

I Introduction to Environmental Careers

THE FIRST half of the 21st century will be a critical era in the evolution of environmental careers. It has been the task of the past thirty years to raise environmental awareness, control and reverse unregulated pollution, and create public and private organizations dedicated to conservation and environmental protection. The work has been difficult and expensive, but the current generation has made remarkable progress. In fact, it has been nothing short of a revolution.

In many ways, however, the next generation of environmental professionals faces challenges that are infinitely more difficult than those that have confronted the current one. The task at hand today is not only to control pollution, but to prevent it; to not only slow the rate of habitat and soil loss, but to reverse it; and to not only regulate unsustainable activity, but to create a sustainable way of life on a crowded planet.

Where will the human race find solutions to its environmental problems? We must find them *everywhere*, and at the same time. We need dramatic improvements in technology, protection of plant and animal habitats, energy conservation and development of renewables, creation of market incentives that complement government action, greater social and racial justice, and better education and ecological understanding. The new generation must pursue all these goals *and* protect the gains of the last half century.

We can safely say that there is enough work ahead to keep all serious environmental workers busy for a lifetime. Conservation, environmental protection, and creating a sustainable future are *the* work of the 21st century.

It's a sobering yet optimistic time that you've chosen to begin an environmental career. As you set out into this changing territory, you'll need a map. This book is designed to be a useful guide for your adventure. Congratulations on your commitment and interest! Let's get started.

MAPPING THE TERRITORY

The environmental world is a large one. There are careers for scientists, engineers, journalists, business people, activists, social scientists, accountants, computer specialists, educators, attorneys, health professionals, and more. Whatever your future interests (or current background), your environmental career will be influenced by trends that are dramatically changing the environmental world.

This chapter provides an introduction to “the big picture.” First, we’ll quickly review some of the largest environmental challenges facing the nation, and the world. Second, we’ll examine the process of environmental employment creation in government, industry, academia, and the nonprofit sector. Third, we’ll provide a statistical look at environmental employment today—How many environmental workers are out there? What do they do? Where do they work? Fourth, we’ll describe twelve career tracks that are important now, or just coming into view.

ENVIRONMENTAL CHALLENGES FOR A NEW CENTURY

The environmental and conservation challenges before us are many, but some loom larger than others. Here are ten selected “mega-challenges” that will certainly engage the attention of environmental professionals as we enter the 21st century.

POLLUTION PREVENTION — WELCOME TO THE THIRD WAVE

The environmental movement in this country is just about one-hundred years old. The movement’s first wave began in the 1890s and lasted until the early 1960s. It was characterized by the growth of a conservation movement that focused mainly on protection of wild and scenic areas and a general appreciation of nature in a rapidly urbanizing world. The second wave lasted from roughly 1964 until the early 1990s and focused primarily on pollution control and remediation—reducing “point source” emissions into the air, land, and water, and beginning to deal with the legacy of uncontrolled dumping. The environmental progress from 1970 to 1993 should be remembered as one of the most dramatic social achievements in our history.

We are now in the third wave of environmentalism, which emerges from the recognition that pollution is not simply industrial emissions, but a by-product of social demands—of the way we live. The by-word of the age is *pollution prevention*. Since the passage of the Pollution Prevention Act in 1990, Congress is on record as formally requiring that pollution prevention be our preferred method of dealing with environmental degradation. What can’t be prevented

is to be recycled. What can’t be recycled is to be treated. Disposal is the last (and least preferred) option.

Your work will be done in the era of pollution prevention, and you should prepare for it now. If your education and experience prepare you primarily to *manage* pollution and clean up past mistakes, you will be behind the times.

GLOBAL CLIMATE CHANGE

Global warming is, perhaps, *the* environmental issue of the 21st century. The challenges are huge. In some ways, however, the diagnosis is straightforward. We must rapidly reduce energy use and develop alternatives to fossil fuels, which can be used by all the people of the world. We must stop (and reverse) the destruction of the world’s forests. We must stabilize world population (although debates rage about acceptable levels). Bill McKibben reminds us that most environmental degradation affects a specific place, no matter how destructively. Global climate change, on the other hand, affects the whole planet, and for a long time. If there is a single piece of work for our generation, it lies here.

The challenges of global climate change create some obvious job opportunities for atmospheric scientists, air quality engineers, energy efficiency experts, and those who can commercialize renewable energy sources. The crisis will also require the creativity of policy analysts to draft international agreements, educators to help us change deeply ingrained behaviors, transportation planners who can get us out of our cars, and more.

INTEGRATING ENVIRONMENTAL COSTS AND BENEFITS INTO THE GLOBAL MARKET ECONOMY

We live in a global economy that is becoming more and more integrated every day. There are no holdouts. The old Communist bloc has collapsed and national boundaries (and environmental laws) mean less and less in a global marketplace. Treaties and regulations at the international level can help immensely. In some ways, however, these are merely holding actions. The real work lies in designing policies and institutions that make the market system take environmental degradation into account as a matter of course.

BIODIVERSITY AND MASSIVE SPECIES EXTINCTIONS

We are wiping out plant and animal species at astonishing rates, primarily through the destruction of habitats. Slowing the rate of habitat loss (and then reversing it) will require political will, scientific research and creativity in planning. It will require that we protect and manage lands effectively, as well as educate private landowners and users about the value of biodiversity. Environmental professionals will play a leading role throughout the world.

problem for one group of people by displacing it onto another. We must build an environmental movement that addresses the needs of people of all races, classes, ethnic groups, and nationalities. We cannot have one environmental movement that is about protecting miles of beach for walks and wildlife, and another for people whose neighborhoods are ringed by toxic waste dumps.

Fortunately, an environmental justice movement has been rising steadily over the last ten years. Led by committed Hispanic, African, Asian, and Native Americans, environmental justice leaders are remaking the face of environmentalism for an era when Americans of European descent will be the minority. It remains to be seen, however, whether environmentalism will become a united movement involving all people or will fragment into factions based on class, race, and ethnicity.

ECOLOGICAL LITERACY

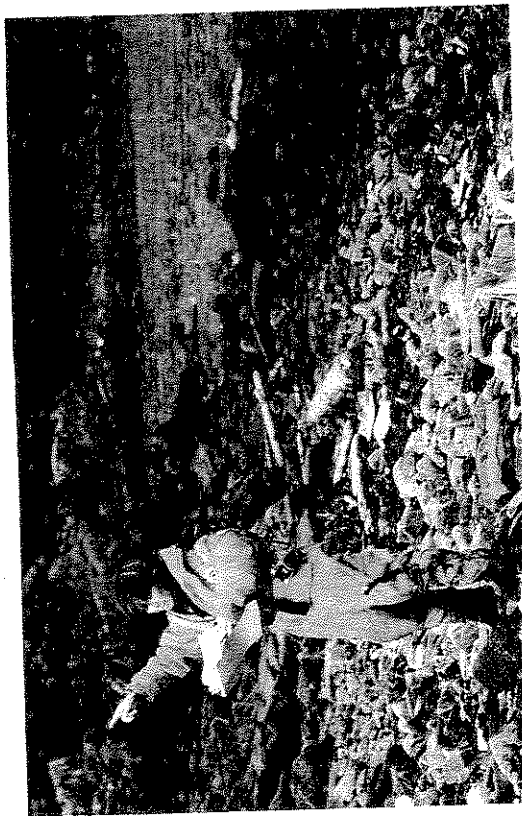
Education is no guarantee of environmentally sound action. A biologist with a Ph.D. can live as destructively as the next person. Nonetheless, understanding the systems that make up our natural world allows one to make choices on the basis of knowledge, and this is always to the good. People are less likely to be taken in by extremists of any stripe. For a democracy to have a discussion about environmental concerns, the citizens must have basic levels of ecological literacy. This is currently not the case.

MONITORING THE EARTH

One hundred years from now, at the end of another century, those who follow us may marvel that our greatest achievement was not that we reached zero emissions in pollution or that we broke our dependence on fossil fuels. These may be seen as accomplishments of the moment, brought on by pressing need. No, it's possible that our descendants will look in awe at us as the first generation that monitored the Earth in real time—that showed us the living Earth. Those who work in fields such as remote sensing and long-term monitoring projects are performing an immense service. They provide factual answers to politically charged questions about biodiversity, global warming, water pollution and use, illegal dumping, soil erosion, and toxics in the environment.

WATER

Clean water is an excellent barometer of ecological health, and water for human use is essential for community life. And yet 20 percent of the world's population—over one billion people—lack access to potable water. Demands for water far exceed its supply. We use almost seven times as much water today as we used in 1900, and economic improvements in less developed countries promise



Marine scientists with the National Oceanic and Atmospheric Administration study and protect coastal zone ecosystems.

CREATING SUSTAINABLE COMMUNITIES

Many environmental issues are framed as a need to *stop harmful activities*. The creation of sustainable communities asks us to invent new realities and create environmentally sustainable ways of living our lives. The sustainable communities movement is less about “solving problems” than it is about creating entire communities that are more fulfilling and less destructive than the old ones. The movement asks fundamental questions, including: What does a sustainable way of life look like on a planet of more than six billion people? Eight billion? Ten billion? If not fossil fuels, then what? If not urban and suburban sprawl, then what? If not industrial farming, then what? If not ever greater levels of “growth,” then what? In 1977, Wendell Berry wrote that we could not yet imagine what a real alternative to our present way of life looked like. In our time, examples will begin to take shape.

ENVIRONMENTAL JUSTICE

A clean and healthy environment is the birthright of *all* people, regardless of how much money they have, the color of their skin, where they live, or their nationality. This isn't how the world works today. People of color and the poor, both in this country and throughout the world, bear a disproportionate impact from environmental pollution. It does no good to “solve” an environmental

another sizable increase in the next few years. Our demands for water reduce flows, which affect fish and wildlife. How will we assure steady supplies of water for drinking, agriculture, industry, and the needs of other species on an equitable basis? This is a challenge that is at least as great as the water pollution issues, which faced the first generation of environmental professionals.

MULTIMEDIA, ECOSYSTEMS, AND "PLACE-BASED" APPROACHES TO ENVIRONMENTAL PROTECTION

When the Environmental Protection Agency (EPA) was formed in 1970, it set up departments for different environmental "media" (e.g., air, water, land), and for different types of waste (e.g., solid, hazardous waste). This structure was widely imitated and has had a major impact on environmental careers. The environment, however, isn't divided up this way. The natural world is a holistic system. In recent years, environmental management has moved toward integrated approaches that reflect the way nature works. Ecosystems management, "place-based" protection, strategic environmental management, watershed planning, and "multimedia" management are all part of this trend. Each chapter of this book shows examples of professionals crossing lines and working together to solve problems.

TAKING UP THE CHALLENGE: FOUR DRIVERS OF ENVIRONMENTAL EMPLOYMENT

Many of us have a basic understanding of employment in such fields as financial services, entertainment, food service, health care, retail sales, and education because we interact with these industries in our daily lives. The process by which these jobs come into being, and continue to be supported, is fairly clear.

In the environmental field, job creation is less clear. It's fair to ask a very basic question: Where do environmental jobs come from? Obviously, environmental employment is generated when government, industry, or the nonprofit sector spends money to hire people. But, what makes a business or agency spend money on environmental employees? What forces provide the funds for your career as an environmental professional?

Aspiring environmental workers would do well to ponder this question early and often. Environmental fields are undergoing rapid change. The sooner you get in touch with the underlying drivers that result in environmental expenditures and job creation, the sooner you will be able to see the waves of change that create and sweep away environmental careers.

In the environmental career world, there are four basic drivers: political agreement supporting legal and regulatory requirements, economics and the marketplace, environmental values, and technology. Let's explore each one of these.

DRIVER 1: CREATING ENVIRONMENTAL CAREERS THROUGH LAWS AND REGULATIONS

In 1970, fewer than 230,000 people were employed in "environmental" and conservation work on expenditures of around \$32 billion. By 1998, nearly seven times as much—\$200 billion—was being spent annually in the United States on environmental protection, supporting the jobs of nearly 2.5 million people. To put this in perspective, consider the size of some other parts of the economy. According to the *Environmental Business Journal*, 1994 revenues to the "environmental industry" were \$172 billion in 1994. In the same year, the paper products industry generated \$144 billion, petroleum refining \$128 billion, aerospace \$105 billion, and motor vehicles \$198 billion. Environmental work, then, is *big*.

What happened to create such considerable environmental job growth in such a brief time?

In short, the environmental movement. American citizens decided that environmental protection was a serious priority. Over the last thirty-five years, citizens and legislators have created a large infrastructure of environmental laws and regulations that has, in turn, created millions of jobs.

Federal, state, and local laws create and define environmental jobs in several ways. First, and most importantly, the alphabet soup of laws *creates compliance responsibilities* that regulated entities must meet. Take the example of air quality. To comply with air quality regulations, the regulated spend money on lawyers, consultants, equipment manufacturers, installers and maintenance people, analytical laboratories, record keeping, public affairs staff, toxicologists, engineers, and research and development scientists.

Second, the passage of environmental laws *creates government employment* for enforcement, education, community involvement, monitoring, research, program management, information management, grant and contract administration, direct service delivery, and more. Behind every environmental worker in government there is a law that created the need for that person.

Third, government action may result in the *purchase and management of public land*, which is carried out by public employees, contractors, interns, and volunteers. Conservation workers at the state and local level eagerly watch budget appropriations for the purchase of new land for wildlife refuges, parks, recreation areas, forests, and other managed properties.

Fourth, environmental laws may require the distribution of funds in the form of *grants and loans*, which create employment, especially at the state government level and in the academic research community.

Finally, laws and regulations *create an industry* of lobbyists, citizen monitors, attorneys, journalists, and policy experts who bring lawsuits, advocate changes in regulations, argue for new (or fewer) laws, and inform the public.

Environmental law and regulation created the modern environmental professions and has been far and away the largest driver in employment creation.

It is difficult to overestimate the power of government action. For thirty years, in fact, environmental career monitoring has been synonymous with watching for changes in Washington, D.C., and the state capitals.

What *kind* of employment is created by law and regulation? It's a question worth exploring in depth, because the answer has had a major impact on the education, training, and career paths of environmental professionals.

Until recently, environmental law and regulation in the United States were largely a matter of "command and control"—a government agency would set out detailed rules to be met (sometimes with prescribed methods) and regulated businesses and governments would work to demonstrate that they were in compliance with the law. Help with funding was often the carrot that accompanied the stick. This style was the rule not only in the control of air and water pollution, but in land-use planning, fish and game management, and many other areas.

Command and control regulation creates a professional focus on knowing the rules, and staying within them. For years, the focus of environmental work has been as much about obeying environmental law as about solving our pressing problems. Environmental workers often felt like (and were treated like) the police. At its worst, command and control keeps the focus on better ways to *comply*, instead of on dramatic improvements in environmental quality and conservation.

