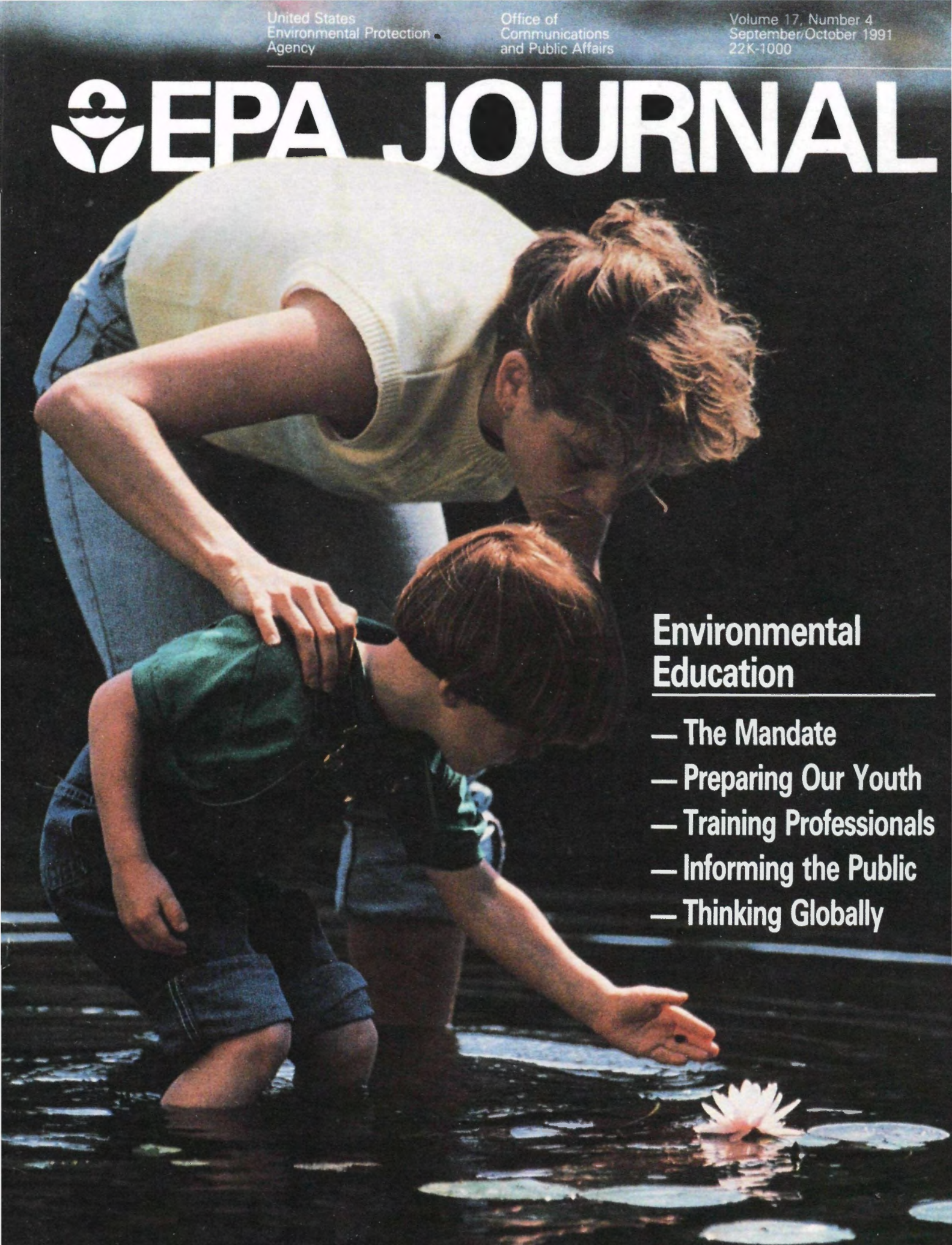


EPA JOURNAL



Environmental Education

- The Mandate
- Preparing Our Youth
- Training Professionals
- Informing the Public
- Thinking Globally

EPA JOURNAL

United States
Environmental Protection Agency

Office of Communications
and Public Affairs

A Magazine on National and Global Environmental Perspectives

September/October 1991 ■ Volume 17, Number 4 22K-1000

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EPA JOURNAL

is printed on recycled paper.

