

TAKING SIDES



Clashing Views on Controversial

Environmental Issues

TENTH EDITION

Thomas A. Easton
Theodore D. Goldfarb

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Selected, Edited, and with Introductions by

Thomas A. Easton
Thomas College

and

Theodore D. Goldfarb

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*This book is dedicated to my children and grandchildren
as well as all other children for whom the successful
resolution of these issues is of great urgency (T. D. G.)*

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Preface

Theodore D. Goldfarb, who was a professor of chemistry at the State University of New York at Stony Brook, ably edited *Taking Sides: Clashing Views on Controversial Environmental Issues* through its first nine editions. In the spring of 2002, Ted succumbed after a long battle with cancer. I have since been asked to assume the editorship of this book.

I have already edited *Taking Sides: Clashing Views on Controversial Issues in Science, Technology, and Society* through five editions and will continue as editor of that title. As a professor of science at Thomas College, I have taught ecology, environmental science, and environmentalism for many years, so I am very pleased by the many new opportunities presented by editing *Taking Sides: Environmental Issues*.

As Ted noted in the preface to the ninth edition of this book, "Faculty are divided about whether or not it is appropriate to use a classroom to advocate a particular position on a controversial issue. . . . No matter whether the goal is to attempt an objective presentation or to encourage advocacy, it is necessary to present both sides of any argument. To be a successful proponent of any position, it is essential to understand your opponents' arguments."

Which answer to the issue question—yes or no—is the correct answer? Perhaps neither. Perhaps both. Students should read, think about, and discuss the readings and then come to their own conclusions without letting my or their instructor's opinions (which are likely to show at least some of the time!) dictate theirs. The additional readings mentioned in the introductions and postscripts should prove helpful.

It is worth stressing that the issues covered in this book are all live issues; that is, the debates they represent are active and ongoing. Some have been active for years; others are new. All are controversial, and I have chosen essays that show the opposing viewpoints on these issues as clearly and as understandably (nontechnically) as possible.

This edition of *Taking Sides: Environmental Issues* contains 38 readings arranged in pro and con pairs to form 19 issues. For each issue, an *introduction* provides historical background and a brief description of the debate. The *postscript* after each pair of readings offers more recent contributions to the debate, additional references, and sometimes a hint of future directions. Each part is preceded by an *On the Internet* page that lists several links that are appropriate for further pursuing the issues in that part.

Changes to this edition About two-thirds of this book consists of new material. The book's volume introduction is new. Also, there are six completely new issues: *Is Biodiversity Overprotected?* (Issue 2); *Are Environmental Regulations Too Restrictive?* (Issue 3); *Do Environmentalists Overstate Their Case?* (Issue 6); *Should the Arctic National Wildlife Refuge Be Opened to Oil Drilling?* (Issue 7);

Should DDT Be Banned Worldwide? (Issue 8); and *Do Human Activities Threaten to Change the Global Climate?* (Issue 12). In addition, for nine of the issues retained from the previous edition, one or both of the readings have been replaced. In all, 24 of the 38 readings are new to this edition.

A word to the instructor *An Instructor's Manual With Test Questions* (multiple-choice and essay) is available through the publisher for the instructor using *Taking Sides* in the classroom. Also available is a general guidebook, *Using Taking Sides in the Classroom*, which offers suggestions for adapting the pro-con approach in any classroom setting. An online version of *Using Taking Sides in the Classroom* and a correspondence service for Taking Sides adopters can be found at <http://www.dushkin.com/usingsides/>.

Taking Sides: Clashing Views on Controversial Environmental Issues is only one title in the Taking Sides series. If you are interested in seeing the table of contents for any of the other titles, please visit the Taking Sides Web site at <http://www.dushkin.com/takingsides/>.

Thomas A. Easton
Thomas College





Introduction

Environmental Issues: The Never-Ending Debate

Thomas A. Easton

One of the courses I teach is called “Environmentalism: Philosophy, Ethics, and History.” I begin this course by explaining the roots of the word *ecology*, from the Greek word *oikos* (house or household), and then assigning the students to write a brief paper about their own households. How much, I ask them, do you need to know about the place where you live? And why?