Command and control approaches have a powerful upside, however. They worked for the first generation of environmental problems. Creating detailed requirements backed up by the power of law made things happen that would never have happened otherwise. We needed to spend billions on secondary treatment plants, and command and control measures made that happen. We needed to reduce emissions at millions of "point sources" throughout the nation, begin protection for endangered species, purchase large expanses for wilderness and refuges, and start to clean up our toxic waste sites.

Americans today owe a huge debt to the activists, environmental professionals, academics and everyday citizens who created our basic environmental laws and regulations. These command and control regulations (and outright bans) will continue to be used for many environmental problems. Some argue that we continue to need more, not less, regulatory intervention.

But the era of command and control as a guiding principle is fading away, both as the basis of environmental policy and as an employment generating "driver" for environmental professionals. This has immense implications for the next generation of environmental workers, in and out of government. Simply put, it's not enough anymore to know and follow the rules (if it ever was). It's not enough to wait for the next round of regulatory upgrades to create new work.

Today's environmental career seeker is being asked for new ideas, innovative technologies, and nonadversarial strategies. Citizens and businesses are looking for answers that cost less, can be implemented faster, are flexible and adaptable, and achieve dramatic levels of improvement for our investment. To respond,

you must understand the legal and regulatory authorities at work in your field. But you must also seek answers that go far beyond compliance if you want to be competitive. You must have the skill and desire to solve problems.

DRIVER 2: ECONOMICS AND THE MARKETPLACE

We've seen that creating environmental careers through regulation has its limits. But if people are not forced by law to spend money on environmental protection, what else can induce them to do so?

In a market economy, one option is obvious. If people or corporations can save money, or (better still) make money by protecting the environment, many will do it. In recent years, we have seen how marketplace drivers can create innovative environmental career opportunities. Economic forces are becoming more and more powerful in environmental job creation, as this book will show.

Businesses are interested in operating profits, which can be enhanced as much by cutting costs as by increasing revenues. Even businesses whose products and services are not inherently "environmental" can improve their bottom line by producing less waste, which is expensive to deal with. In other words, environmental benefits are a by-product of the desire to reduce costs, improve productivity, and be more competitive.

The regulatory approaches discussed earlier play an interesting role in pushing businesses to invest in environmental solutions. By requiring businesses, and ultimately consumers, to pay to eliminate pollution, regulations bring more of the true cost of our way of life into the market system. These costs include polluted air and water, habitat loss, resource depletion, and damage to human health and safety.

It's useful to remember when regulations are attacked in favor of "the market" that regulation and taxation may be necessary to make the market respond at all. Why conserve energy if it's cheap? Why find substitutes for toxic chemicals if they are inexpensive, and legal? As the true costs are seen, the desire to reduce them grows, not only by preapproved means, but through other creative actions. Now, everyone—accountants, risk managers, process engineers, administrative assistants, marketing and sales people, fleet managers, contracting officers—can contribute to environmental solutions. The move to reduce waste, coupled with the legal necessity to do so, is producing talk about the possibility of zero emissions in some industries, a truly remarkable turn of events.

It's fairly easy to see how the drive to *save* money can produce environmental results and employment. Can whole businesses be built, however, on products and services that protect the environment and actually turn a profit?

Many businesses believe they can, and have, enhanced profits by appealing to customers who share their commitment to a clean environment. Of course, some companies engage in mere "green washing" (creating an ecofriendly image through colorful marketing alone), but a growing number are engaged in real change in their products and processes.

legal assistant. Water sampling that used to require two teams of chemists—one in the field and one in the lab—might now be done on-site by a couple of people in a van. Finding a replacement for a popular toxic substance can eliminate the need for people to store, ship, monitor, and dispose of hazardous waste. A talented geographic information system technician can develop in a day maps, that once would have taken a team of interns weeks to create.

Every single environmental career is being altered by technology, without exception. The obvious beneficiaries of this reality are not only the people who can use the new generation of technologies, but those who are exceptionally skilled in creating them in the first place.

Throughout this book, you will see examples of these four drivers at work. As you develop your own career, remember that no one driver exists alone. All four interact constantly to create new patterns of environmental and conservation jobs. Let's take a look at what that pattern looks like today.

WHERE THE JOBS ARE: AN ENVIRONMENTAL CAREER OVERVIEW

Hundreds of thousands of environmental professionals work for government agencies, from well-known players such as the National Park Service to the smallest local water district. Although overall growth in government employment has slowed, the public sector continues to be a dominant employer and a prime mover in the development of new policy directions for environmental problem solving.

PUBLIC SECTOR

Federal Government. The federal government is, by far, the largest single employer in the environmental career world. In late 1997, over 230,000 people worked for federal environmental and conservation agencies, according to a survey carried out by the Environmental Careers Organization (ECO) (see table 1.1).

The environmental agencies of the federal government employ (or fund) large numbers of professionals in certain fields. The Geological Survey employs more environmentally related earth scientists than anyone else. Nearly a quarter of professional foresters work at the Forest Service. The National Oceanic and Atmospheric Administration (NOAA) is probably the largest employer of oceanographers and atmospheric scientists, and helps fund many others. The field of range management is dominated by the Bureau of Land Management, and the park professionals who serve as superintendents at Yellowstone, Yosemite, Denali, and the Grand Canyon have reached a career pinnacle. The U.S. Fish and Wildlife Service is a major employer of biologists. The Department of Agriculture's Natural Resources Conservation Service employs a large number of the nation's soil scientists. Much of the nation's renewable energy

How? Think about your own buying and desires. Do you opt for organic food; 100 percent post-consumer recycled paper products; nontoxic cleaners; low-energy use appliances; wood certified as sustainably grown; ecotourism over the grand hotel; the string bag versus the plastic sack; curbside recycling; public transit over adding one more car to the road; renewable energy (if you could get it) over fossil fuels?

Multiply yourself by millions of others and add in the purchasing power of businesses and government agencies as well. Get the picture? All of the businesses that make ecofriendly products hire people, and although only a few of these people can be said formally to have environmental careers, they are making a large difference.

DRIVER 3: ENVIRONMENTAL VALUES

Protecting the natural world is a powerful value. Many of us don't need to be forced by law or lured by money to pursue it. We willingly spend time and money to create environmental and conservation organizations that, in turn, hire people and support careers. American individuals, foundations, and corporations gave over \$4 billion in charitable donations to environmental, conservation, and animal welfare causes in 1997. Government agencies added to that amount with hundreds of millions in government grants and contracts to nonprofit groups.

Thousands of environmental professionals have jobs because people care about environmental quality and want to do something about it. This widespread citizen support is crucial to the growth of environmental careers (not to mention the protection of ecosystems). It's worth remembering that community support takes work to maintain, and that environmental professionals have a special duty to help broaden the circle of involvement.

The "values" driver gives us land trusts like The Nature Conservancy, The Trust for Public Land and hundreds of smaller groups. It's produced watershed organizations, dozens of environmental justice advocates, hiking and trail maintenance groups, animal rescue shelters, nature centers, big national activists (e.g., the Natural Resources Defense Council, the Environmental Defense Fund, the Sierra Club, and the National Wildlife Federation), and small neighborhood groups that fight local battles.

Our desire to understand, celebrate, and enjoy the natural world is also part of the driver that supports careers for nature writers, photographers, videographers, journalists, outdoor adventure leaders, environmental educators, scientists, academics, and more.

DRIVER 4: TECHNOLOGY

Technology is both a creator and a destroyer of environmental careers. Each new generation of remote sensing technology wipes out the need for some of the biologists who did field surveys. A new CD-ROM can do the work of a

Table 1.1 Federal Government Employment at Environmental and Conservation Agencies (1997)

Agency	Permanent	Temp/Seasonal	Total
National Park Service	15,729	6,000	21,729
Bureau of Land Management	8,760	1,900	10,660
Fish and Wildlife Service	7,000	500	7,500
U.S. Geological Survey	10,395	—	10,395
Other interior agencies	21,843	—	21,843
Environmental Protection Agency	18,165	—	18,165
USDA Forest Service	30,000	15,000	45,000
Other agriculture (enviro-related)	11,000	—	11,000
Department of Energy	16,983	—	16,983
Transportation (enviro-related)	12,610	—	12,610
National Oceanic and Atmospheric	7,500	—	7,500
Army Corps of Engineers	27,454	—	27,454
Other agencies	21,000	—	21,000
TOTAL	208,439	23,400	231,839

Source: Environmental Careers Organization.

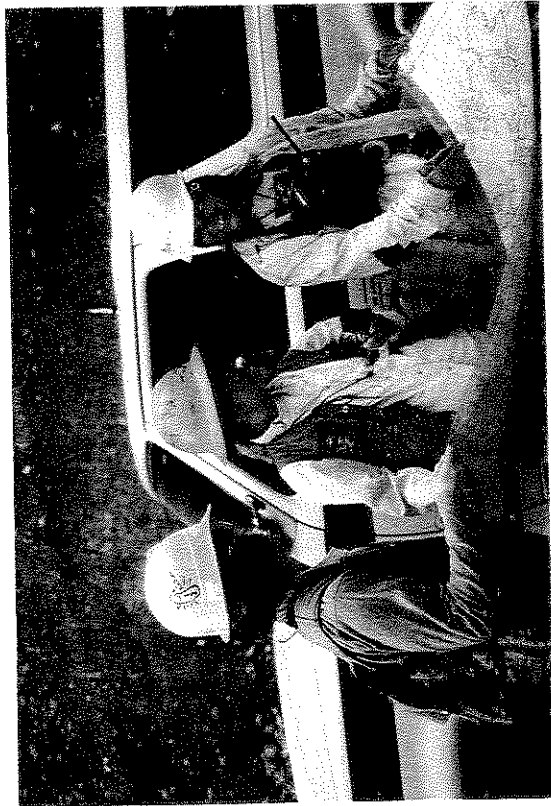
ronmental work (broadly defined), producing an environmental workforce of 459,000 workers. Included are employees at state colleges and universities.

We have seen that the federal government is changing its role, from one of detailed management to broad goal setting, assistance, and oversight. This often means a transfer of authority to the states. Some even argue that ownership and management of many federal lands and forests might be given over to state governments. Unfortunately, transfer of responsibility is rarely accompanied by increased revenues. In addition, state legislatures may be trying to shrink *their* permanent workforces by transferring work to private contractors and local government.

In addition to increased responsibility for former federal programs, state governments create programs of their own that deal with citizenry concerns. State governments lead the way, for example, in the creation of laws to promote recycling and the protection of watersheds.

The structure of state environmental work is roughly the same throughout the United States. Although the names vary, most states have agencies in the following areas:

- Environmental protection
- Fisheries and wildlife
- Food and agriculture
- Parks and recreation
- Water resources
- Public health
- Public utilities
- Community and economic development
- Coastal zone management (if applicable)



A wildlife biology survey crew in Oregon prepares for a day in the field.

research is done by the Department of Energy. Finally, the Environmental Protection Agency (EPA) has helped define modern environmentalism over the last twenty-eight years.

Throughout this book, you will find information about employment trends at the major federal agencies, as well as commentary about policy directions that influence other private and public sector employers, and website addresses to locate more information on your own.

Individual agencies change with new political climates and major legislation or executive orders. Generally, however, federal agencies are recasting their role in the direction of developing broad regulatory guidelines, conducting research, providing technical assistance and education to others, turning over authority to the states, and overseeing enforcement by state and local entities.

There are other trends you should be aware of. In general, the federal government workforce continues to shrink. It is hiring more consultants, private contractors, and temporary employees. Increasingly, federal employees manage nonfederal employees, who carry out much of the government's work. Finally, the workforce is growing older. A wave of retirees is inevitable. Whether or not this will generate an equal wave of new employment is questionable.

State Government. Although the federal government is large, nearly twice as many people work on environmental issues at the state level; 4,587,000 Americans worked for state government in 1996 (including 1,219,000 part-time employees), and roughly 10 percent of state employment involves envi-

- Emergency services
- Energy resources
- Planning (if state land planning is in force)

If you're interested in state government, be sure to look at the full range of agencies and not just the ones that are obviously "environmental."

Local Government. There are over 70,500 local governments in the United States, employing 5,948,000 people in 1996 (see table 1.2). Estimating the number of environmental workers at the local level is difficult. For one thing, employment counts for the "environmental industry" (see table 1.3) take in thousands of workers at publicly owned water supply and wastewater treatment plants, as well as those that are privately owned. After subtracting these workers, ECO estimates that roughly 8 percent of local government employees do environmental and conservation work, or 475,840 people.

Local government work is "hands on" environmental work. It's where recycling bins are picked up and the contents separated and sold, water and wastewater is treated, land-use plans are written and monitored, street trees are planted and trimmed, stormwater runoff systems are maintained, and community gardens are managed. Local government keeps the buses running and installs bike paths.

There is a lot of environmental work being done at the local level, but, ironically, jobs can be hard to find. A given town or city may have only a small handful of environmental professionals, and some of those may have a variety of nonenvironmental duties. In addition, "privatization" is a powerful movement at the local level, as towns and cities contract out work to business. The sheer number of employers can also work against the job seeker. Because employment is spread out over thousands of different jurisdictions, it's hard to keep track of more than a few at any one time.

Nonetheless, local government is a big part of the future of environmental-

Table 1.2 Local Government Employment in Environmental and Conservation Work (1996)

<i>Municipal Government</i>	<i>Towns and Townships</i>
Entities: 19,279	Entities: 16,656
Full-time: 2,199,000	Employment: 410,000
Part-time: 440,000	Enviros: 32,800
Enviros: 211,120	
<i>County Governments</i>	<i>Special Districts</i>
Entities: 3,043	Entities: 31,555
Employment: 2,251,000	Full-time: 497,000
Enviros: 180,080	Part-time: 151,000
	Enviros: 51,840

ism in this country. As Congress and the state legislatures shrink the government workforce while trying to increase environmental quality, more of the actual work is pushed to the local level. Local experiments are among the most creative in the environmental world.

To get an idea for the structure of local government where you live, simply take a walk through the Blue Pages of your telephone book.

Schools. There are at least 14,400 school systems in the United States, employing 3,476,000 full-time and 1,107,000 part-time workers. Allowing for custodians, principals, bus drivers, administrators, secretaries, and so forth, the lion's share of this 4.6 million workforce is, of course, teachers.

It's impossible to make an accurate count of how many teachers could be categorized as "environmental" educators. Arguably, however, there is no "environmental" work more important than the education of our children. In many ways, it's the foundation upon which everything else rests. To everyone reading this book who chooses a teaching career and improves the nation's ecological literacy and commitment to citizenship, a hearty congratulations.