EPA JOURNAL Subscriptions

The annual rate for subscribers in the U.S. for *EPA Journal* is \$10. The charge to subscribers in foreign countries is \$12.50 a year. The price of a single copy of *EPA Journal* is \$3.50 in this country and \$4.38 if sent to a foreign country. Prices include mail costs. Subscriptions to *EPA Journal* as well as to other federal government magazines are handled only by the U.S. Government Printing Office. To subscribe to *EPA Journal*, send a check or money order payable to the Superintendent of Documents. The requests should be mailed to:
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October 1, the start of the government's new fiscal year, activated the National Environmental Education Act. The act was passed by Congress and signed by President Bush a year ago.

The timing is propitious. In a recent national survey, more than half of all high school students reported that they knew very little about most environmental problems. Although teachers show great interest in the environment, they simply do not have the time to go beyond the curricula already set for them, and those curricula do not incorporate environmental topics.

Meanwhile, the nation faces a serious shortfall in engineers, mathematicians, and scientists. The growth rate in these occupations is expected to reach 25 percent by the year 2000. EPA, one third of whose workforce is engineers and scientists, expects to hire 1,500 more of them in the next five years alone. But the interest of college freshmen in these careers is declining even more rapidly than the demand for them is rising.

As for the general public, polls show that the long-term trend toward heightened sensitivity about environmental matters continues unabated. However, as we reported to you earlier (March/April *Journal*), the public's rating of which environmental problems are the most serious differs in major respects from that of the experts.

The new National Environmental Education Act is a modest piece of legislation. No lofty goals, no grinding timetables, it authorizes appropriations that total \$65 million over the next five years. Funding of \$7 million is expected for this year. We are reminded that an earlier environmental education law was passed in 1970 and repealed in 1981. Then, the lead was given to the former Department of Health, Education, and Welfare. This time, the lead is EPA's.

Stay tuned. □

John Heritage

Contents

THE MANDATE



6 A New Law with New Directions

Can EPA keep the promise?
by Jack Lewis
and Marvin Zeldin

10 Our Goals

We dare not treat this planet as though we have a spare.
by William K. Reilly

12 First Steps

We hit the ground running.
by Lew Crampton

14 The Challenge

Will we end up where we're headed?
by Thomas H. Kean

PREPARING OUR YOUTH



17 "What Did you Learn in School Today?"