The answers vary. Some of the resulting papers focus on people—roommates if the “household” is a dorm room, spouse and children if the student is older, parents and siblings if the student lives at home—and the need to cooperate and get along, and sometimes the need not to overcrowd. Some pay attention to houseplants, pets, and occasionally even bugs and mice. Some focus on economics—possessions, services, and their costs; where the checkbook is kept; where the bills accumulate; the importance of paying those bills; and, of course, the importance of earning money to pay those bills. Some focus on maintenance—cleaning, cleaning supplies, repairs, and whom to call if something major breaks. For some, the emphasis is on operation—running the garbage disposal, grocery shopping, working the lights and the stove, and so on. A very few recognize the presence of toxic chemicals under the sink and in the medicine cabinet and the need for precautions in their handling.

Not surprisingly, some students initially object that this exercise seems trivial. “What does this have to do with environmentalism?” they ask. Yet the course is rarely very old before most are saying, “Ah! I get it!” That nice, homey microcosm has a great many of the features of the macrocosmic environment, and the multiple ways that people can look at the microcosm mirror the ways that people look at the macrocosm. It is all there, as is the question of priorities: Which is most important—people, fellow creatures, economics, maintenance, operation, waste disposal, food supply, or toxics control? Or are they all equally important?

And how does one decide? I try to illuminate this question by describing a parent trying to teach a teenager not to sit on a woodstove. In July, the kid asks, “Why?” and continues to perch. In August, likewise. And still in September. But in October or November, the kid yells “Ouch!” and jumps off in a hurry.

That is, people seem to learn best when they get burned.

This is surely true in our homely *oikos*, where we may not realize that our fellow creatures deserve attention until the houseplants die of neglect or cockroaches invade the cupboards. Similarly, economics comes to the fore when the phone gets cut off, repairs when a pipe ruptures, air quality when the air conditioner breaks or strange fumes rise from the basement, and garbage disposal when the bags pile up and begin to stink. Toxics control suddenly matters when a child or pet gets into the rat poison.

In the larger *oikos* of environmentalism, such events are analogous to the loss of a species or an infestation by another, to floods and droughts, to lakes being turned into cesspits by raw sewage, to air being fouled by industrial smokestacks, to the contamination of groundwater by toxic chemicals, to the death of industries and the loss of jobs, and to famine and plague and even war.

If nothing is wrong in our households, we are not very likely to realize that there is something we should be paying attention to. And this, too, has its parallel in the larger world. Indeed, the history of environmentalism is, in part, a history of people carrying on with business as usual until something goes obviously awry. Then, if they can agree on the nature of the problem (Did the floor cave in because the joists were rotten or because there were too many people at the party?), they might learn something about how to prevent its recurrence.

The Question of Priorities

It is a truism that agreement is difficult. In environmental matters, people argue endlessly over whether or not anything is actually wrong, what a problem's eventual impact will be, what (if anything) can be done to repair any resulting damage, and how to prevent recurrence—not to mention who is to blame and who should take responsibility for fixing the problem! Part of the reason is simple: Different things matter to different people. For example, individual citizens might want clean air and water, or cheap food, or a convenient commute. Politicians might favor sovereignty over international cooperation. Economists and industrialists might consider a few coughs (or worse) a cheap price to pay for wealth or jobs.

No one now seems to think that protecting the environment is not important. But different groups—even different environmentalists—have different ideas of what “environmental responsibility” means. To a paper company that cuts trees for pulp, it might mean leaving a screen of trees (a “beauty strip”) beside the road and minimizing erosion. To hikers following trails through or within view of the same tract of land, that might not be enough; they might want the trees left alone. The hikers might also object to people using trail bikes and all-terrain vehicles on the trails. They might even object to hunters and anglers, whose activities they see as diminishing the wilderness experience. They might push for protecting the land as limited-access wilderness. The hunters and anglers would object to that, of course, because they want to be able to use their vehicles to bring their game home or to bring their boats to their favorite rivers and lakes. They could also argue, with some justification, that their license fees support a great deal of environmental protection work.

To a corporation, dumping industrial waste into a river might make perfect sense because alternative ways of disposing of waste are likely to cost more and diminish profits. Of course, the waste renders the water less useful to wildlife or humans living downstream, who might well object. Yet preventing the corporation from dumping might be seen as depriving it of property. A similar problem arises when regulations prevent people and corporations from using land—and making money—as they had planned. Conservatives have argued that environmental regulations thus violate the Fifth Amendment to the U.S. Constitution, which says, “No person shall . . . be deprived of . . . property, without due process of law; nor shall private property be taken for public use, without just compensation.”