PRIVATE SECTOR

Private sector environmental employment is found throughout the economy—in the "environmental industry," at regulated companies such as electric utili-

Table 1.3 Estimated Environmental Industry Employment

<i>Area</i>	<i>Entities</i>	<i>Jobs</i>	<i>Billions (\$)</i>
<i>Services</i>			
Analytical services	1,400	20,000	1.2
Wastewater treatment	27,000	113,700	25.9
Solid waste management	5,900	229,600	35.8
Hazardous waste management	2,500	53,300	5.6
Remediation/Ind. services	3,800	100,000	8.9
Consulting and engineering	5,800	162,800	15.6
<i>Equipment</i>			
Water (includes chemicals)	2,600	100,700	19.0
Instrument/Information system	500	24,800	3.4
Air pollution	800	83,300	16.2
Waste management	2,000	88,200	12.2
Process/Prevention technology	300	15,200	1.0
<i>Resources</i>			
Water utility	58,000	118,000	25.3
Resource recovery	2,000	128,300	16.9
Environmental energy	600	24,400	2.3
TOTAL	113,200	1,262,300	189.3

Primary source: Environmental Business International.

18 ties and manufacturers, at service businesses (e.g., law, architecture, insurance, finance, and so forth), and in a growing number of "green" businesses aimed at ecologically savvy consumers. More than ever before, the private sector is a source of job and entrepreneurial opportunities for those who care about the environment.

The Environmental Industry. *The Environmental Business Journal* estimates that there are over 113,000 "revenue producing organizations" in the environmental industry. These businesses and agencies supported nearly 1.3 million jobs on revenues of \$189 billion in 1997. California, Texas, New York, Pennsylvania, and Florida are among the leading states for environmental industry employment.

From 1970 to 1988, the environmental industry grew rapidly. In the 1970s, growth was 9-11 percent annually. The 1980s saw even better growth, with around 10 percent in the early 1980s and more than 12 percent from 1985 to 1988, peaking in 1988 at 15 percent. Throughout the 1990s, growth has been flat to moderate, ranging from a low of 2 percent to a high of about 6 percent. Clearly, the industry has matured, although new growth spikes cannot be ruled out.

What activities make up the environmental industry? As table 1.3 shows, the industry can be roughly divided into *services, equipment, and resources*. Each sector deserves some explanation.

The services and resources areas are certainly the most visible part of the industry to the general public. The most prominent services are in solid waste (e.g., operating municipal and commercial recycling, landfill, and "resource recovery" facilities) and water (e.g., constructing and operating water utilities and wastewater treatment plants).

The area of consulting and engineering, which represents "environmental work" to many aspiring professionals, is a smaller part of the overall industry than many believe. The consulting field is an important barometer of environmental employment, however. Consulting firms are usually the first to unearth new trends and service needs. The consulting sector also hires a disproportionately large number of highly trained scientists and engineers, when compared with the other sectors.

Hazardous waste management and remediation activity is still a contributor to total employment, and clean-up activity on old military bases, Superfund sites, and Department of Energy lands can create sharp increases in jobs. Increased interest in "brownfields" redevelopment (see chapters 4 and 9) could create a boom if government and investors spend as expected.

Over 25 percent of all environmental industry employment is involved with designing, selling, installing, and servicing environmental equipment and chemicals, especially to water and wastewater treatment plants. The equipment sector uses large numbers of salespeople, technicians, and distributors.

As we enter the 21st century, the environmental industry is going through wrenching changes, brought on by shifts in the drivers we discussed earlier,

and by general business trends in the economy. Until recently, the industry relied on new generations of government regulation and investment for its bread and butter. Government shifts in priorities from general pollution control (1970s), to hazardous waste remediation (1980s), to air pollution issues (early 1990s), to water concerns (late 1990s) have created roller-coaster employment tides.

New government actions are more uncertain today, as we saw earlier in our discussion of command and control regulation. Therefore, the industry is searching for ways to provide services to business and government that respond to marketplace needs that are not generated by government activity. This has proven to be a difficult venture, with as many failures as successes; however, four areas have emerged that hold promise. These are strategic environmental management, pollution prevention, environmental energy sources, and private management of water supplies. For more on these areas, see the waste, air, water, and energy chapters.

Mergers, acquisitions, and breakups have roiled the industry, as firms search for the right balance between size and flexibility to deliver environmental goods and services. Current trends point to an industry that will have a few dominant giants and many small "boutique" companies with fewer medium-size firms able to compete.

A major opportunity for private sector environmental employers lies overseas. The global market for environmental products and services is estimated at nearly \$400 billion annually, roughly 37 percent of which is in the United States. Overall growth in the U.S. at the end of the 1990s has, however, been extremely small. In contrast, other parts of the world are projected to experience an exploding demand for environmental work. Asia (not including Japan) is projected to grow at more than 15 percent annually (assuming recovery from the 1998 economic problems). Latin America will grow at 12 percent, and Africa at 10 percent. Although American industry faces heavy pressure from German, French, British, and Japanese firms, U.S. firms are competitive in most areas.

Regardless of these challenges, the environmental industry remains a great place for environmental professionals to build a satisfying career, especially for those with an entrepreneurial bent and a desire for fast-paced work environments that are focused on results.

OTHER PRIVATE EMPLOYERS

Beyond the environmental industry, the private sector is full of career opportunities. Although formal statistics are not available, here are a few of the places you will find environmental work being done.

Regulated Companies. Most larger companies have set up their own "environment, health, and safety" (EHS) departments to deal with regulatory compliance, pollution prevention, worker safety, risk management, and emergency

services. Industries with well-staffed departments include electric utilities, mining, forest products, petroleum, chemicals, heavy manufacturing, metals, electronics, food products, transportation, hospitals, and consumer goods. Some companies also run their own analytical laboratories to test air, soil, and water samples.

Corporate environmental managers have noted considerable changes in their responsibilities in the last few years. The most challenging has been the attempt to integrate environmental concerns into the basic operations of the business; that is solving environmental problems through the mutual work of professionals in operations, product design, process manufacturing, finance and accounting, legal, and so forth. Environmental departments are no longer considered lonely backwaters that constantly bring bad news requiring expenditures that bring no financial returns.

Nonetheless, EHS professionals are still required to know the regulations and keep the company in compliance. Common professionals hired include engineers, chemists, environmental scientists, toxicologists, industrial hygienists, and technicians. Competition is often intense, and industry-specific experience is usually desired.

Law Firms. Environmental law is firmly ensconced as a specialty, both in law schools and in most law firms. The sheer bulk of case law on environmental concerns, and the risk of not knowing it, are so large (and change so fast) that legal employment will remain strong well into the next century. Competition, however, will certainly increase. Environmental law is a popular specialty for today's law students, even as demand has dropped somewhat.

The Financial and Insurance Industries. "Investment banking is social policy," says Allen Hershkowitz, senior scientist at the Natural Resources Defense Council. "Investment banking is more important to environmentalists, objectively, than nine out of ten things Congress is going to do."

In a similar vein, environmental writer Bill McKibben asks, "What does it mean that alone among the Earth's great pools of money and power, insurance companies are beginning to take the idea of global climate change quite seriously?" Environmental work is growing in both of these industries, as well as at accounting firms, business consulting outfits, and related companies.

Other Industries. Environmental employment is found in many other places throughout the private economy, including the health care industry, agriculture, media and entertainment, pharmaceuticals, and transportation. For dozens of examples of environmental work throughout the economy, see *Green at Work* by Susan Cohn (Island Press 1995), which is a great book that explores opportunities for people of all backgrounds who want to protect the environment while they pursue a business career.

NONPROFIT ORGANIZATIONS

No one knows how many environmental nonprofit groups there are in the United States. Estimates range as low as 4,000 and as high as 10,000 or more. There has been a large (and welcome) growth in small, local, grassroots groups in the last ten years. Many of these groups, however, have no staff. The number of nonprofit groups of interest to career seekers drops precipitously if one eliminates all volunteer groups. For example, the 1998-99 *EnviroDirectory* for New England lists about 200 environmental and conservation nonprofits in the six-state region, and it covers almost all of the well-known groups.

Although no comprehensive census has been done, we do know that there are:

- Over 1,200 land trusts;
- Over 2,000 water-related groups;
- 1,450 nature centers;
- Hundreds of chapters of national and regional groups, such as Sierra Club, Audubon Society, Izaak Walton League, and so forth;
- More than 200 environmental justice groups;
- Thousands of small neighborhood and community groups devoted to environmental improvement;
- Hundreds of animal rescue and rehabilitation groups;
- 90 aquariums; and
- Over 1,000 student groups on college campuses.

The list can go on to include church projects, garden clubs, scout troops, rail-to-trails organizations, summer camps, museums, and more.

The structure of staffed nonprofit organizations, wherever they are, is remarkably similar. Usually, there is an executive director who manages the organization, as well as an administrative assistant. In many cases, that's the whole staff. Larger organizations will also have a fundraising and membership department, program staff for major activities, finance and accounting personnel, education and communications people, lobbyists and attorneys, a volunteer coordinator, and project coordinators for grant-funded initiatives. Core staff are supplemented by interns and volunteers.

The largest environmental nonprofit group is certainly The Nature Conservancy, which employs over 2,500 people all over the world, as well as many seasonal employees and interns. Most groups are considerably smaller.

Thirty of the better-known groups in the nonprofit world include: American Farmland Trust, American Forests, American Lung Association, American Rivers, Appalachian Mountain Club, Audubon Society, Clean Water Action, Conservation Foundation, Defenders of Wildlife, Earth Island Institute, EcoFrustr, Environmental Defense Fund, Friends of the Earth, Greenpeace, Izaak Walton League, Land Trust Alliance, League of Conservation Voters, National Parks and Conservation Association, National Wildlife Federation, Natural Resources Defense Council, Public Citizen, Public Interest Research



Analysing air, water, and soil samples is an essential part of environmental protection work.

Group, Rails to Trails Conservancy, Resources for the Future, Sierra Club, Trust for Public Land, Wilderness Society, World Resources Institute, World Wildlife Fund, and Worldwatch Institute.

Taken together, these thirty influential groups employ perhaps 4,000 people, probably less. The Environmental Defense Fund (EDF), for instance, is one of the best-known environmental groups in the world. The paid staff at EDF numbers 160 people, and it is a big environmental group. It's not surprising that full-time staff positions at well-known environmental nonprofits are among the most competitive of all environmental career offerings.

The environmental nonprofit world is headquartered in a few major cities. Certainly, Washington, D.C., is the geographic center of nonprofit environmentalism. Many of the groups above have a heavy concentration of staff people in the nation's capital, as well as its Maryland and Virginia suburbs. New York City, Boston, San Francisco, Chicago, Denver, and Seattle are also popular centers for large nonprofits.

Nonprofit work in the late 1990s has a few consistent trends. First, management standards have increased. Boards are demanding that directors and managers have (or get) strong management and leadership skills. Passion and commitment are not enough. Second, revenue-generating ability is crucial. A lot of people can come up with good ideas, but fewer can make them pay

through fee-for-service programs, membership, sales of supporting goods and materials, and fundraising. Those who can are in demand. Third, nonprofits are learning to work together. Funders (and the public) are asking that nonprofit managers learn to form effective alliances and collaborations. Fifth, nonprofit environmental groups are learning to diversify, creating an environmental movement that appeals to all Americans, regardless of class, race, and ethnicity. Finally, environmentalism is returning to the grassroots with the understanding that a concerned, involved, informed, and politically savvy citizenry is essential for environmental success.

ACADEMIA

There are more than 2,400 four-year colleges and over 1,400 two-year colleges in the United States. Almost all of them have programs that help prepare people for environmental and conservation fields, from basic biology, earth science, chemistry, and geography programs to the best-known graduate schools, such as the University of Michigan's School of Natural Resources.

The story of environmental employment at colleges, universities, and research institutes is a confusing one. On the one hand, environmental majors at the undergraduate level are extremely popular. Dozens of interdisciplinary environmental studies and environmental science degree programs have been created in the last few years, many of them in response to student demand as much as educational need. Within disciplines such as biology, chemistry, geography, earth science, political science, toxicology, and engineering, "environmental" foci are popular selections. In professional schools for journalism, law, and policy, the environmental track is a desirable one. Finally, large numbers of environmental technology (technician) programs have sprung up at community colleges and vocational schools.

Does all of this mean a booming market for full professors throughout the nation? Well, yes and no. Certainly, total employment is steady or rising. But, as everyone knows who has attended college recently, full professors remain a small core group, even at successful programs. The academic workforce is also made up of graduate assistants, part-time instructors, lecturers, and other non-permanent positions. Landing a tenure track professorship in the environmental professions remains a fairly difficult task.

One might also think that environmental research grants to academics would be up substantially, fueling an increase in academic work at the scientific level. And research in some areas is up. Nonetheless, government funding for environmental research (still the overwhelming source of most research money) is erratic and subject to fads and political pressure. Many research workers report nomadic careers and constant grant writing. People pursuing a Ph.D. in environmental and conservation work with the idea of an academic or research career should plan carefully and develop skills in attracting funds to support their work.

DISCIPLINES IN DEMAND—THE MOST POPULAR ENVIRONMENTAL CAREERS

As we enter the 21st century, who is getting hired? What types of professionals are most in demand by environmental employers? The answers to these questions depend on which definition one uses for "in demand." People from some fields are "in demand" because of the sheer number of individuals employed in those fields, even if current growth rates are not high. Other fields may be growing rapidly but from a small base. Finally, a few fields are just starting to show up, but future growth will be needed soon. The descriptions that follow include a combination of all three definitions.

POLLUTION PREVENTION (P2) SPECIALISTS

Most pollution prevention (P2) work is done by engineers, chemists, and other scientists, but people from almost any profession can identify ways to reduce, reuse, and recycle. In addition, some of the most effective pollution prevention is achieved through education and training; that is, helping professionals understand what might be done in their industry through simple changes. To get a sense of the broad range of work being done by pollution prevention professionals, check out the National Pollution Prevention Roundtable's website at <http://es.inel.gov/nppr>. For information about education for P2, contact the National Pollution Prevention Center for Higher Education or visit their website at www.umich.edu/~nppcpub/.

GEOGRAPHIC INFORMATION SYSTEMS AND OTHER COMPUTER SPECIALISTS

The environmental community lives on data, especially data that can be shown visually and interactively by computer systems that demonstrate interaction between human activities and ecological systems. Geographic information systems (GIS) specialists are in demand at planning agencies, consulting firms, research centers, and throughout private industry. GIS, of course, relies on the existence of good data in the first place, which creates employment for sampling professionals and new technological developments in monitoring equipment and remote sensing from satellites. Finally, traditional database and information systems managers are also in demand. For more information about GIS careers and educational opportunities, visit <http://ulysses.unl.edu/calmit/gisr.html>, which links to dozens of other related sites.