Much more than the three "R's."
by Jeff Welsch

20 What the Family Can Do

Match a visual lesson to a verbal one.
by Mary Metzger and
Cynthia A. Whittaker

23 Learning Theatrically

Let's use the right brain.
by Peyton Lewis

25 The Games Children Play

Even Verminous Skumm is made of recycled materials.
by Jack Lewis

27 In Pursuit of the Lorax

Who's in charge of the last Truffula seed?
by Jennifer Zicht

TRAINING PROFESSIONALS



31 Toward Environmental Responsibility

How do we become literate?
by Anthony D. Cortese

35 Shortfall in the Workforce

Where will we get the scientists and engineers?
by Maureen Delaney

INFORMING THE PUBLIC



39 Two-Way Environmental Education

Shouldn't one listen as well as speak?
by Peter M. Sandman

42 The Resource of Public Broadcasting

Hundreds of TV and radio stations already help.
by Lee H. Monk

44 It Will Take More Than Education

Solo-driving addicts must feel it in the pocketbook.
by James M. Lents

46 The Greening of Graying America

What can a Senior Environment Corps do?
by John Grupenhoff

48 Curiosity Might Save the Day

How can we protect the quality of life?
by Jacques-Yves Cousteau

THINKING GLOBALLY



51 A Universal Task

by the Dalai Lama

53 The Peace Corps Joins In

Can teaching English help the upper Tisza?
by Judy Braus

55 Enabling Others To Act Wisely

Help from tiny primates with a big charisma.
by Seth Rosenthal

DEPARTMENTS

2 **Newsline—**
News and Comment on EPA

57 **Cross Currents—**
Resolving Environmental Conflicts: A book review

59 **Featuring EPA—**
A Well Water Tale
by Ross Ettlin

61 **Titans in Conservation—**
Henry David Thoreau
by Jack Lewis

63 **On the Move—**
New Names in Key Agency Posts

EPA is charged by Congress to protect the nation's land, air, and water systems. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

EPA JOURNAL is published by the U.S. Environmental Protection Agency. The Administrator of EPA has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget. Views expressed by authors do not necessarily reflect EPA policy. No permission necessary to reproduce contents except copyrighted photos and other materials.

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Grand Canyon Visibility to Improve Under EPA Rule

EPA has adopted a final regulation that will cut by 90 percent the pollution emitted by the Navajo Generating Station in northern Arizona. The regulation is consistent with an agreement reached between business and environmental groups that the Agency had promoted earlier. It marks the first time that EPA has issued a major regulation solely to improve visibility. Administrator Reilly said: "The Grand Canyon is a symbol worldwide of the grandeur of the American landscape, yet it has been routinely shrouded by a winter haze limiting visibility and obscuring its magnificent vistas. Today's stringent air pollution standard will protect this priceless natural wonder and demonstrate the Bush Administration's steadfast commitment to clean air and to the protection of our national parklands."

The Washington Post reported: "... President Bush today hailed an agreement among the federal government, environmentalists, and owners of a large power plant



National Park Service photo.

intended to curb the major source of winter air pollution over the Grand Canyon, the first use of a 14-year-old federal law to protect scenic vistas within a national park The Grand Canyon agreement has its roots in a lawsuit against President Ronald Reagan's Environmental Protection Agency and was brought to fruition by Bush's EPA. Along the way, the administration's Council on Competitiveness, which is headed by Vice President

Quayle, sought unsuccessfully to limit the deal out of concern that it would be too costly to the power plant's owners The agreement is noteworthy because it was the first to be produced by negotiation rather than regulation. That approach, fostered by EPA Administrator William K. Reilly, reflects 'the common-sense view that you can get further by seeking people's help than suing them,' Bush said."

The Los Angeles Times commented: "... The air pollution accord, made public last month, requires the Navajo Generating Station in nearby Page, Arizona, to reduce sulfur dioxide emissions by 90 percent before the end of the decade in an attempt to end the conditions that can leave the canyon blanketed in haze The plan is expected to impose additional costs of \$89 million a year on the coal-burning power plant. For customers of the Los Angeles Department of Water and Power, which buys about 23 percent of the electricity generated by the plant, the additional cost is expected to be about 2 percent a year The pollution controls initially were to have taken effect in 1995, but under the compromise they will not begin until 1997. The Administration predicts that the cutbacks should improve visibility at the Grand Canyon only by 7 percent on the average winter day, causing some within the environmental community to contend that the plan does not go far enough"

Storm-Water Runoff from Industry Proposed for Control

A general permit that would be used to control storm-water runoff from industrial facilities has been proposed by EPA. The facilities include: manufacturing plants, where storm water comes into contact with raw materials or wastes; construction operations that disturb five or more acres; landfills; junkyards; power plants; mining operations; some oil and gas operations; and airports. Some city-operated

facilities, such as landfills and certain sewage-treatment plants, would also be controlled by the new permit. More than 100,000 facilities, nationwide, could eventually be affected.