One might think that the dangers of dumping industrial waste into rivers are obvious. But scientists can and do disagree about the consequences of such activities, even given the same evidence. For instance, a chemical in waste may clearly cause cancer in laboratory animals. Is it therefore a danger to humans? A scientist working for a company that is dumping that chemical in a river might maintain that no such danger has been proven. Yet a scientist working for an environmental group such as Greenpeace might argue that the danger is obvious because carcinogens generally affect more than one species.

Scientists are human. They have values rooted in political ideology and religion. They might feel that the individual matters more than corporations or society, or vice versa. They might also favor short-term benefits over long-term benefits, or vice versa. And scientists, citizens, corporations, and government all reflect prevailing social attitudes. When America was expanding westward, the focus was on building industries, farms, and towns. When problems arose, there was vacant land waiting to be moved to. But when the expansion was done, problems became more visible and less avoidable. People could see that there were trade-offs involved in human activity: more industry meant more jobs and more wealth, but there was a price in air and water pollution and adverse effects on human health (among other things).

Nowhere, perhaps, are these trade-offs more obvious than in the former Soviet Union, which was infamous for refusing to admit that industrial activity was anything but desirable. Any citizen who spoke up about environmental problems risked being jailed. The result, which became visible to Western nations after the fall of the Iron Curtain in 1990, was industrial zones in which rivers had no fish, children were sickly, and life expectancies were reduced. The fate of the Aral Sea, a vast inland body of water once home to a thriving fishery and a major regional transportation route, is emblematic: Because the Soviet Union wanted to increase its cotton production, it diverted the rivers that delivered most of the Aral Sea's freshwater supply for irrigation. The sea then began to lose more water to evaporation than it gained, and it rapidly shrank, exposing a sea bottom that is so contaminated by industrial wastes and pesticides that wind-borne dust is now responsible for a great deal of human illness. The fisheries are dead, and freighters lie rusting on bare ground where waves once lapped.

The Environmental Movement

The twentieth century saw immense changes in the conditions of human life and in the environment that surrounds and supports human life. According to historian J. R. McNeill, in *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (W. W. Norton, 2000), the environmental impacts that resulted from the interactions of burgeoning population, technological development, shifts in energy use, politics, and economics during that period are unprecedented in both degree and kind. Yet a worse impact might be that people have come to accept as “normal” a very temporary situation that “is an extreme deviation from any of the durable, more ‘normal,’ states of the world over the span of human history, indeed over the span of earth history.” Thus, people are not prepared for the inevitable and perhaps drastic changes ahead.

Environmental factors cannot be denied their role in human affairs. Nor can human affairs be denied their place in any effort to understand environmental change. As McNeill says, “Both history and ecology are, as fields of knowledge go, supremely integrative. They merely need to integrate with each other.”

The environmental movement, which grew during the twentieth century in response to increasing awareness of human impacts, is a step in that direction. Yet environmental awareness was evident long before the modern environmental movement. When he was young, John James Audubon (1785–1851), famous for his bird paintings, was an enthusiastic slaughterer of birds (some of which he used as models for his paintings). Later in life, he came to appreciate that birds were diminishing in numbers, as was the American bison, and he called for conservation measures. His was a minority voice, however. It was not until later in the century that John Muir (1838–1914), founder of the Sierra Club, began to call for the preservation of natural wilderness, untouched by human activities. In 1890 Gifford Pinchot (1865–1946) found “the nation . . . obsessed by a fury of development. The American Colossus was fiercely intent on appropriating and exploiting the riches of the richest of all continents.” Under President Theodore Roosevelt, he became the first head of the U.S. Forest Service and a strong voice for conservation (not to be confused with preservation; Pinchot’s conservation meant using nature in such a way that it was not destroyed; his aim was “the greatest good of the greatest number in the long run”). In the 1930s Aldo Leopold (1887–1948), best known for his concept of the “land ethic” and his book *A Sand County Almanac, and Sketches Here and There* (Oxford University Press, 1949), argued that people had a responsibility not only to maintain the environment but also to repair damage that was done in the past.

