable resources

nonrenewable (exhaustible) resources

sustainable yield

3. Types of Pollution, Responses to Pollution

point sources of pollution

nonpoint sources of pollution

input pollution control

output pollution control

4. Basic Principles of Matter and Energy

law of conservation of matter

first law of thermodynamics

second law of thermodynamics

energy quality

energy efficiency

net useful energy