Runoff of rain and snow from "nonpoint" sources (pipes are "point" sources, for example) is the largest remaining water pollution problem in the United States. In built-up areas, runoff flows into storm sewers after picking up pollutants from a wide variety of sources, including such unlikely ones as city parking lots and suburban lawns. The sewers' discharge to surface waters poses threats to drinking

water, aquatic life, and the recreational and economic uses of these waters. Industrial facilities can be significant sources of storm-water contamination, releasing toxic metals, sediments, oil and grease, and a wide range of other chemicals.

The general permit proposed by EPA describes pollution prevention measures that industrial facilities would have to develop. The measures include sediment and erosion control; controlling spills; and removing illegal hookups to storm sewers and stopping the dumping of oil and other wastes into them.

When issued in its final form, the permit will become part of the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act. EPA has delegated NPDES permitting authority to all but 12 states and six territories, and it is these several remaining jurisdictions for which the general permit is specifically intended. However, the Agency hopes the rest of the states will adopt similar permits to bring storm-water runoff under control.

Enforcement Actions

International Paper Pleads Guilty to Felonies; Will Pay \$2.2 Million in Fines

International Paper Company has pled guilty in federal court to five felony charges having to do with operations of its Androscoggin mill in Jay, Maine. The mill is the largest in the state. The government charges that the company violated RCRA by generating, storing, and treating hazardous waste without a permit. Further, company officials lied to federal and state authorities, stating that the mill did not generate, store, or treat hazardous waste, and that it

discharged effluent through only one outfall to the Androscoggin River; in fact, it discharged through two. The company will pay \$2.2 million in criminal fines, the largest amount ever assessed in Maine for either criminal or civil violations, and the second largest criminal fine ever collected in the United States.

Mobay and Allied Colloids Cited for TSCA Violations

In separate actions, EPA has filed administrative complaints against Mobay Corporation of Pittsburgh, Pennsylvania, and Allied Colloids, Inc., of Suffolk, Virginia, for violations of the

Toxic Substances Control Act. The Agency seeks in excess of \$4.75 million in penalties from Mobay; it seeks \$2 million from Allied Colloids. Under TSCA, companies must notify EPA 90 days before they manufacture or import a new chemical. EPA reviews the notice for the intended use of the chemical, as well as for the chemical's potential effects on human health and the environment. If the chemical passes review, it can be added to the TSCA inventory of approved substances.

Allied Colloid's major products include polymers used in the paper, pollution-control, mineral processing, petroleum, and

textile industries. EPA alleges, among other complaints, that since 1983 the company has imported seven new chemicals and distributed them for commercial purposes without submitting notices to the Agency.

Mobay, a subsidiary of the German firm Bayer AG, imports, manufactures, and sells a variety of chemical products. EPA's complaint, which contains over 400 counts, alleges among other violations that Mobay imported chemicals for commercial purposes that were not on the TSCA inventory.

EPA Would Throttle Down on City Bus Exhaust

Steep cuts in particulate emissions from diesel-powered city buses would begin with the 1993 model-year under a rule proposed by EPA. By 1994, when fully in place, they would reduce city-bus emissions of particulates by 95 percent. Administrator Reilly said: "We have received more complaints about the huge, black billows of smoke from buses than any other issue relating to vehicles. Today's proposal, together with previous rules to reduce sulfur in diesel fuel, will protect a large segment of the population, improve visibility, and make the black clouds of diesel bus exhaust a thing of the past."

The Washington Post reported: "... For anyone caught behind a city bus in downtown traffic, the demand for clean air takes on a sudden urgency. ... But the EPA's proposal to cut 95 percent of the particles from diesel bus exhaust was a long time coming. In 1977



Steven Delaney photo.