ENVIRONMENTAL COMMUNICATORS AND EDUCATORS

In recent years, the nation has seen a noticeable shift in environmental problem solving, away from a preference for secrecy, adversarial relationships, and litigation, and toward greater openness and a search for common ground.

Regulators depend on education as much as they do on enforcement. Non-profit leaders meet with corporate executives. "Right-to-know" laws require polluters to make available information that would have been carefully guarded just a few years ago. And institutions of all stripes seek to influence the hearts and minds of the general public.

The freer flow of information, and the desire for more voluntary actions, creates opportunities for communicators and educators who can help translate scientific and technical issues for the general public, and for those who can create venues (e.g., meetings, conferences, public hearings, and community gatherings) for an open exchange of opinions. Progressive land developers, for instance, now engage local governments and community residents in open dialogue long before approaching formal boards for permit approvals.

Simultaneously, the rapid growth in environmental information creates a pressing need for professionals to stay up-to-date. Continuing education is critical for success, and this has created opportunities for educators who provide rapidly changing seminars, workshops, short courses, safety trainings, and other learning opportunities.

ENGINEERING SPECIALTIES

Engineers of all kinds are at the center of the environmental careers world. Process and chemical engineers with industry-specific knowledge will be particularly in demand for pollution prevention projects. Consulting in this field is on the rise. Agricultural engineering is another rising position, and one that is tackling one of our most intractable environmental problems—raising food sustainably for six billion people (and growing). Environmental engineers with training in multimedia approaches to environmental concerns are certainly needed.

International work holds immense possibilities for environmentally related engineers of the future as less advanced countries spend billions to improve the basic water, wastewater, and pollution control infrastructure that wealthier nations have already constructed. Finally, engineers will have interesting challenges taking apart some of the engineering "solutions" of the past. See chapter 4 for information on how the Army Corps of Engineers is working to dismantle the dikes, levees, dams, and braces on the Napa River, allowing it to run free for flood control purposes. Aspiring engineers can start with information from the American Academy of Environmental Engineers (www.enviro-engrs.org), the American Institute of Chemical Engineers (www.aiche.org), and the American Society of Agricultural Engineers (www.asac.org).

ENVIRONMENTAL CHEMISTS

Chemists are found at every level of environmental work and in all parts of the economy. Education in chemistry remains one of the best baseline scientific backgrounds for an environmental professional career, including nonscientific

ones. Chemistry training is particularly crucial in the environmental protection and waste management fields (e.g., water, air, solid waste, and hazardous waste, chapters 6, 7, 8, and 9, respectively). Chemists are found in the lab, on the remediation site, at treatment facilities, in the classroom, and on corporate and government regulatory compliance staffs. Finally, experiments in chemistry will bring us new, nontoxic chemicals that can be incorporated by engineers into pollution prevention strategies. If you are interested, you can get more information from the American Chemical Society (www.acs.org) or university chemistry departments.

FUNDRAISING PROFESSIONALS

If there is one constant in the nonprofit world, it is the need to raise funds. In fact, development directors are often among the best paid, and most sought after, professionals in nonprofit environmental work. Fundraising directors write grant requests, develop relationships with foundation and corporate donors, manage membership campaigns, pursue major donors, and carry out appeals and special events. Organizational communications involving newsletters, websites, public education, and marketing often fall in the development department as well. The National Society of Fund Raising Executives (www.nsfre.org) can help you get started.

The private sector corollary to fundraising professionals are “rainmakers”—professionals who can attract business to consulting firms and other environmental industry firms. If you can generate revenue, you will be in demand.

PLANNERS

Environmental management is looking for greater levels of integration. That's what “place-based” approaches, multimedia management, watershed planning, ecosystems management, and sustainable development are all about. Moreover, environmental problems call for a greater number of people whose professional background prepares them to combine human needs and ecological realities for the advancement of both within a framework of political and financial reality at the local level. Well-educated planners bring exactly this set of skills to the table, not only for jobs formally called “planner,” but for a wide range of opportunities. Get in touch with the American Planning Association (www.planning.org) to learn more.

ENVIRONMENTAL TECHNICIANS

Environmental technicians are an immense part of the environmental career world, although they may go under different names. Technicians collect air, water, and soil samples. They carry out botanical and wildlife inventories. Technicians do the basic work at water and wastewater treatment plants, as well

at treatment, storage, and disposal sites. There are thousands of forestry, biological, range management, and remediation technicians.

The vast majority of technicians have undergraduate training. One of the themes of environmental employment over the last ten years has been a noticeable rise in the number of environmental degree programs at community college and vocational schools. As environmental work has matured, many employers have come to realize that a talented person with an associate's degree, trained in the latest technologies and regulations, can effectively do work that was once reserved for people with undergraduate degrees. Job-oriented students have also realized that a two-year degree might be a more cost-effective way to enter the environmental professions.

Finally, if it's true that many people become environmental professionals to work outdoors, technician work is a great place to start. It's often true that the technicians are the ones out in the fields, streams, and work sites, while other professionals are back in the office.

TEACHERS

The nation needs a new generation of teachers. Shortages in many school districts are already a serious problem, and a large wave of retirees is about to make it worse. From our point of view, all teachers are prospective environmental educators. Talented educators use math, science, literature, theater, art, languages, government, and history to open the eyes of students to the natural world and environmental issues. Someone has probably figured out a way to use driver's education and gym class as well. And yet fewer people are entering the field. The arguments against teaching are well known—low pay, hard working conditions, considerable responsibility, and no guarantee of respect from your peers, to name a few. However, don't let this dissuade you. If you think that teaching is for you, go for it! You will find a world of opportunity. See chapter 5 for a wealth of resources on education careers.

CONSERVATION BIOLOGISTS

Environmental employment in biology has moved away from “single species” biologists to more broadly ecological scientists who study whole ecosystems. Within the ecosystems management approach, the field of conservation biology has emerged as a demand field. As the name implies, conservation biology focuses on conservation and protection of plants, fish, and wildlife. The rapid pace of species extinction, the need for practical ways to enforce the Endangered Species Act, and the general awareness that biological understanding does not lead automatically to workable conservation strategies has moved conservation biology into the spotlight. On a pure science front, many conservation biologists work in the field of population genetics, which is crucial to our understanding of extinction. Good places to learn more include universities that offer conservation biology specializations (including Minnesota,

Michigan, Maryland, Penn State, and Clemson) and associations such as the Ecological Society of America (www.sdsc.edu/~esa/esa.htm), the American Institute of Biological Sciences (www.aibs.org), and the Society for Conservation Biology (www.scb.org).

ENTREPRENEURS AND BUSINESS MANAGERS

Paul Hawken, in his influential book *The Ecology of Commerce*, makes a powerful case that the transformation of business into an inherently sustainable enterprise is perhaps the crucial task of our generation. This points to the need for a new kind of manager within business and for entrepreneurs who will start businesses that advance sustainability. On the first front, the rapid growth of environmental coursework within most of the leading M.B.A. schools is cause for hope. On the second, Gary Hirshberg, founder and president of Stony Brook Farms (known best for their yogurts) is an example. Hirshberg left the environmental nonprofit world to start his own company and demonstrate by example that the ideas he advocated could succeed in the "real world." The company has been an outstanding success. For regular examples of stories like this, check out *In Business: The Magazine for Environmental Entrepreneurship* (J.G. Press, 419 Stale Avenue, Emmaus, PA, 18049, 610-967-4135). To learn more about environmental business management at the Fortune 500 level, contact the Management Institute for Environment and Business (www.wri.org/meb/).

DUAL TRACK ENVIRONMENTAL MANAGERS

Integration of different fields—science, engineering, politics, law, information technology, project management, business administration, marketing, communications, and economics—is at the heart of the emerging environmental professions. Among the most popular careers are hybrids that combine two or more professional tracks. The Masters of Environmental Management program at Duke University's Nicholas School for the Environment is an example of an interdisciplinary program that weaves together different tracks to educate the environmental managers of tomorrow. Demand is also high for people who combine two traditional degrees. Engineers with an M.B.A., or scientists with a master's in public administration are two good examples.

These are just a few of the popular career fields in environmental and conservation work. There are many, many more. Let your own skills, talents, and dreams guide you.

2 Education and Internships for Your Environmental Career

LET'S SAY you are a college freshman with an interest in wildlife, or a career changer returning to school to pursue a watershed protection career. You're likely to ask, "What kind of degree should I get?" It's a commonsense question. After all, education is an expensive proposition in time and money, and you want to be sure that it leads to the right job for you.

While some careers (such as law, medicine, and accounting) have clear educational paths, the requirements necessary to pursue environmental careers are less clear cut. There are many educational paths to a satisfying environmental job. A quick review of undergraduate majors held by professionals at the U.S. Environmental Protection Agency reads like a college catalog in that almost every field in the humanities, social sciences, business, natural sciences, engineering, and the professions is included. In addition, environmental agencies are full of people who are doing work completely unrelated to their original college degree.

While it can be liberating to hear about a Spanish major who is now the director of a land trust, it doesn't help one decide which classes to take, which specialties to select, and which skills are most in demand. For, while it is true that the environmental career world remains remarkably open to a variety of academic disciplines, it's also true that there are more people with specialized education, advanced degrees, and experience competing for jobs. This reality increases the importance of making good choices.

To make things even more difficult, you are entering the environmental professions during an era of rapid and sweeping change, as chapter 1 indicated. It's easier to plan your education when you can predict that the future will be pretty much the same as the past, or at least that today's employment trend will continue long enough for you to spend four to six years preparing for it. The

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Library, UCal, Berkeley, CA 94720. [Http://www.lib.berkeley.edu/ENVI/citydir.html](http://www.lib.berkeley.edu/ENVI/citydir.html).
Urban Land Institute. A nonprofit organization that works toward improving land-use and real estate development. Publishes *Urban Land* magazine and maintains *Land Use Digest*, an online periodical. 1025 Thomas Jefferson St., Suite 500W, Washington, DC 20007. (202) 624-7000. [Http://www.uli.org](http://www.uli.org).

5 Environmental Education and Communication

AT A GLANCE

Employment:

Over 300,000 environmental educators and communicators nationwide (includes K-12 and college teachers)

Demand:

5 percent annual growth from 1997 to 2007

Breakdown:

Public sector, 60 percent

Private sector, 15 percent

Nonprofit sector, 25 percent

Key Job Titles:

Camp counselor

College professor

Communication specialist

Community affairs manager

Community relations specialist

Corporate trainer

Environmental advocate

Environmental education specialist

Environmental journalist

Internal communications specialist

Interpretive naturalist

Media relations specialist

Museum educational staff member

Nature writer

Outdoor trip leader
 Photographer
 Public information specialist
 Regulatory affairs coordinator
 Right-to-know coordinators
 Science teacher
 Teacher in-service trainer
 Videographer

Influential Organizations:

Council for Environmental Education
 Environmental Protection Agency, Office of Environmental Education
 National Association for Interpretation
 North American Association of Environmental Education
 Society of Environmental Journalists

Salary:

Entry-level salaries average \$18,000 to \$25,000 and sometimes lower. Salaries for experienced personnel fall into the \$28,000 to \$45,000 range. Upper-end salaries are in the \$60,000 to \$75,000 range, with some fields paying lower and some higher. Keep in mind, however, that the field also runs on thousands of relatively low-paid seasonal workers, volunteers, and interns.

WHAT IS ENVIRONMENTAL EDUCATION AND COMMUNICATION?

A naturalist explains the effects of wildfire on the ecosystem of Acadia National Park. A reporter writes an article about toxic contamination of local groundwater. A sixth grade biology teacher measures soil moisture with students and puts the data on the World Wide Web. A college professor prepares for a class on forest hydrology. All of these activities are examples of environmental education.

We live in an age of information, communication, and education. The sheer number of schools (110,000), colleges (2,400), community colleges (1,400), nature centers (1,450), training programs, parks, wildlife refuges, newspapers, and magazines that do *some* environmentally related work assures that the field of environmental education and communication will continue to be important.

The Environmental Communication Resource Center at Northern Arizona University defines environmental communication as the "communication of environmental messages to audiences by all means and through all channels . . . and is achieved through effective message delivery, interactive listening, and public discussion and debate." Teaching people how to think critically and creatively to solve environmental problems is the common goal of all environmental education (EE) programs. Essentially, environmental communicators and educators provide their audiences with the knowledge and skills to look at

an environmental issue critically and make informed, balanced decisions about the environment that result in taking responsible actions. This requires an interdisciplinary approach that makes connections between environmental issues and the associated social, economic, political, scientific, and technological concerns.

In this chapter, environmental education is defined as including the following:

- Classroom teaching in the schools at all levels.
- Education at museums, zoos, nature centers, parks, and aquaria.
- Print, broadcast, and electronic environmental journalism.
- Public information efforts by corporate and government organizations.
- Education for advocacy.

Although environmental educators work in a wide range of settings, they all share one objective—to help people appreciate and understand the natural world around them.

HISTORY AND BACKGROUND

In the early 1800s, the United States was still overwhelmingly a rural culture, and "environmental education" was the learning one received from agriculture, hunting, fishing, and other daily activities. Already, however, urban areas were growing dramatically, and writers and naturalists such as Henry David Thoreau perceived the need for an education that would incorporate an understanding of nature and raise awareness of ecological degradation. In 1864, with the publication of George Perkins Marsh's *Man and Nature*, people began to realize that human activities could do irreversible damage to the Earth.

By 1891, Cornell University was encouraging schools to teach nature study as part of the core curriculum. Early conservation groups, such as the Sierra Club, formed and undertook education projects among their first tasks. Visitors to newly formed national parks sought some form of "interpretation" for both education and entertainment.

The modern era of environmentalism is often traced to the publication of Rachel Carson's *Silent Spring* in 1962. The various professions trace their emergence as a definable career to different points in time, but all within the last 40 years. Tim Merriman, executive director of the National Association for Interpretation, says that Freeman Tilden's book, *Interpreting Our Heritage*, "really made the identity of the field [of interpretation] more definite." Environmental journalism became an established field in the late 1960s and early 1970s as many newspapers established environmental beats. Environmental education, according to the Presidential Council for Sustainable Development's *Public Linkage, Dialogue and Education Task Force Report* (1997), "dates back at least to the 1972 Stockholm conference on the environment. Two subsequent United Nations' conferences defined the new field."

USE OF VOLUNTEERS, INTERNS, AND SEASONAL WORKERS

Here's an interesting statistic. Tim Merriman of the National Association for Interpretation reports that there are over 10,000 full-time interpreters in the United States, and there are more than 250,000 docents active at parks, museums, nature centers, zoos, and aquariums. Most of these are volunteers or hourly, part-time workers. A look through the help wanted ads in *Earth Work* magazine shows the same pattern—many environmental education jobs are available. Most of them are seasonal or intern-level positions.