The modern environmental movement was kick-started by the publication of Rachel Carson’s *Silent Spring* (Houghton Mifflin, 1962). In the 1950s Carson realized that the use of pesticides was having unintended consequences—the death of nonpest insects, food chain accumulation of poisons and the consequent loss of birds, and even human illness—and meticulously documented the case. When her book was published, she and it were immediately vilified by

pesticide proponents in government, academia, and industry (most notably, the pesticides industry). There was no problem, the critics said; the negative effects, if any, were outweighed by the benefits; and she—a *woman* and a nonscientist—could not possibly know what she was talking about. But the facts won out. A decade later, DDT was banned, and other pesticides were regulated in ways unheard of before Carson spoke out.

Other issues have followed or are following a similar course.

The situation before Rachel Carson and *Silent Spring* is nicely captured by Judge Richard Cudahy, who, in “Coming of Age in the Environment,” *Environmental Law* (Winter 2000), writes, “It doesn’t seem possible that before 1960 there was no ‘environment’—or at least no environmentalism. I can even remember the Thirties, when we all heedlessly threw our trash out of car windows, burned coal in the home furnace (if we could afford to buy any), and used a lot of lead for everything from fishing sinkers and paint to no-knock gasoline. Those were the days when belching black smoke meant a welcome end to the Depression and little else.”

Historically, humans have felt that their own well-being mattered more than anything else. The environment existed to be used. Unused, it was only wilderness or wasteland, awaiting the human hand to “improve” it and make it valuable. This is not surprising, for the natural tendency of the human mind is to appraise all things in relation to the self, the family, and the tribe. An important aspect of human progress has lain in enlarging our sense of “tribe” to encompass nations and groups of nations. Some now take it as far as the human species. Some include other animals. Some embrace plants, bacteria, and even landscapes, as well.

The more limited standard of value remains common. Add to that a sense that wealth is not just desirable but a sign of virtue (the Puritans brought an explicit version of this with them when they colonized North America; see Lynn White, Jr., “The Historical Roots of Our Ecological Crisis,” *Science* [March 10, 1967]), and it is hardly surprising that humans have used and still use the environment intensely. People also tend to resist any suggestion that they should restrain their use out of regard for other living things. Human needs, many insist, come first.

The unfortunate consequences include the loss of other species. For example, lions vanished from Europe about 2000 years ago. The dodo of Mauritius was extinguished in the 1600s (see the American Museum of Natural History’s account at http://www.amnh.org/exhibitions/expeditions/treasure_fossil/Treasures/Dodo/dodo.html?dinos). And the last of North America’s passenger pigeons died in a Cincinnati zoo in 1914 (see http://www.amnh.org/exhibitions/expeditions/treasure_fossil/Treasures/Passenger_Pigeons/pigeons.html?dinos). Concern for species was at first limited to those of obvious value to humans. In 1871 the U.S. Commission on Fish and Fisheries was created and charged with finding solutions to the decline in food fishes and with promoting aquaculture; the first federal legislation designed to protect game animals was the Lacey Act of 1900. It was not until 1973 that the U.S. Endangered Species Act was adopted to shield all species from human impacts.

Other unfortunate consequences of human activities include dramatic erosion, air and water pollution, oil spills, accumulations of hazardous (including nuclear) waste, famine, and disease. Among the many “hot stove” incidents that have caught public attention are the following:

- The Dust Bowl—in 1934 wind blew soil from drought-stricken farms in Oklahoma all the way to Washington, D.C.;
- Cleveland’s Cuyahoga River caught fire in the 1960s;
- The Donora, Pennsylvania, smog crisis—in one week in October 1948, 20 people died and over 7,000 were sickened;
- The London smog crisis in December 1952—4,000 dead;
- The *Torrey Canyon* and *Exxon Valdez* oil spills, which fouled shores and killed seabirds, seals, and fish;
- Love Canal, where industrial wastes seeped from their burial site into homes and contaminated ground water;
- Union Carbide’s toxics release at Bhopal, India—3,800 dead and up to 100,000 ill, according to Union Carbide; others claim a higher toll;
- The Three Mile Island and Chernobyl nuclear accidents;
- The decimation of elephants and rhinoceroses to satisfy a market for tusks and horns;
- The loss of forests—in 1997 fires set to clear Southeast Asian forest lands produced so much smoke that regional airports had to close;
- Ebola, a virus that kills nine-tenths of those it infects, apparently first struck humans because growing populations reached into its native habitat;
- West Nile Fever, a mosquito-borne virus with a much less deadly record than Ebola, was brought to North America by travelers or immigrants from Egypt;
- Acid rain, global climate change, and ozone depletion, all caused by substances released into the air by human activities.