Congress ordered the EPA to set standards for diesel particulates for 1981 model buses. But before rules were promulgated, the new Reagan administration shelved the order. Because the standards had still not been set as of last year, lawmakers imposed specific limits and deadlines in the Clean Air Amendments of 1990. ... According to environmentalists, the past should have arrived years ago for emissions of the tiny hydrocarbon particles that burrow deep into sensitive lung tissue and, the EPA says, can cause bronchitis, asthma attacks, respiratory infections, and cancer. ... If the proposal becomes final,

the noisome symbol of urban air pollution would not be expected to disappear until the turn of the century. Only 3,000 new buses are introduced every year to a nationwide fleet of 44,000. However, old buses typically are rebuilt every four to five years and, in cities of more than 750,000 people, these too must comply. ..."

The Wall Street Journal said: "... The particulate-emission rules will cost the industry as much as \$70 million over 15 years, according to EPA officials, who concede that some of the proposed standards may not be achievable with currently

available technology. ... For new buses, the standards for particulate emissions would fall to 0.10 gram per brake horsepower-hour for 1993 models—that is, a 277-horsepower bus engine could emit 27.7 grams over an hour. A standard of 0.05 gram would apply to 1994 and later models. The current standard for trucks and buses is 0.25 gram. This would remove 270 tons of particulate matter a year when fully effective. ... Stanley Miller, manager of alternative fuel project centers for Detroit Diesel Corp., a major engine manufacturer, said the company believes it will be able to meet the 1994 standard with diesel engines as well as with engines powered by methanol or natural gas. Under the EPA rules, a transit-system operator could comply with the tougher rules by switching to a cleaner-burning fuel. ..."

Standards Set for Municipal Landfills

EPA has set the first comprehensive federal standards for municipal landfills. They include location, design, operating, and closure requirements, as well as clean-up standards for existing contamination. Administrator Reilly said: "... Americans produce 180 million tons of municipal trash a year. Three quarters of that goes to landfills. These standards build on current state efforts to protect groundwater and other resources from contamination."

The Wall Street Journal reported: "... The ... rules ... are estimated to cost about \$330 million a year, or about \$4 a household. [They] have been delayed for more than three years, partly in response to White House objections to their cost Most of the 6,000 solid-waste landfills operating today aren't environmentally acceptable, according to the EPA, which predicts that 50 percent of those will close within five years, partly as a result of the new rules Under the program, states will have to incorporate the federal standards into their permit programs for trash facilities and get those programs approved by the EPA. The EPA will impose the federal standards on states that don't submit acceptable plans. If a state's plan is approved, however, the state can tailor various requirements to local conditions 'The good news is this rule is out and it offers some new protection,'



Wide World photo.

said Daniel Weiss, who works on waste issues for the Sierra Club. 'The bad news is there are loopholes, so some people will remain at risk.'

The Washington Post said: "... The nation's 6,000 landfills will have to install special devices to monitor the movement of underground contaminants, clean up ground water polluted by trash, and cover the dump daily with soil to prevent pest infestation. New landfills will have to be rimmed with a clay and plastic liner to prevent leaks The standards were issued nearly four years after a deadline set by Congress. Although the EPA proposed regulations in 1988, they have been held up since by the Office of Management and Budget. A lawsuit brought by environmental groups forced the agency to publish the long-awaited plan Public landfills receive three-fourths of the 180 million tons of trash dumped by Americans every year. None of the garbage meets the EPA definition of 'hazardous.' But significant

dangers are posed by household pesticides, mercury in certain paints, lead in batteries and newsprint and cadmium in plastics"

The New York Times said: "... Perhaps the most significant feature of the new rules is a requirement that all landfills monitor ground water, the source of drinking water for half of all Americans, to detect leakage of lead, plastics, or other chemicals into the water. Ground water is sampled by drilling wells. Only one-fourth of all landfills now monitor the ground water for contamination The rules also prescribe the use of advanced technology to line the pits at municipal dump sites, to protect soil and water from chemical contamination. The protective layer typically consists of a plastic lining on top of two feet of clay. The rules also specify daily operating procedures, stipulating that trash and garbage must be covered over with a layer of soil every day, to suppress bad odors and prevent trash from blowing away In addition, dump operators must monitor production of methane gas to make sure it does not build up and cause explosions or fires. Methane can be produced through the decomposition in a landfill of leaves, grass clippings, food scraps, and other organic waste"

that they have the financial means to cover clean-up costs and damages that could result from leaks. EPA has proposed extending the deadline by which small businesses must comply with the requirement. Many of those affected have had difficulty acquiring the

insurance that would demonstrate they comply, and a number of states have created their own assurance funds to assist them. Of 43 states that have created funds, 27 have received EPA approval to use them in complying with RCRA. The extension, from October 26,