CABLE TELEVISION AND THE ENVIRONMENT

The number of cable networks continues to expand, and this is good news for environmental educators who create videos and television programs. There is even a whole network dedicated to animals. Although the field is extremely competitive, there are more opportunities here than ever before. You may find environmental and "nature" programming coupled with general science education on television.

CONTINUING CHANGES IN DEMOGRAPHICS

If you aren't familiar with the term *environmental justice*, start familiarizing yourself with it. *Environmental justice* refers to equal protection from environmental hazards for all people regardless of age, ethnicity, gender, social class, or race and came about to address the inequitable distribution of environmental risks to low-income neighborhoods and communities of color. The need to structure education in a way that reaches a diverse audience is a pressing issue for all formal and nonformal education and communication. According to *Education for Sustainability: An Agenda for Action*, classrooms and society in general are increasingly more diverse racially, culturally, and linguistically. Environmental communicators and educators will need to have skills in conflict resolution, intercultural communication, languages, and teaching approaches that are sensitive to cultural values and practices. This points to the need for the development of curricula that is relevant to multicultural audiences and for teacher training so that these ideas can be passed on to students. More obviously, the field needs greater diversity among practitioners. Hispanic, African, Native, and Asian Americans with environmental training are in demand.

ADVOCACY OR EDUCATION?

Rows of school children watch a video about old-growth forests in the Pacific Northwest. Later, the class talks about issues such as habitat destruction, forest practices, endangered species, and the ethics of cutting the last remnants of our ancient forests. Environmental education, right? Suppose you found out later that the video was produced and paid for by Weyerhaeuser Company, the large forest products company? Or, conversely, the teacher ordered it from the Sierra

A dramatic increase in environmental education careers can be traced to the first Earth Day and the first Environmental Education Act in 1970. Earth Day itself was a massive "teach-in," bringing information about pollution and its effects to hundreds of thousands and spotlighting the low level of environmental literacy in our nation. A survey in that year by the National Education Association showed that 78 percent of surveyed teachers felt there was a lack of curriculum for environmental education.

Other important events in the 1970s were the United Nations conferences on the environment: the 1972 Conference on the Human Environment in Stockholm; the Belgrade Conference in 1975, which defined the goal of environmental education; and the Tbilisi conference in 1978, which built on the Belgrade charter and laid out five objectives for environmental education—awareness, knowledge, attitudes, skills, and participation. The issues raised at these conferences provided a framework for the field.

In 1990, Congress passed a new Environmental Education Act designed to coordinate educational efforts at federal, state, and local levels, as well as to promote the exchange of information and publicize model programs to encourage their emulation around the country. Also in the 1990s, the *Brundtland Commission Report* and *Agenda 21* of the United Nations Conference on Environment and Development (UNCED) laid the groundwork for moving environmental education into the 21st century. Those who want to make a difference through environmental education should become familiar with the issues raised during all of the above-mentioned conferences.

ISSUES AND TRENDS

The following sections discuss broad issues that affect employment of environmental educators and communicators.

INTEGRATING ENVIRONMENTAL LEARNING INTO K-12 CURRICULUM

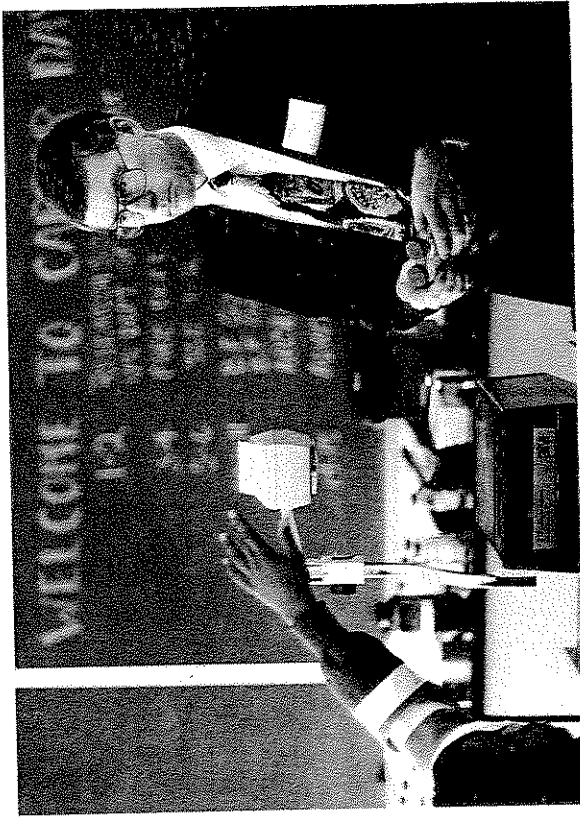
Environmental content in the schools is increasing. It may not be happening as quickly as we would like, or as uniformly, but the general trend is upward. More children are doing projects about energy conservation, destruction of the rain forest, water pollution, recycling, and global climate change. Environmental learning is spread throughout the curriculum, although science class remains the most likely place for learning about how natural systems work and how human activities affect them. That's the good news. The growth of environmental learning, however, does not necessarily translate into increased employment of "environmental educators." Instead, more generally trained teachers are looking for help in the form of nature centers and museums that offer field trips, curriculum guides, materials that can be incorporated into class activities, videos that summarize important issues, and continuing education seminars to help "teach the teachers." Persistent financial pressures on school districts contribute to the problem. Creativity and inexpensive purchases, not a wave of new hiring, are the preferred answers for most schools.

Club. It's pretty clear that either side would produce "education" with a decided point of view.

There is a concerted effort by environmental education groups such as the North American Association for Environmental Education (NAAEE) to set standards by which EE materials can be developed and evaluated. The goal is to present unbiased, factual information based on scientific evidence, and to include all perspectives where there are different scientific explanations and opinions. The common refrain of EE programs is that they endeavor to teach children *how* to think rather than *what* to think, thereby giving them critical thinking skills that enhance performance in all subject areas. Good EE programs should explore social, political, and economic aspects, in *addition* to the scientific aspects, of environmental problems and solutions.

Lea Parker, assistant professor of environmental communication and journalism at Northern Arizona University says: "Rather than alarmist types of communication, the trend is to inform people of how they can make a difference in working toward environmental sustainability in their respective communities." This indicates a need for skilled education and communication professionals who can completely integrate everything from scientific studies to propaganda, and deliver a concise, complete message about the environmental implications of our way of life to millions of people.

Calls for objectivity have not solved the problem. Many educators continue



Students at Garrett Morgan School of Science in Cleveland ask questions of an environmental professional at career day.

to believe that a major goal of environmental education must be to rouse the public to political and personal action. This is a source of endless controversy in the field.

BABY BOOM ECHO

The "baby boom echo" is a tidal wave of teenagers flooding our nation's high schools. Their parents are baby boomers who set the school enrollment record in 1971. In 1996, that record was broken. The last ten years saw a sharp rise at the elementary level, however, in 1997 that pattern shifted to secondary schools. According to the 1997 *Back to School* report by U.S. Secretary of Education Richard W. Riley, "unlike the previous baby boom (1947-1961) there will be no sharp decline in enrollments" after this boom; rather the student population will level out at a much higher number.

The baby boom echo will also affect higher education in the coming years as the number of full-time college students in the next ten years (1997-2007) is projected to increase by 21 percent. Riley's report says that: "While the number of elementary school teachers is expected to increase 5 percent between 1997 and 2007 . . . the number of secondary school teachers is projected to increase by 14 percent." The report goes on to say that in New York City public schools, for example, there is a shortage of state-certified science teachers. A 1996 survey by Recruiting New Teachers, Inc., reported that 69 percent of urban school districts reported an immediate need for science teachers.

THE REVOLUTIONARY IMPACT OF COMPUTERS AND THE INTERNET

Take a minute to do an on-line search for information on wetlands loss. Within seconds, you will have more information available to you than the most diligent graduate student could have gathered ten years ago. Moreover, you are now instantly linked with scholars, activists, companies, government agencies, journalists, and educators from around the world. You can ask questions, locate the best sources of information, review raw data, and view sophisticated maps prepared by the world's most advanced geographic information specialists. This is all in a day's work for you . . . a high school senior.

The personal computer and high-speed communications have changed the pace and face of education *and* communication. In the next few years the TV, computer, and telephone will become one instrument and the primary source of information. A 1997 survey by Nielsen Media Research reports that about 37 million people in the U.S. and Canada have Internet access. *Education for Sustainability: An Agenda for Action* reports that: "Computer-aided environmental education that takes advantage of new interactive multimedia approaches will grow dramatically in the coming decade."

In 1993, approximately 25 percent of U.S. schools had modems. One year later 64 percent had them, including 77 percent of all high schools. From 1987 to 1997 the number of computers in schools grew from one computer for every 125 children to one for every 12 children.

being seen as more important, especially in major urban areas. Another reason for decreased coverage is perhaps a sense that the environment is getting better and we have to worry less about it. Izakson says: "We've addressed some of the worst pollution problems. Rivers don't catch fire anymore. L.A.'s air quality is the best it's been in twenty or thirty years . . . [but] it doesn't seem to me that the issues are lessening. . . . We are in a serious state with our fisheries on the east and west coasts. We've got some real problems, and mostly people don't know about it."

Environmental journalists are being asked to deal with ever-evolving complexity at a time when the trend in news communication is to simplify. But many of the complex and interrelated problems plaguing our planet cannot be adequately explained in a newspaper article or a two-minute segment on the evening news. Izakson and other environmental journalists agree that you have to be creative in finding the time and space to more fully report the complexities of environmental issues. You have to be able to make a compelling argument to an editor to get space to write about environmental issues, and you must be willing to work on those stories in addition to assigned stories.

Despite the decline of environmental journalism in the 1990s most environmental journalists feel that the outlook for future employment is good. In *SEJournal's* 1997 summer issue, Chris Bowman interviews Peter Bhatia, managing editor of the Portland *Oregonian*, with no less than seven environment beat reporters. Bhatia says: "The children who grew up with Earth Day and recycling are going to be caring adults, wanting to know about the world in which they live. The environmental ethic (of youth) is going to produce an appetite for reporting that explains things for them."

RAPID GROWTH IN COLLEGE ENVIRONMENTAL PROGRAMS

Environmental studies programs across the country are experiencing significant growth demand. Classes that a few years ago drew a handful of students are now oversubscribed. Bob Robitaille, director of programs at the Environmental Careers Organization says: "On the university level we're seeing an explosion of interest by undergraduates in the environment. Environmental studies programs are busting at the seams. It's one of the fastest growth areas in American academia—so fast that it's creating problems." Colleges and community colleges are responding by improving environmental courses in traditional disciplines and creating majors in environmental journalism, environmental communications, and environmental education. This, along with the impending increase in general enrollment, suggests that colleges and community colleges will hire additional faculty members in the near term. Dartmouth's Robert Braile says that, "interdisciplinary education, which has always been the hallmark of environmental studies programs, is in a sense becoming a kind of expertise. It's making the generalist an expert. . . . We're producing people who can think across many disciplines. I think that's needed."

A whole chapter could be written about how the World Wide Web and the growth of educational CD-ROMs is changing environmental education. For a look at what's happening, read the Case Study toward the end of this chapter.

Robert Braile, an environmental correspondent for the *Boston Globe* who teaches environmental writing at Dartmouth College, says that technology has "radically changed the way journalism is done, from the speed with which a story is produced to the range and depth of that story. It's easier to get expert opinion, for one thing. Some would argue that technology has made things too fast, especially when it comes to environmental journalism. It's more complex than general reporting. Sometimes it just takes time to write."

Another trend in high-tech journalism is the growth of "websites," magazines that are published (sometimes exclusively) on the World Wide Web. Those that are the on-line companion to print magazines often have an entirely different content. Writing for the Web requires an additional set of skills, as the language is more informal than print journalism, and employs sidebars, photos, humor, and "hot-links" to other sources. David Tencenbaum, feature writer at *The Why Files*, a biweekly electronic science magazine, and freelance and science correspondent for ABCNEWS.com, says: "To write on the Web, you must keep up with the market—study what else is being done out there. Also, humor is a hallmark of writing on the Web."

Keep in mind that the information on the Internet doesn't get there by magic. People with expertise in website design and management are in demand.

THE SQUEEZE ON ENVIRONMENTAL JOURNALISM

There is a general public awareness that we have immense problems with our planet and atmosphere. However, the 1990s has actually seen a drop in the amount of coverage and a narrow range of coverage in most mass media. A study by the Center for Media and Public Affairs found that the percentage of environmental stories on network evening broadcasts dropped from 2.74 percent in 1990 to 0.86 percent in 1996.

The University of Michigan Environmental Journalism Program conducted a survey in 1996 of 506 environmental journalists representing all media. The survey found that a majority of TV, newspaper, and newsletter writers said that they spent less time reporting about the environment in 1996 than they had in the previous year. A "lack of resources" was cited as the most serious problem facing environmental journalists by 38 percent of those surveyed. Other "major" problems cited were lack of time, low salaries, lack of space, and lack of interest by editors. Only one-third of journalists surveyed said they spent more than 75 percent of their time on their beat.

Orna Izakson, environment beat reporter for the *Bangor Daily News* (see the Profiles section toward the end of this chapter) says part of the problem is that editors who don't have an interest in or understand environmental issues tend not to give them air-time unless pushed to do so. Issues such as crime are

REGULATORS AS EDUCATORS

We've seen that environmental regulation is moving away from "command and control" to less adversarial "partnerships" with regulated businesses and the general public. In addition, businesses are working harder to communicate with (and listen to) the public about environmental concerns. This creates opportunities for "environmental communicators" in every sector.

CAREER OPPORTUNITIES

As we have seen, environmental educators and communicators are at work in every part of the environmental community. Each sector, however, requires somewhat different kinds of people and skills.

PUBLIC SECTOR

Environmental education in the public sector ranges from working as a park interpretive ranger at Yellowstone, to directing environmental education programs for state and local agencies, to teaching at a local school.

Federal Government. The U.S. Department of the Interior, with its many agencies, including the National Park Service, the U.S. Fish and Wildlife Service, and the Bureau of Land Management, is one of the largest employers of environmental educators. For many people, in fact, pursuing a career in environmental education is synonymous with becoming an interpretive naturalist at a national park.

If you are one of these people, be aware that these jobs are among the most sought after positions in the environmental field, despite low pay, poor housing conditions, and limited career paths. Literally thousands of people compete for a handful of positions at the major parks, and some work for years as seasonal or volunteer workers without becoming permanent employees. EE programs are conducted on nearly all of the 191 refuges administered by the U.S. Fish and Wildlife Service. These positions are less competitive but still attract large numbers of applicants. However, if you are not dissuaded by this litany, the Advice section later in this chapter will help.