The alarms have been raised by many people in addition to Rachel Carson. For instance, in 1968 (when world population was only a little over half of what it is today) Paul Ehrlich described the ecological threats of a rapidly growing population in *The Population Bomb* (Ballantine Books), and Garrett Hardin described the consequences of using self-interest alone to guide the exploitation of publicly owned resources (such as air and water) in his influential essay “The Tragedy of the Commons,” *Science* (December 13, 1968). (In 1974 Hardin introduced the unpleasant concept of “lifeboat ethics,” which says that if there are not enough resources to go around, some people must do without.) In 1972 a group of economists, scientists, and business leaders calling themselves “The Club of Rome” published *The Limits to Growth* (Universe Books), an analysis of population, resource use, and pollution trends that predicted difficult times within a century. The study was redone in 1992 using more powerful computer models, and the researchers came to very similar conclusions (see *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future* [Chelsea Green, 1992]).

The following list of selected U.S. and UN laws, treaties, conferences, and reports illustrates the national and international responses to these alarms:

- 1967 The U.S. Air Quality Act set standards for air pollution.
- 1968 The UN Biosphere Conference discussed global environmental problems.
- 1969 The U.S. Congress passed the National Environmental Policy Act, which (among other things) required federal agencies to prepare environmental impact statements for their projects.
- 1970 The first Earth Day demonstrated so much public concern that the Environmental Protection Agency (EPA) was created; the Endangered Species Act, Clean Air Act, and Safe Drinking Water Act soon followed.
- 1971 The U.S. Environmental Pesticide Control Act gave the EPA the authority to regulate pesticides.
- 1972 The UN Conference on the Human Environment, held in Stockholm, Sweden, recommended government action and led to the UN Environment Programme.
- 1973 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) restricted trade in threatened species; because enforcement was weak, however, a black market flourished.
- 1976 The U.S. Resource Conservation and Recovery Act and the Toxic Substances Control Act established control over hazardous wastes and other toxic substances.
- 1979 The Convention on Long-Range Transboundary Air Pollution addressed problems such as acid rain (recognized as crossing national borders in 1972).
- 1982 The Law of the Sea addressed marine pollution and conservation.
- 1982 The second UN Conference on the Human Environment (the Stockholm +10 Conference) renewed concerns and set up a commission to prepare a "global agenda for change," leading to the 1987 Brundtland report (*Our Common Future*).
- 1983 The U.S. Environmental Protection Agency and the U.S. National Academy of Science issued reports calling attention to the prospect of global warming as a consequence of the release of greenhouse gases such as carbon dioxide.
- 1987 The Montreal Protocol (strengthened in 1992) required nations to phase out the use of chlorofluorocarbons (CFCs), the chemicals responsible for stratospheric ozone depletion.
- 1987 The Basel Convention controlled cross-border movement of hazardous wastes.
- 1988 The UN assembled the Intergovernmental Panel on Climate Change, which would report in 1995, 1998, and 2001 that the dangers of global warming were real, large, and increasingly ominous.
- 1992 The UN Convention on Biological Diversity required nations to act to protect species diversity.

- 1992 The UN Conference on Environment and Development (also known as the Earth Summit), held in Rio de Janeiro, Brazil, issued a broad call for environmental protections.
- 1992 The UN Convention on Climate Change urged restrictions on carbon dioxide release to avoid climate change.
- 1994 The UN Conference on Population and Development, held in Cairo, Egypt, called for the stabilization and reduction of global population growth, largely by improving women's access to education and health care.
- 1997 The Kyoto Protocol attempted to strengthen the 1992 Convention on Climate Change by requiring reductions in carbon dioxide emissions, but U.S. resistance limited its success.
- 2000 The Treaty on Persistent Organic Pollutants required nations to phase out the use of many pesticides and other chemicals.
- 2002 The UN World Summit on Sustainable Development, held in Johannesburg, South Africa, brought together representatives of governments, nongovernmental organizations, businesses, and other groups to examine "difficult challenges, including improving people's lives and conserving our natural resources in a world that is growing in population, with ever-increasing demands for food, water, shelter, sanitation, energy, health services and economic security."