1991, to December 31, 1992, would give the Agency time to work with the remaining states on their funds. The extension would affect the smallest gas stations and convenience stores; it is part of a broad effort by EPA to reduce the cost of regulations on small business.

Black Fly Repellent Poses Risk to Women of Childbearing Age

Insect repellents containing the chemical ingredient 2-ethyl-1, 3- hexanediol may pose a risk of birth defects to pregnant women, according to a notice issued by EPA. Consumers can tell whether a product contains the ingredient by checking the active ingredients listed on the container. The following products contain the ingredient:

- 6-12 Plus Repellent Stick
- 6-12 Plus Repellent Liquid
- Off! Insect Repellent IV
- 6100 Formula 2 Fly and Mosquito Repellent Gel
- Johnson Wax 6017 Formula 10 Insect Repellent
- BF-100 Blackfly Repellent Solution

Products are applied on the skin. They are sold primarily in northeastern and upper midwestern states to repel black flies.

EPA has advised retailers that they should remove products voluntarily from their shelves. The Agency has published notice in the *Federal Register* that the four companies registered to sell and distribute 2-ethyl-1, 3-hexanediol products are now prohibited from doing so. The four have already voluntarily requested that their registrations be cancelled.

EPA took action under the Federal Insecticide, Fungicide, and Rodenticide Act after reviewing new

Temporary Relief Proposed for Small Businesses

The Resource Conservation and Recovery Act (RCRA) requires that owners and operators of underground storage tanks (USTs) show

information submitted by Union Carbide Corporation. The information showed possible adverse developmental effects in test animals exposed to 2-ethyl-1,3-hexanediol. (The most significant was failure of

lungs to inflate at birth.) While the Agency is not aware of any reports of adverse human reactions to repellents containing the chemical, as a precautionary measure it urges women of childbearing age to avoid using them.

Motor Vehicle Regulations

Computers Would Monitor Emission Control Hardware

Commencing with the 1994 model year, EPA would require that computers be installed on all passenger cars and light trucks to monitor, as a minimum, the engine (for misfires), the catalytic converter, and the oxygen sensor. Once each trip, the computer would scan these functions, locate trouble, and store the information. A dashboard light would signal the driver to have the vehicle checked; trouble codes in the computer's memory would help technicians diagnose the problem.

Emission control failures often do not affect vehicle performance, and owners continue driving unaware. However, such failures can significantly increase emissions and waste fuel. A defective catalytic converter, for example, can increase exhaust emissions by as much as 700 percent. Computers have been installed in some vehicles to monitor engine operation (e.g. air-fuel mixture) since the mid-1980s. However, their ability to perform other functions has been recognized only recently. Early detection of emission problems would not only improve air quality but could benefit owners economically: Repairs would be less complicated, and might be covered under manufacturer warranty.

The proposed on-board diagnostic computer system would add about \$94 to the

cost of a new car, and about \$101 per light truck. Savings in repairs and fuel, over the life of a vehicle, would reduce these costs to \$40 and \$30, respectively.

EPA Proposes Garages Recycle CFCs from Auto Air Conditioners

EPA has proposed mandatory recycling of CFCs at garages that service automobile air conditioners. (CFC-12 is sold under brand names such as Freon.) Currently, when these units are serviced, CFCs are released to the air, threatening the atmospheric ozone layer. The Agency would also require that technicians be trained and certified in the proper use of recycling equipment; the equipment, itself, would have to be tested by an independent laboratory. To clamp down on the handling of CFCs by consumers, the Agency would restrict the sale of small containers of the substance.