Competition at agencies that more recently began incorporating environmental recreation and education into their agendas is less daunting. These include the Bureau of Land Management (BLM) and the USDA Forest Service (USFS).

The BLM conducts an environmental education program called Wonderful Outdoor World (WOW), which provides neighborhood-based urban camping experiences for inner city youth. BLM also has a website that lists EE and volunteer programs (<http://www.blm.gov/education/education.html>). The USFS developed a program called Natural Resource Conservation Education, which provides structured educational experiences and activities that are tar-

geted to age groups and populations and that enable people to realize how natural resources and ecosystems affect each other and how resources can be used wisely. These agencies employ professionals to develop and implement these programs.

Other possibilities are the Environmental Protection Agency's Office of Environmental Education, which offers positions for curriculum developers, trainers, and similar educators; the Department of Energy, with its many laboratories; and the Department of Defense; and the U.S. Geological Survey.

State Government. State governments are a rising star in the environmental education profession. Almost every state has a full-time or part-time environmental education specialist position. States play a key role in setting and reviewing curriculum requirements for local schools, creating funding priorities, running grant programs, training teachers, and implementing federal programs and policies. State departments of education are often the focal point for preparation and implementation of environmental education plans under the Environmental Education Act. In addition, each state has a collection of environmental and conservation agencies with growing needs for the skills of educators and communicators. These agencies include departments of fish and wildlife, forestry, environmental protection, natural resources, parks and recreation, cooperative extension, and public health.

The National Environmental Education Advancement Project (NEEAP, see



Field identification is an important part of a good environmental education.

the Resources section at the end of this chapter) manages a program in partnership with the EPA, the National Wildlife Federation, the North American Association of Environmental Education, and the National Fish and Wildlife Foundation called EE 2000. EE 2000 provides seed funding, leadership training, consulting services, a clearinghouse and a quarterly newsletter to those interested in strengthening state-level EE programs. The idea is to assist states in their efforts to develop "comprehensive" EE programs.

As defined by NEEAP, components of state-level EE programs include: a state EE coordinator and staff; state and regional EE centers; preservice and inservice teacher training; and K-12 curriculum and instruction requirements, among others. Since only four states (Maryland, Minnesota, Pennsylvania, and Wisconsin) have a majority of these components in place and since the plan calls for helping twenty states build comprehensive plans by the year 2000, positions are being created for environmental education specialists in state departments of education.

Local Government. Public schools, from kindergarten to graduate school, hire many times more environmental educators than any other sector. Consider that there are more than 110,000 public and private elementary and secondary schools, more than 2,400 four-year colleges and universities, and more than 1,400 two-year colleges in the United States. All of these schools employ environmental educators. They may be called librarians, science teachers, biology professors, or wastewater certification instructors, but they are all environmental educators.

Career opportunities in teaching vary wildly depending on the economic and population growth of an area. Almost every state in the country has some sort of EE program. Few, however, are comprehensive enough that they attempt to integrate EE into most or all subject areas. States that have a stronger commitment to EE will obviously offer more opportunities than those that have a lesser one. Wisconsin is often cited as having the best teacher-training programs for environmental education nationwide. Other states with good EE teacher-training programs are Florida, Arizona, Colorado, Hawaii, Illinois, Minnesota, Missouri, and North Carolina.

A word about elementary and secondary teaching is in order. Why do it? It requires long trainings, with usually a master's degree for better positions. Pay is relatively low. Budgets are usually tight. Facilities are poor. Success is often frustratingly slow. And yet, in spite of all of this, no single environmental profession needs talented, creative, and enthusiastic people more than teaching. No career will produce higher rewards in personal satisfaction, and none will create a higher environmental quality return on society's investment. If we are truly serious about environmental change, we must start with the education of our children.

At the community college, undergraduate, graduate, and doctoral levels, the prominence of environmental specialties is increasing in schools of science, health, and public policy. There is a growing demand for professors and

instructors in environmental areas, as noted in the Issues and Trends section earlier in this chapter.

In addition to schools, consider other environmental education and communication positions with local government agencies. Solid waste and recycling programs, storm water management agencies, household hazardous waste initiatives, land-use planning agencies, staff offices for elected officials, neighborhood programs, public works departments, water and air pollution agencies, and other local environmental functions have needs for education and communication professionals and their skills. Look particularly for departments that depend on widespread changes in individual behavior, such as curbside recycling efforts. Education and communication efforts in the form of classes, speeches, brochures, community events, school presentations, public meetings, and so forth are usually a large part of these initiatives.

A final arena for environmental educators in local government is the parks and recreation departments. Many cities, towns, and counties operate zoos, museums, summer education programs, arboretums, botanical gardens, large parks, youth camps, cleanup programs, conservation corps efforts, nature centers, and other places where environmental education is the key service. For the aspiring educator, a significant advantage of the local sector is its willingness to accept, train, and use volunteers and interns.

Tim Merriman, executive director of the National Association for Interpretation, says that overall demand for interpreters is growing due to the rapid growth in travel and tourism. "Private tour companies, nonprofit nature centers, and city- or county-based programs are growing the most rapidly," Merriman says. However, he cautions that "there may be fewer line interpretation jobs, but more for docent coordinators" due to the increased usage of volunteer/docent interpreters.

Skills essential to any environmental education position, whether it's in a primary or secondary school, with a private nature center, or with one of the general land management agencies, include: good leadership skills; group interaction skills; the ability to inspire people to action; and the ability to work with diverse populations. A second or even a third language can also enhance your chances of being hired and a dose of equal parts enthusiasm, creativity, and dedication goes a long way toward a successful career.

PRIVATE SECTOR

Private sector jobs in environmental education include community involvement coordinators for private companies, environmental training services, and the environmental media. This is a small but growing area in total employment.

Corporations. Have you received any "environmental education and communication" recently? Your utility company sent you a colorful brochure highlighting ways you can conserve energy and cut your energy bill. The place mat at the fast-food restaurant where you had lunch was covered with the environmental

much of what the public knows about environmental issues is learned through the media, environmental stories, insight, news, and information are needed. However, as mentioned in the Issues and Trends section earlier in the chapter, coverage of environmental issues dropped in the 1990s.

According to the survey of 506 environmental journalists done by Michigan State University's Environmental Journalism Program, the only medium in which journalists say they spend more time on environmental coverage is radio. Forty-one percent of radio journalists surveyed said they spent more time reporting on environmental issues in 1996 than in 1995. Six percent said they spent less.

Environmental book publishing is another field where hiring is taking place. Most major book stores have added entire "nature/environment" sections, and large publishing companies are expanding to create departments specializing in environmental books.

"Video technology is one of the fastest growing and most innovative fields in the job market. It's so new that some research projects might not even know they need someone in this position until you suggest and create it. Research institutes and universities may hire these professionals," according to *100 Jobs in the Environment* (Quintana 1997). This is true of many jobs in this field. Who ever thought there was a need for a live picture of the Earth on the World Wide Web until someone creative came up with the idea?

Beth Parke, executive director of the Society of Environmental Journalists (SEJ), says that environmental magazines, "have not had such a great fate," and in television, "there are very few dedicated environmental reporters, or even science/health/environment reporters, but there are some."

On the upside, however, Parke reports that "specialized newsletters is a strong market center for environmental reporting." She cites such publications as *Environment Daily*, *Oil Spill News*, *Defense Cleanup*, and *Oil Spill Technology* as examples. Parke continues by stating that "the on-line information services seem to be expanding their hiring [and] a number of news organizations have defined a 'growth beat' [population issues] which is extremely environmental in its underpinnings."

Other areas to consider for jobs are universities and research organizations, which, though they are not considered "news organizations," publish a lot of environmentally related material.

NONPROFIT SECTOR

Nonprofit organizations are a major player in the environmental education field, serving as information resources to the media and education resources to the public at large. Almost all nonprofit environmental organizations engage in education, from small neighborhood groups with one staff person to large international organizations such as Greenpeace and the World Wildlife Fund. Both the writers and the publishers of this book, for instance, are nonprofit organizations.

In *The Environmental Career Guide*, Nicholas Basta suggests: "perhaps the

accomplishments of the company. "Printed on Recycled Paper" was prominently noted. The newsweekly you read on the bus carried a two-page ad tout-ing the pollution prevention record of the chemical industry. When you got home, there was a message on your doorknob from the private recycling firm that collects your trash, inviting you to a neighborhood meeting to discuss changes in the system. The notice is signed by the "recycling education staff." Finally, in the evening newspaper, you discover that environmental activists and the area's largest polluter are sitting down together for talks about reducing the use of toxic materials at the firm. The company's representative is referred to as "community involvement coordinator."

"It used to be that environmental communicators worked mostly for government organizations or nonprofits. Increasingly however . . . the corporate world is hiring environmental communicators to communicate issues both internally and externally," says Lea Parker, assistant professor of environmental communication at Northern Arizona University. These professionals generally don't have a technical background and so are better able to understand the information needs of the general public or company employees.

Federal regulation has helped inspire this kind of need. One example is the "community right-to-know" requirement under the Superfund Amendment and Reauthorization Act (SARA). Under right-to-know laws, reams of data about corporations' use of toxic chemicals are available to the public. It is in a firm's best interest to provide some assistance to the public in interpreting these data. Without such help (and sometimes with it), the likely response is fear of the unknown.

Corporations in the oil, chemical, waste management, manufacturing, and other industries are employing a broad range of environmental communicators with training in public relations, media coordination, graphic arts, government relations, environmental journalism, compliance, law, and technical fields.

Advertising agencies who have "green" clients are also in the business of environmental communication, enticing people to purchase products and services that are safer for the environment.

Consulting Firms. As mentioned earlier, many environmental laws require that workers be certified or receive specialized training before they are allowed to work. A growing number of private firms have sprung up to provide this service. These firms hire instructors, trainers, and workshop leaders to deliver educational services to corporations and agencies. Career opportunities in this field may not require a great deal of specialized training. If you are a quick study and have a winning classroom presence, training firms may be willing to help you learn the material you will teach.

Environmental training specialists will also be needed to work directly for companies employing significant numbers of seasonal or temporary workers.

The Media. Print and electronic media outlets such as newspaper, book, magazine, and World Wide Web publishers; television and radio stations; audiotape and videotape production companies; and others make up "the media." Since

most dynamic form of environmental communication occurs at nonprofit organizations. . . . These organizations try to present a compelling message to the public that will help them form opinions on environmental issues and hopefully act on their belief through writing letters, volunteering for the organization, or changing their daily behaviors to make a difference."

Career opportunities in nonprofit organizations for people skilled in education and communication are greatest with groups in which education is the main activity, such as nature centers that offer field trips for schoolchildren, or with large, well-known groups, such as The Nature Conservancy or the National Wildlife Federation. Environmental education may also be incorporated into the job descriptions of lobbyists, program and research staff members, administrators, and fund-raisers. Much of this work is seasonal, depending on the school year or summer vacation activities to provide "customers." Skills in demand include outdoor skills; the ability to teach environmental fieldwork techniques; knowledge of biology, botany, ornithology, and wildlife science; strong oral communication and teaching abilities; and innovative ideas for curriculum design. Schoolteachers seeking summer work, take note!

SALARY

Salaries in this field vary widely depending on which sector you work in and what particular job you do in that sector. In general, however, entry- to mid-level salaries are low and the rewards come from job satisfaction.

Interpreters may be the most poorly paid in the group. Owen Winters at the Natural Sciences for Youth Foundation (see Resources section), reports that some nature centers provide room and board and hire entry-level people for as low as \$12,000 annually. Winters says: "It really puts a lump in my stomach when I see that. We're taking some of our best and most enthusiastic people and just economically abusing them." Nature centers that don't provide room and board pay between \$17,000 and \$20,000, and "probably with no benefits" according to Winters. The mid-level for interpreters is in the range of \$25,000 to \$32,000 annually.

Private school teachers fall just below interpreters on the poorly paid list, starting around \$16,500 and rising to around \$27,500. Public school district salaries are a little higher, with smaller school districts paying less.

Entry-level environmental journalists working for small-town papers start in the mid-teens. This is where the majority of journalism jobs are found. Entry-level journalists at larger, urban daily or weekly newspapers earn about \$23,000 annually. A senior editor earns from \$28,000 to \$45,000. Also, note the following:

- An editor at an environmental newsletter or book publisher can expect to start at between \$18,000 and \$25,000. Five years' experience increases that range to between \$25,000 and \$35,000.

- Aquarium instructors start in the low \$20s. Experienced instructors can earn up to \$30,000.
- A public affairs officer at a nonprofit organization can start as low as \$17,000, but increases quickly to around \$25,000 or more.
- An interpreter at a federal agency starts at around \$20,000. With five years' experience salaries rise to the high \$20s or low \$30s.

In all sectors except the private, administrators and directors are the only ones who can expect predictable salaries higher than \$40,000. Educators, writers, and other communicators in government agencies and nonprofit groups often level off in the \$35,000 to \$40,000 range. Salaries for "environmental" positions with magazines, newspapers, television and radio stations, and other media outlets are so varied that an attempt to characterize them would be meaningless.

A bright spot in the salary picture is the pay of college professors in environmental fields. Depending on their institution and field, it is not unusual to find professors earning \$40,000 to \$75,000, after weathering low-paying positions as graduate assistants and instructors.

Environmental educators and communicators like what they are doing for the world. However, choosing a career in environmental education or communication requires that an individual face squarely the fact that some emotionally rewarding jobs are often poorly compensated. If money is a prime motivator, think carefully before choosing this field, and consider educational opportunities and experiences that will maximize your value in the job market.

GETTING STARTED

Even for people who have known since reading *Ranger Rick* at age six that they would grow up to become environmental educators, getting started takes careful planning.

EDUCATION

Educators and journalists often fall into one of two groups. One group emphasizes scientific and technical knowledge, placing secondary importance on teaching and communications. The other group develops teaching and communication skills first and leaves scientific understanding to graduate school or on-the-job training. Today, however, professional advice seems less polarized, calling for interdisciplinary study that combines significant pieces of both academic worlds. According to the Society of Environmental Journalists (SEJ), covering environmental issues requires sophisticated knowledge about science, law, politics, history, ethics, economics, and international relations and assumes a high level of journalistic skills to explain how all these disciplines come to bear on the environment. Chris Rigel, at SEJ says, "The one thing I keep hearing

over and over is that just getting a journalism degree isn't enough. It's very important to have a strong science background."

Robert Braile goes even further, saying: "I've never been a fan of the undergraduate journalism major. . . . journalism is best learned by doing it. . . . [and] undergraduate journalism majors are seen in the profession as people who are trained to be journalists but don't have anything to write about because they haven't really had any substantive academic experience." As an undergraduate, Braile recommends building journalism experience by writing for student publications or small daily or weekly publications or newsletters, infusing your major with environmental writing, and combining that background with a graduate degree in journalism.