Rachel Carson would surely have been pleased by these responses, for they suggest both concern over the problems identified and determination to solve those problems. But she would just as surely have been frustrated, for a simple listing of laws, treaties, and reports does nothing to reveal the endless wrangling and the way political and business forces try to block progress whenever it is seen as interfering with their interests. Agreement on banning chlorofluorocarbons was relatively easy to achieve because CFCs were not seen as essential to civilization and because substitutes were available. Restraining greenhouse gas emissions is harder because fossil fuels are considered essential. Also, although fuel substitutes do exist, they are more expensive.

The Globalization of the Environment

Years ago environmental problems were largely seen as local. A smokestack belched smoke and made the air foul. A city sulked beneath a layer of smog. Bison or passenger pigeons declined in numbers and even vanished. Rats flourished in a dump where burning garbage produced clouds of smoke and runoff contaminated streams and groundwater and made wells unusable. Sewage, chemical wastes, and oil killed the fish in streams, lakes, rivers, and harbors. And toxic chemicals such as lead and mercury entered the food chain and affected the health of both wildlife and people.

By the 1960s it was becoming clear that environmental problems did not respect borders. Smoke blows with the wind, carrying one locality's contamination to others. Water flows to the sea, carrying sewage and other wastes with it. Birds migrate, carrying with them whatever toxins they have absorbed with

their food. In 1972 researchers reported that most of the acid rain falling on Sweden came from other countries. Other researchers have shown that the rise and fall of the Roman Empire can be tracked in Greenland, where glaciers preserve lead-containing dust deposited over the millennia—the amount rises as Rome flourished, falls with the Dark Ages, and rises again with the Renaissance and Industrial Revolution. Today it is common knowledge that pesticides and other chemicals can show up in places where they have never been used (such as the Arctic), even years after their use has been discontinued. The 1979 Convention on Long-Range Transboundary Air Pollution has been strengthened several times with amendments to address persistent organic pollutants, heavy metals, and other pollutants.

There are also new environmental problems that exist only in a global sense. Ozone depletion, first identified in the stratosphere over Antarctica, threatens to increase the amount of ultraviolet light reaching the ground, thereby increasing the incidence of skin cancer and cataracts, among other things. The cause is the use of chlorofluorocarbons in refrigeration, air conditioning, aerosol cans, and electronics (for cleaning grease off circuit boards) by the industrialized world. The effect is global. Worse yet, the cause is rooted in northern lands such as the United States and Europe, but the worst effects may be felt where the sun shines brightest—in the tropics, which are dominated by developing nations. A serious issue of justice or equity is therefore involved.

A similar problem arises with global warming, which is also rooted in the industrialized world and its use of fossil fuels. The expected climate effects will hurt mostly the poorer nations of the tropics, perhaps worst of all those on low-lying South Pacific islands, which are expected to be wholly inundated by rising seas.

Both the developed and the developing world are aware of the difficulties posed by environmental issues. In Europe, “green” political parties play a growing part in government. In Japan, some environmental regulations are more demanding than those of the United States. Developing nations understandably place dealing with their growing populations high on their list of priorities, but they also play an important role in UN conferences on environmental issues, often demanding more responsible behavior from developed nations such as the United States (which often resists these demands; it has refused to ratify international agreements such as the Kyoto Protocol, for example).

Western scholars have been known to suggest that developing nations should forgo industrial development because if their huge populations ever attain the same per-capita environmental impact as the populations of wealthier lands, the world will be laid waste. It is not hard to understand why the developing nations object to such suggestions; they too want a better standard of living. Nor do they think it fair that they should suffer for the environmental sins of others.

Are global environmental problems so threatening that nations must surrender their sovereignty to international bodies? Should the United States or Europe have to change energy supplies to protect South Pacific nations? Should developing nations be obliged to reduce birth rates or forgo development be-

cause their population growth is seen as exacerbating pollution or threatening biodiversity?

Questions such as these play an important part in global debates today. They are not easy to answer, but their very existence says something important about the general field of environmental studies. This field is based in the science of ecology, a word whose root is that same *oikos* with which I began. Ecology focuses on living things and their interactions with each other and their surroundings. It deals with resources, limits, and coexistence. It can see problems, their causes, and even potential solutions. And it can turn its attention to human beings as easily as it can to deer mice.