Although the motor-vehicle air conditioner repair industry is the biggest user of CFCs in the United States, EPA does not believe its proposed regulation will have significant economic impact. Because of the ongoing phaseout of CFCs generally, service companies would have initiated recycling by 1992 anyway; the rule would go into effect January 1, 1992. In fact, more than 100,000 recycling machines have already been sold to service garages under an industry voluntary program.

Most Uses of Parathion Cancelled

Registrants of the pesticide parathion have volunteered to cancel most uses immediately under an agreement they have reached with EPA. Parathion is one of the most acutely toxic pesticides registered by the Agency. Administrator Reilly said: "The agreement EPA has reached with parathion registrants will result in a dramatic reduction in the number of workers who annually are poisoned by exposure to this pesticide. Those uses which pose the greatest dangers to workers will be prohibited almost immediately and the Agency plans to cancel the other uses soon."

The New York Times reported: "... Ending a decades-long debate over the deadly pesticide that has been linked to more than 70 deaths and thousands of illnesses among farm workers, the Environmental Protection Agency and the maker of ethyl parathion agreed today to eliminate its use on all but nine crops by the end of this year The action will compel growers of fruits, nuts, and vegetables—about 80 crops in all—to seek more costly alternatives to control more than 200 types of insects and mites. But agricultural leaders in California, which produces half the fruits and vegetables in the U.S., said today that this probably would not translate into significant increases in produce costs to consumers because farmers have been gradually reducing their dependence on parathion as the state has tightened restrictions in recent years A chemical that is as harmful on skin contact as certain chemical-warfare agents, parathion is an

organophosphate developed in Germany and approved for use in the United States since 1948. It gained wide use after 1972, when DDT was banned. Its advantage was that it was inexpensive and highly effective against a broad range of pests, but years of monitoring made its hazards more clear The chemical attacks the nervous system when it is inhaled or exposed to the skin, causing nausea, vomiting, headaches, blurred vision, sweating, drooling, muscle spasms, and in some cases coma and death. It is extremely toxic to birds, but the EPA said it had no documented cases of illness among consumers of parathion-treated foods"

The Washington Post said: "... Under terms of the agreement with the EPA, Cheminova Agro of Denmark will continue to produce the pesticide—parathion—for use on nine of the 900 crops for which it was licensed. Most of the chemical sold each year is used on the nine crops, and the Agency is still seeking a ban on those remaining applications But the EPA's cumbersome, uncertain process assures that parathion will survive for at least another 18 months—the final delay in a regulatory history so full of delays that environmentalists consider it a classic failure of government Linda Fisher, who became assistant EPA Administrator for pesticides in 1989, blamed the delay partly on the central conflict within the law that regulates pesticides, which requires the EPA to balance a chemical's costs to the environment and to public health against its benefits to the food industry"

A NEW LAW WITH NEW DIRECTIONS

**Can EPA
keep the
promise?**

by Jack Lewis
and Marvin Zeldin

(Lewis is an assistant editor of EPA Journal. Zeldin is a free-lance writer and environmental consultant.)



Mike Brisson photo.

"Human history becomes more and more a race between education and catastrophe."

—H.G. Wells in *The Outline of History*

Last year, Congress gave EPA a new mandate: to promote environmental education. How will EPA carry out this broad mandate? What's already being done around the nation in environmental education by schools, government agencies, nonprofit organizations, the private sector? What can be done? What should and should not be done? And what exactly is environmental education?

This issue of *EPA Journal* explores these questions. But first some background.