Lea Parker, assistant professor of environmental communication and journalism, sees both science and communications as equally important: "I don't think an environmental communicator can successfully do the job without some background in the sciences. Communication skills needed include critical and analytical reporting, public affairs reporting, and some kind of environmental research and reporting class. Also needed are skills in public relations, interpersonal communication, public speaking and organizational communication."

Jim Detjen, Knight Chair of journalism at Michigan State University's Environmental Journalism Program, weighs in with: "As we move into an increasingly international and increasingly computerized world, I believe it will be vital for journalists to become better educated. I'd like to see more environmental journalists trained in several specialties. A reporter educated in environmental issues and economic theory would be able to provide valuable insights about how business and the environment interact."

It is important to note that many environmental writers who are currently employed do not have formal education in the sciences. But Orna Izakson, environment beat reporter at the *Bangor Daily News*, says that if (like her) you don't have a science background, you should at least have an affinity for biology and chemistry. Izakson says, "the bottom line is that, especially in the beginning, you're not going to be so specialized that any kind of science education will give you all the background you need."

For environmental educators in public and private schools, there will be obvious teacher certification requirements for elementary or secondary opportunities. The vast majority of teachers who consider themselves environmental education specialists have science teaching certifications. *Education for Sustainability: An Agenda for Action* states: "The need for preservice teacher training in environmental curricula can hardly be overemphasized. . . . Most teachers feel that they are not prepared for conveying the broad spectrum of issues and content related to the environment."

For those who wish to pursue a formal degree in environmental education, there are a growing number of college programs of varying quality. In an article titled "Environmental Literacy and the College Curriculum" in the *EPA Journal* (Spring 1995), Richard Wilke says: "While many institutions offer environmentally related minors and majors, they do not require even basic

The key traits of an environmentally literate citizen are: an awareness and appreciation of their natural and built environment; knowledge of natural systems and ecological concepts; understanding of the range of current environmental issues and the ability to use investigative, critical-thinking, and problem-solving skills toward the resolution of environmental issues. This then would encompass the key objectives of environmental education.

—Abby Ruskey, "State Profiles in Environmental Education,"
EPA Journal, Spring 1995

instruction in environmental literacy." The North American Association for Environmental Education is a good resource for more information about the quality of environmental studies programs (see the Resources section at the end of this chapter).

Academic preparation for interpretation careers has become more formalized in the past decade and certification adds another layer of formality. Tim Merriman, executive director of the National Association for Interpretation (NAI), says: "Interpreters with multiple skill sets will have an advantage. If you have a strong background in interpretation or communication, it also helps to have a major in zoology, botany, biology, history, or anthropology." Both the National Park Service and NAI have certification programs, and interpreters who want an advantage should pursue certifications in multiple competencies.

ADVICE

Here is a collection of advice from educators and communications professionals on the keys to entering their fields.

Inspire curiosity. "The most important thing for a nature center educator is to be able to answer the question of a visitor so that you give them enough of an answer and a question back so they want to learn and dig for more. You have to understand how to take that spark of curiosity and fan it into a flame that will last a lifetime." Owen Winters, Natural Science for Youth Foundation

Write for newsletters. "When a student asks me where to start I always suggest specialized newsletters and on-line information services. I think a lot of really great daily newspaper reporters got their start or did some time in specialized venues like that." Beth Parke, executive director, Society of Environmental Journalists.

Use professional associations. "Get involved in your profession early. Students who already belong to their professional association have the advantage to the best jobs, promotions, and more interesting venues. Networking has become

an essential part of any profession. At a national or regional meeting you can sit down and chat with the director of a major program. Building that personal network can add to your ability to achieve your personal goals for success." Tim Merriman, executive director, National Association of Interpretation.

Be clear. "Journalists have to fight for the space and airtime to explain complex but important environmental issues. They need to work to clearly explain complex subjects in understandable and compelling ways." Jim Detjen, Knight Chair of Journalism, Michigan State University's Environmental Journalism Program.

Develop some experience. "Before you graduate, complete internships to make sure this is what you want. You can never have too much experience." Michelle Jansen, interpretive naturalist and intern coordinator, Carpenter St. Croix Valley Nature Center.

SUMMARY

Environmental education and communication professionals have an influence on environmental results that far exceeds the wages and recognition we give them. The ultimate success of the environmental movement depends on an educated and caring citizenry, who have both the ability and the desire to understand the threats and opportunities before us and to act with wisdom in their personal and political lives. Ecological literacy will be crucial to progress in the 21st century.

Environmental education opportunities are everywhere—in the classroom, on television, and in radio; in newspapers, magazines, and books; at conferences and other gatherings; and through the Internet. Job opportunities in environmental education and communications are growing, not only in the form of specific positions, but in the revisioning of science, management, and regulation positions to include education as an integral responsibility.

CASE STUDY

A Case for Global Environmental Education on the World Wide Web

To get an idea of what Web-based environmental education is all about, consider the following two representative scenes:

At a high school in upstate New York, Becky arrives at school and quickly makes her way toward the computer to check her electronic mail in hopes that a university scientist 100 miles away has received her query and can advise her group (which is composed of students at her school and a neighboring high school) in their study of the causes of pollution in their watershed. Upon confirmation of help from the scientist, she sets up an on-line meeting between all the parties involved to discuss the project.

In Germany, two fourth graders meet on a spring morning at the site of selected native trees to take their turn at observing and recording "budburst." After budburst occurs, approximately one month of daily observation data will be entered into a form on the World Wide Web. This information, along with temperature and precipitation data also gathered by students, will be used by scientists to determine a number of things, including how climate affects vegetation patterns.

The advent of email, the Internet, and the World Wide Web (WWW) has rapidly transformed public access to information and communication, allowing students, teachers, and scientists to work collaboratively in ways never before possible. Today many of the world's best minds on any subject are instantly accessible and willing to share their knowledge (<http://www.askanexpert.com>). Scenarios such as those described above are taking place worldwide every day. They are facilitated by a number of Internet-based programs and projects such as Global Rivers Environmental Education Network (GREEN), a watershed education network) and Global Learning and Observations to Benefit the Environment (GLOBE, a network for the study of the global environment). These, and other programs like them, help students reach higher levels of achievement in science and math by "doing science," motivate student interaction, experimentation and collaborative learning, and increase scientific understanding of the Earth. Through these programs, millions of students gain a real-world understanding of their roles in the world ecosystem by studying issues that affect their lives and homes. Most web-based EE programs send students into the natural environment for hands-on investigations of their local environmental problems. The phrase "think globally, act locally" is brought to bear in the very nature of such programs. With this understanding, students are inspired and empowered to take responsibility for the environment. The broader educational benefits of using the Web for environmental education include the following:

- Increased literacy where students become mindful of spelling when trying to search for a topic and where students write to a responsive audience of peers, mentors, and strangers, which makes them more conscious of word choice, grammar, and syntax.
- Environmental literacy where students become informed citizens, gain problem solving skills, and are motivated to take action.
- Computer literacy where citizens are not afraid of computers. Indeed, they wouldn't want to try to get along without one.
- Interdisciplinary learning where students explore the ecological, social, political, and economic aspects of environmental problems.
- Critical thinking learned through weighing and comparing diverse viewpoints, and analyzing and synthesizing the information to construct personal understanding.
- Geographic and cultural diversity.
- The ability to work collaboratively through project-based learning, where different strengths and talents are used and appreciated.
- Respect for thinking "outside the box."

- Skills in fieldwork and application of science concepts.
- Increased interest in science careers.

This is not to say that web-based learning should be used as a substitute for face-to-face collaboration, lectures, textbooks, and field-based learning. Rather, it should be viewed as a tool that enhances these activities with a global perspective, bigger data sets to study, expert advice and answers to problems, geographic and cultural diversity, and much more.

Though computers with WWW access aren't yet as common in schools as the chalk and blackboard, they soon will be. Consider that in 1994 just over 3,000 schools in the United States had access to the Web. In 1998, over 12,000 elementary and secondary schools in 80 countries, including over 8,000 in the United States, not only have access, but have constructed their own websites. However, if web-based EE is to be effective, it must be affordable and accessible to all.

Initiatives are being created all over the country, from the federal down to the grassroots level, to bring adequate phone lines, modems, and computers to public and private K-12 schools, public libraries, and even public housing projects. Why? It's very simple—those who have on-line skills have immense advantages over those who don't. The challenges of a new global economy require schools to graduate a new kind of student, one who can think critically, has experience with problem solving, can communicate in writing to diverse audiences, and has the ability to work collaboratively. Every job mentioned in this book relies on communication and partners for success. Web-based learning is thought to engender all these skills and more. But there is no doubt that computers, and the use of them for worldwide communication on any topic imaginable, are here to stay.

One can access thousands of collaborative environmental education projects by cruising the global information superhighway. However this "superhighway" can feel more like gridlock due to frustration caused by the overwhelming volume of information. In an attempt to answer this problem there are now a number of websites that are designed to provide "one-stop-shopping" for various resources, including EE.

You will still need a great deal of patience and persistence, however, to find the right project or partner.

The University of Minnesota's College of Education maintains an "International Registry of Schools on the Web" at their virtual Route 66 homepage at <http://web66.coled.umn.edu>. In addition, several websites maintain a registry of projects, such as Global SchoolNet at <http://www.gsn.org>, EnviroLink's Environmental Education Network at <http://www.envirolink.org/enviroed>, International Education and Resource Network (iEARN) at <http://www.learn.org>, and the Community Learning Network at <http://www.dln.org>.

Another site is Education World ("where educators go to learn") at <http://www.education-world.com>. A recent database query of "environmen-

tal education" on that site yielded over 5,000 links to lesson plans and whole curricula spanning K-12 grade levels that incorporate EE across all disciplines—writing/language arts, math, life and earth science, social studies/government, and even art. For example, a government class in Sweden sought a partner school in the U.S. Midwest to compare legislative processes and collaborate on ideas for how each class might go about influencing environmental lawmaking.

Students and teachers alike are enthusiastic about EE on the Web. A grade school teacher in Florida comments, "any time you put a child in front of a computer they're excited about learning." In an article that appeared in *Educational Researcher* (vol. 25, no. 2, March 1997, pp. 27-33), Ronald D. Owston notes that students "thrive on interacting with the (computer)" and have been raised in a world where computers are an integral part of daily life. In the article, Owston examines whether WWW increases access to education, promotes improved learnings, and contains the costs of education to justify widespread use in classrooms. He finds positively for all three questions but qualifies this by saying that the promise of the technology is rooted in how educators use it.

One challenge of EE via the WWW is to give teachers the skills they need to implement EE on the WWW. Initial training doesn't go very far with the rapid rate of technological advances, and EE projects are still new and constantly evolving to work out the bugs. For instance, the GLOBE program, initiated in 1995, evolved considerably between the first and second school years. An evaluation of the second year of GLOBE program operations by SRI International says that, "Although the pace of change has left nearly all program participants with the sense that they are constantly straining to catch up with the latest developments, few doubt that the effort has been worth it."

All Internet users have the ability to collaborate on-line, taking part in experiments, presentations, and interactive lessons and sharing their work with the world. Along the way, all constituencies become students in the education process, challenging traditional ideas about teaching, learning, and schools and fundamentally changing the interactions between students and teachers.

Web-based EE facilitates student-centered learning by allowing them to formulate questions and seek the answers on the Internet, exploring resources that seem promising to them at their own pace. A ten-year-old may well have more capacity for answering computer-related questions about Web-based learning than the teacher. In addition, through the pursuit of environmental investigations and problem solving, students begin to be seen as experts in certain aspects of environmental problems and gain the respect of their communities and professionals in the field.

As students choose to attempt to solve environmental problems that are beyond a teacher's realm of knowledge, teachers must let go of their status as the primary source of knowledge for students and take on the role of facilitator in gathering information and helping the students analyze and understand what they come up with. Clinton Kennedy, a teacher at Cascade High School

in Idaho (see profile toward the end of this chapter) says of his advanced biology students: "Never underestimate the power of students—turn them loose on meaningful projects, be ready to give advice, and watch things happen. I learn with the students. . . . I am not the 'sage on the stage,' but the 'guide on the side.' . . . This is a much more rewarding way to run a class."

Finally, schools become only one venue for learning as the WWW allows students, teachers, and scientists to transcend pre-Web obstacles to collaboration, such as the cost of travel and cultural and time zone differences, to form worldwide on-line peer networks. Suddenly "school" is no longer contained in a building in the community but located in a virtual global village. In rural areas where comprehensive libraries are not available, the Web, sometimes referred to as the world's largest library, broadens research capabilities and the whole world is brought within the confines of the classroom.

The Web is a powerful tool for enhancing environmental education. Interactive environmental education encourages thinking and problem solving rather than memorization and regurgitation and increases our knowledge base of our planet through scientific contributions that are shared worldwide. That is how EE projects on the WWW can "make a difference" for the environment.

PROFILES

Clinton A. Kennedy Science Teacher Cascade Junior/Senior High School Cascade, Idaho

The Cascade Reservoir Restoration Project is conducted by advanced biology students at the local high school. The reservoir provides a real-life laboratory in which students must balance scientific, economic, and political aspects in proposing a solution to an environmental problem and implementing their solution. They learn that unless all of these aspects are equally addressed, success is virtually impossible.

Clinton Kennedy, science teacher at Cascade High School, says his desire to teach young people about the environment emerged from his experience as a youth leader for the Boy Scouts: "My greatest satisfaction came from teaching other scouts something new about nature." However, Clint's inclination to teach was side-tracked during his early college years.

After high school, Clint went to the University of Idaho in Moscow, Idaho, where his first major was forestry. However, his "insatiable curiosity" and interest in the "hard sciences" led him to change his major. When he was a senior, Clint became concerned that his biology/botany/zoology major would lead him to a lab job, so he quit college and got a job as a timber faller. This was intended as a stopgap measure to "gel [his] thoughts on [his] career goals." He and his wife decided to start a family and then planned for him to go back to



Junior high school science teacher Clinton Kennedy teaches students how to identify lake organisms in his Cascade, Idaho, classroom.

school. However, due to the arrival of identical twins the stopgap turned into a seventeen-year career.

By the late 1980s, Clint was increasingly dissatisfied with his work. He says, "by [then] I was convinced that if our youth were not given the tools to analyze problems and make good decisions as adults, the quality of life in . . . [the] future was in jeopardy. The things I loved so much about Idaho were disappearing for reasons that didn't seem valid or necessary." In order to remain in "small town Idaho" and get back to his first love, science, Clint returned to the University of Idaho to become a science teacher. He earned a B.S. in secondary education with an emphasis in biology.