Yet human beings are not mice. We have economies and political systems, vested interests, and conflicting priorities and values. Ecology is only one part of environmental studies. Other sciences—chemistry, physics, climatology, epidemiology, geology, and more—are involved. So are economics, history, law, and politics. Even religion can play a part.

Unfortunately, no one field sees enough of the whole to predict problems (the chemists who developed CFCs could hardly have been expected to realize what would happen when these chemicals reached the stratosphere). Environmental studies is a field for teams. That is, it is a holistic, multidisciplinary field.

This gives us an important basic principle to use when evaluating arguments on either side of any environmental issue: Arguments that fail to recognize the complexity of the issue are necessarily suspect. On the other hand, arguments that endeavor to convey the full complexity of an issue may be impossible to understand. A middle ground is essential for clarity, but any reader or student must realize that something important might be left out.

Current Environmental Issues

In 2001 the National Research Council's Committee on Grand Challenges in Environmental Sciences published *Grand Challenges in Environmental Sciences* (National Academy Press) in an effort to reach "a judgment regarding the most important environmental research challenges of the next generation—the areas most likely to yield results of major scientific and practical importance if pursued vigorously now." These areas include the following:

- Biogeochemical cycles (the cycling of plant nutrients; the ways human activities affect them; and the consequences for ecosystem functioning, atmospheric chemistry, and human activities)
- Biological diversity
- Climate variability
- Hydrologic forecasting (groundwater, droughts, floods, etc.)
- Infectious diseases
- Resource use
- Land use
- Reinventing the use of materials (e.g., recycling)

Some of these “grand challenges” are covered in this book. There are, of course, a great many other environmental issues—many more than can be covered in any one book such as this one. I have not tried to deal here with invasive species, the Endangered Species Act, the removal of dams to restore populations of anadromous fishes such as salmon, the depletion of aquifers, floodplain development, urban planning, and many others. My sample of the variety of available issues begins with the more philosophical ones. For instance, as I have already said, many people believed (and still believe) that nature has value only when it is turned to human benefit. One consequence of this belief is that it may be easier to convince people that nature is worth protecting if one can somehow calculate a cash value for nature “in the raw.” Some environmentalists object to attempts to do this because they believe that economic value is not the only value or even one that should matter at all (see Issue 1).

What other values might be considered? Perhaps nature has a value all its own or a right to exist unmolested. Perhaps human property rights should take precedence (see Issue 3). Perhaps the aim should be social justice (Issue 4).

There is also considerable debate over the “precautionary principle,” which says in essence that even if we are not sure that our actions will have unfortunate consequences, we should take precautions just in case (see Issue 5). This principle plays an important part in many environmental debates, from those over the value of preserving biodiversity (Issue 2), to the wisdom of opening the Arctic National Wildlife Refuge to oil drilling (Issue 7), to the folly (or wisdom) of burying nuclear waste under Yucca Mountain in Nevada (Issue 15).

Should we be concerned about the environmental impacts of specific human actions or products? Here, too, we can consider the wisdom of opening the Arctic National Wildlife Refuge to oil drilling as well as the conflict between the value of DDT for preventing malaria and its impact on ecosystems (Issue 8), the hormone-like effects of some pesticides and other chemicals on both wildlife and humans (Issue 10), and the hazards of air pollutants (Issue 11) and global warming (Issue 12). Another concern is genetic engineering: although it promises to do wonders for food production, some worry about its potential effects on ecosystems (Issue 9).

Waste disposal is a problem area all its own. It encompasses not only nuclear waste (Issue 15) but also hazardous waste (Issue 13) and municipal waste (Issue 14). A new angle on hazardous waste comes from the popularity of the personal computer—or more specifically, from the huge numbers of computers that are discarded each year.

What solutions are available? Some are specific to particular issues, as recycling is to waste handling (Issue 14). Some are more general, as evidenced by the issue on whether or not population growth is a primary cause of environmental problems (Issue 16).

Some analysts argue that whatever solutions are needed, government does not need to impose them all. Some maintain that private industry can be trusted to find and implement enough solutions voluntarily to reduce the need for regulations (Issue 18). Such voluntary action would perhaps be more likely