Today, Clint is a certified teacher in natural science and physical science. The six courses he teaches change from year to year. His school operates on a rotating A/B day schedule consisting of four 95-minute class periods per day—three teaching periods and a preparatory period. In the 1997–1998 school year he teaches seventh grade integrated science, tenth grade standard biology, and tenth grade college prep (CP) biology on A-day schedule. On B-day schedule he teaches seventh grade integrated science, eleventh grade CP chemistry, and a combined eleventh and twelfth grade advanced biology class.

Clint arrives at school at 7:30 A.M. to organize his day. This can include setting up labs or demonstration activities, gathering materials, making copies, and discussing issues with colleagues. Some days students may arrive early to make up labs or get help. At 8:15 the tardy bell rings for first period and

announcements are heard over the intercom. Clint takes attendance and lunch count and enters the numbers onto a computer network. He begins each class similarly by taking attendance, and then asks if there are questions on assignments. If students are slow to start the day's discussion, he may ask his own questions—in the form of a quiz! Clint says, "this usually is enough motivation to get them to take the lead and ask questions."

Clint's teaching style relies heavily on discussion that requires students to come to class prepared. He also integrates the hands-on activities of the Project WILD curriculum, an interdisciplinary conservation and environmental education program that emphasizes wildlife. Though each group's needs are different, Clint feels that discussion-oriented classes allow him to focus on areas where students need help and to introduce new material more effectively.

After second period, Clint goes to the teacher's lounge to eat lunch with other teachers. He says, "this is a relaxing and enjoyable time with joking and pleasant discussions." Third period begins after lunch at 12:20. His preparatory fourth period is spent planning, writing, grading assignments, and entering grades onto a computer network. He also supervises independent study classes during that time, and occasionally gets involved in helping other teachers with technology issues.

Cascade High School is strongly committed to technology. Each teacher has a Power Macintosh at his or her disposal and each class may have five or more computers available for student use. Clint has some high-end computers for graphic and World Wide Web work that allow students to do multimedia reports using a variety of sophisticated software.

Clint's advanced biology class is project-oriented with a chemistry prerequisite in which students create their own projects by researching a local environmental problem and proposing a solution. In the first phase of the course, lectures are used to provide a scientific vocabulary and to introduce the fundamentals of limnology. These are complemented by lakeside field work, hands-on labs, and demonstrations.

During the second phase of the course, students begin to identify solutions to environmental problems. They attend water quality meetings, give public testimony, write letters to representatives, and use the Internet to do research and set up cooperative experiments with some of the world's leading experts. Students must build support for their ideas in both the professional and the local communities. If they build enough support, they attempt to raise funds to implement their projects. If the fundraising is successful, students then implement, test, and monitor the success of their work. Finally they write a paper and/or produce a video on their findings. All projects are then put on the class website (<http://www.cascadehs.csd.k12.id.us/advbio/home.html>) to share with the whole world.

This alternative way of teaching requires that Clint be able to help several groups working on different projects at once. Because of the nature of his advanced biology class, students may need help in the evenings, on weekends,

or even during the summer. Clint says: "The rewards from watching the students do real-life, meaningful things with the knowledge I've helped them gain over the years make teaching worthwhile for me. I wouldn't give it up for anything, even though it requires a considerable time commitment." Another thing he likes about his job is that working with large groups of people means no two days are the same.

Besides being on hand to advise students in the summer, Clint runs a youth crew for the USDA Forest Service that does hands-on environmental projects such as Bull Trout habitat improvement, erosion control on trails, and salmon habitat restoration. He also teaches a Project WILD workshop for teachers on environmental issues in Idaho.

On the downside, Clint says: "If you elect to teach a real-life project class, you will have real-life political problems to deal with. Teaching about the environment is very controversial and much political heat can be brought to bear." Clint offers the following advice:

- Respect all opinions
- Identify biases, including your own
- Teach critical thinking—how to think, not what to think
- Honor disagreement
- Stay true to your ideals, but don't be radical
- Listen well
- Be a life-long learner

Clint says: "Teaching . . . can be frustrating, and rewards are not instantaneous. But when students come back a few years after graduating and confide in you about the impact you had in their lives, it makes everything worthwhile."

Michelle Jansen
Interpretive Naturalist/Intern Coordinator
Carpenter St. Croix Valley Nature Center
Hastings, Minnesota

Interpretive naturalists need effective communication skills as well as formal biology or environment-related training. It is essential that they speak and write with confidence while retaining an insatiable curiosity about the natural environment and an eagerness to learn and share new things about it throughout their careers.

Michelle Jansen, interpretive naturalist and intern coordinator at the Carpenter St. Croix Valley Nature Center, didn't consider her current career until midway through college. Though she had been visiting nature centers all her life, it wasn't until she visited her hometown nature center that she realized her education, lifestyle, and hobbies could be integrated into a career as a naturalist.

Initially Michelle thought she wanted to be a doctor and began working toward a biology degree at a small liberal arts college. Along the way she real-

ized that she wasn't cut out to be a doctor and began to take a look at the things she did enjoy, such as being outside and teaching children. She ended up transferring to the University of Minnesota, College of Biological Sciences and graduated with a B.S. in ecology, evolution, and behavior in 1994.

While in college Michelle completed an internship at Wood Lake Nature Center in Richfield, Minnesota. After graduation she interned at the Dodge Nature Center in West St. Paul, Minnesota, and began working as a substitute naturalist at Wood Lake. Over the next two years Michelle sent out résumés for full-time positions while continuing to substitute at Wood Lake, work as a seasonal naturalist at Dodge, and volunteer at several other nature centers and wildlife refuges. In 1996 she was hired by Carpenter St. Croix Valley Nature Center as an interpretive naturalist. Since then she has taken on additional responsibilities as intern coordinator.

"Many times being a naturalist, particularly at a small nature center, is like being a 'Jack of all trades,'" says Michelle. Her primary duties are planning, writing, and teaching one- to two-hour environmental education programs for school children, as well as weekend and evening programs for the general public. However, she gets involved in the operations of the nature center in a variety of other ways.

A recent day for Michelle begins at 8:00 A.M. with cleaning animal cages, weighing the hawk and the owl, and preparing "diets" for all the animals. That done, she prepares for a 9:00 erosion class by gathering supplies and arranging chairs. From 9:00 to 11:00 she teaches fourth graders about erosion. When the students are gone she cleans up and prepares for a class she will teach after lunch. At 11:30 she's back at her desk making a variety of phone calls, including checking references for prospective interns, soliciting donations for a special event, and making inquiries to find a rabbit to add to the program animals. Then she takes a break for lunch and a hike a portion of the 600-acre property. From 1:00 to 3:00 P.M., Michelle teaches second graders about reptiles and amphibians. Again she cleans up after the class, and then spends a little more time taking care of the animals. By 3:30 she's at her desk again, responding to summer camp requests and researching and writing a newsletter article. At 4:45 she meets briefly with the other four naturalists to discuss an upcoming class. At 5:00 she secures the animals for the night, locks up, and leaves.

In addition to the daily duties just described, Michelle is currently working on special projects, which include: writing a grant to secure funding of the internship program; revising the center's policies for birthday parties; rewriting some of the class curricula; and preparing for a fundraising event called the Apple Blossom Special, a 2K, 5K, 10K, and half-marathon foot race open to the public.

As with many environmental professionals, one of the things Michelle likes most about her job is the variety of skills she calls on to perform her duties and the absence of a "typical day." She says, "I can use skills such as writing, creativity, sense of humor, and organization while at the same time teaching, using natural history and other biology knowledge, and dealing with people." She

also enjoys the ability to be outdoors about 80 percent of the time, which allows her to "see the seasons change close up." But Michelle gets the most satisfaction from, "sharing some of [her] deepest values [with] an audience that hopefully will grow with the knowledge and use it in making their decisions."

Michelle admits that there are times when her job "loses the 'spark,'" such as when she's bogged down with paperwork and can't get outdoors; when it starts to pour rain and she has a group out far from cover; or when the program animals make a mess, "always in the wrong place!" But Michelle derives motivation for her job from such things as seeing the look on a child's face when he or she has "gotten it"; noticing a tree bud that has opened; seeing eagles return from migration; and feeling like she's making a difference in the way people view nature.

Michelle advises those who are interested in careers as naturalists to be patient. "It usually takes a while to get a full-time position and when you do, chances are you'll never be a millionaire." But, she adds, "overall it is worth it. The naturalist field is exciting and very rewarding."

Orna Izakson
Reporter, environmental beat
Bangor Daily News
Bangor, Maine

Environmental reporters are often the public's only source of environmental information, yet they often have to fight to cover the environment because of lack of space or lack of understanding and importance in the eyes of editors.

Orna Izakson, a reporter covering the environmental beat at the *Bangor Daily News*, announced to her parents at age fifteen that she was going to be a writer, but her desire to be an environmental writer came after she graduated from college.

During college, Orna gained experience in every aspect of producing and publishing as editor of three student publications and an alumni newsletter. She changed her major often because, she says, "I wanted to have five majors! I wanted to be everything!" Her interest and involvement in filmmaking eventually won out. Orna graduated with a B.A. in film studies from Wesleyan University in Connecticut in 1988.

After college, Orna traveled for a year and a half. Having grown up in Manhattan ("a little island in the lower Hudson estuary" as Orna calls it), traveling provided her first opportunities to hike, camp, and experience the wilderness. It was in New Zealand, where she spent nine months, that she had life-changing hiking and camping experiences. She says: "I found something that made sense to me, like a piece had been missing. Living in cities is fine, but it's not for me, but I had always lived in cities, so I didn't know. This was a big revelation. [That's] how I became interested in environmental issues."

Once back in the states, Orna moved to the west coast to look for a job. She

ended up in San Francisco working at *Publish* magazine, a national magazine covering electronic publishing. It was there that Orna's ability to write, her interest in environmental issues, and the opportunity to go to graduate school came together. The impetus came from reading a Gannett Center journal called *Covering the Environment* (Summer 1990), which was subsequently expanded and published as a book called *Media and the Environment* by Craig LeMay and Everett Dennis. She says: "The arguments were intellectually fascinating! (It was) a lot of stuff about objectivity versus advocacy and how to cover the environment . . . and I said yes! I want to do that!"

In 1992, Orna began a master's program at the University of Missouri School of Journalism. There she worked on the *Columbia Missourian*, a daily newspaper. The paper had a health/science/environment beat, but unlike California, environmental issues weren't as "omnipresent." Orna soon realized it would be hard to get the environmental clips she needed to compete successfully for environment beat jobs after graduation.

At the end of her first year, Orna made a proposal to the managing editor of the paper to create a separate environment beat, and when she returned to campus in the fall of 1993, there was one. Orna knows several reporters who have successfully argued for an environment beat.

That summer, Orna interned at *High Country News* in Colorado, a "fortnightly paper covering regional environmental issues in the western United States." The internship was unpaid, but the experience was invaluable. She clipped environmental stories from weekly and daily papers from twelve western states, wrote assigned stories that were closely edited, and left with some good clips of her own.

Orna spent her last semester in Portland, Oregon, where she interned at *Willamette Week*, wrote a "scholarly" paper on objectivity and advocacy in environmental reporting, and looked for a job. After turning down a couple of offers, she accepted a job with the *News-Times*, a twice-weekly paper in Newport, Oregon. She was hired to cover the city government beat, but quickly began reporting on environmental issues as well, writing as many as twenty-four stories in a week and paying her dues. She secured the environment beat after covering it and the city government beat for nine months. In addition, she obtained clips as correspondent to the *Cascadia Times* in Portland, Oregon. In 1997, after three years at the *News-Times*, Orna left to take her current job at the *Bangor Daily News*.

On a recent Monday, Orna writes a follow-up story on a mercury spill that she covered the previous Friday. She arrives at the office and reads a story on the spill written by another reporter over the weekend. She talks to the reporter, then reads a story about the spill from another paper. She learns that environmentalists are protesting near the plant and goes out to cover it. She talks to protesters, takes notes, and keeps her eyes open. After two hours she thinks she knows the protesters' concerns. The story seems straightforward. She leaves the protest and goes to lunch, thinking about how to write the story.

Once back in the newsroom she begins writing. Then the phone rings: "Orna, it's Ned. We're taking them to court." Ned is the commissioner of environmental protection. With that, the pace of her day, as well as the story she is writing, changes completely. She tracks down the spokesperson for the chemical company to get his reaction, makes other calls, and reorganizes the story she was writing, as the deadline nears.

Orna says tight deadlines can be frustrating and some days, "writing feels like pulling teeth." Sometimes figuring out the scientific part and then trying to translate it into English is "like beating your head against a brick wall." Also, people sometimes call and yell at her about letters or editorials they think she wrote, but didn't.

Some things that Orna likes about her job are: getting outdoors to cover natural resource stories; getting past the rhetoric of those she interviews to what is really going on, then putting that into a story; and being able to work outside socially imposed hierarchies in a venue where all people are on par. She says: "It's just as important what the fisher thinks . . . as it is to talk to the governor." She also likes the feeling that her work is important to the public: "My feeling is that underneath it all are fundamental questions about science, about what it means [when mercury is spilled in a river] . . . I could write what it means politically, but for the people to make an informed decision about how much fish they want to eat or whether to support the mercury-reduction law, I've got to say what it means [for the environment]."

RESOURCES

Amazing Environmental Organization Webdirectory. "Earth's biggest environmental search engine." Includes information on environmental education and communication and professional associations. Also don't miss the employment section on the Webdirectory homepage, which provides links to job listings, descriptions, and agencies specifically concerned with environmental employment. [Http://www.webdirectory.com](http://www.webdirectory.com).

Association for the Study of Literature & Environment (ASLE, pronounced "az-lee"). An allied organization of the Modern Language Association founded to promote the exchange of ideas and information pertaining to literature that considers the relationship between human beings and the natural world. ASLE encourages and seeks to facilitate new nature writings, traditional and innovative scholarly approaches to environmental literature, and interdisciplinary environmental research. Publications include *Interdisciplinary Studies in Literature and Environment* (quarterly). Website has hundreds of links related to literature and environment. [Http://www.people.virginia.edu/~dip2n/asle.html](http://www.people.virginia.edu/~dip2n/asle.html).

Bureau of National Affairs (BNA). Founded in 1950, the first publisher to cover the Environment and Safety field regularly and in depth. Excellent resource for up-to-date comprehensive information on major environmental issues. Also consider BNA as possible employer, as it was rated one of the best companies in America to work for by *Fortune* magazine. Has over 20 different publications related to specific issues. 9435 Key West Ave., Rockville, MD 20850. (800) 372-1033. [Http://www.bna.com](http://www.bna.com).