In 1970, the year of the first Earth Day celebration, Congress passed the National Environmental Education Act. Never fully funded, or implemented by the former Department of Health, Education and Welfare, the act was repealed in 1981. In 1990, the 20th anniversary of Earth Day, Congress again turned to the subject. The result: the National Environmental Education Act of 1990. The stated policy of the new law is "to establish and support a program of education on the environment, for students and personnel working with students, through activities in schools, institutions of higher education, and related educational activities, and to encourage postsecondary students to pursue careers related to the environment."

Congress did not invent environmental education. Dr. Thomas Marcinkowski, head of the North American Commission on Environmental Education Research, put it well last year in his testimony on the proposed legislation: "The educational and environmental roots of environmental education may be traced back a century or more. They are traceable to the creation of our first national park, our first attempts to grapple with how to manage our nation's bounteous natural resources, and the nature study movement. They are traceable to those working at the turn of the century on the preservation

EPA's Role Under the New Act

Among other things, the National Environmental Education Act directs EPA, through a newly created Office of Environmental Education:

- To educate the general public—to "develop and support programs . . . to improve understanding of the natural and built environment, and the relationships between humans and their environment, including global aspects of environmental problems"
- To support development and dissemination of "model curricula, educational materials and training programs" for elementary and secondary students
- To develop and disseminate environmental education "publications and audio-visual and other media materials"
- To develop and support "seminars, training programs, teleconferences and workshops" for environmental education professionals
- To develop programs to attract students to environmental careers
- To make grants of up to \$250,000 for projects "to design, demonstrate, or disseminate practices, methods, or techniques related to environmental education and training"
- To provide internships for college-level students and fellowships for teachers in environment-related positions in federal agencies
- To make national awards for outstanding contributions to environmental education.

of the vast tracts of land which now comprise much of our national forests and wilderness system."

"They are traceable," he continued, "to the creation of federal level resource management agencies, and to the involvement of those agencies in conservation education. They are traceable to the youth camping and outdoor education movements, and to the development of ecology as a

science. They are traceable to the initial monitorings of environmental impacts, and to the international conferences of the 1960s. By 1969, the date many cite as the beginning of environmental education, a century of groundwork had been laid."

Today there are literally hundreds of organizations across the nation involved in environmental education—public and private schools at all levels; local, state, and federal government agencies; nonprofit organizations; private companies; professional associations; foundations and clubs. Programs vary from state to state, from community to community. But in one way or another, many professional and non-professional educators are hard at work trying to "educate" anyone who will listen about one or more aspects of the town, city, state, nation, world in which we live—about our environment.

There are regional and national associations of environmental educators. There are clearinghouses and networks for the interchange of environmental education ideas, techniques, and programs.

Several federal agencies are involved in environmental education—the Fish and Wildlife Service, the National Park Service, the Soil Conservation Service, the Tennessee Valley Authority, for example. And EPA itself has been promoting environmental education ever since it published its first public information brochure 21 years ago. Today EPA operates 19 clearinghouses and nine hotlines, providing information on a wide variety of topics. Through publications, audio-visuals, speakers' bureaus, poster and essay contests, conferences, seminars and other activities, EPA headquarters, regional offices, and labs have to one degree or another been conducting environmental education for years.

And, of course, the media have been covering environmental issues—and in so doing have imparted environmental education to the public. Indeed, the environment as an issue ranks high in public awareness.

With all this environmental education going on, why then a new National Environmental Education

Act? Because, Congress said, the status quo just isn't good enough.

The act says flat out that current federal efforts "to inform and educate the public concerning the natural and built environment and environmental problems are not adequate" (emphasis added).

The act says flat out that existing federal support "for development and training of professionals in environmental fields is not sufficient" (emphasis added).

To remedy these shortcomings, the act says that the federal government, acting through EPA, "should work with local education institutions, state education agencies, not-for-profit educational and environmental organizations, noncommercial educational broadcasting entities, and private sector interests to support development of curricula, special projects, and other activities, to increase understanding of the natural and built environment, and to improve awareness of environmental problems."

Further, the act directs EPA to work with those same interests "to develop programs to provide increased emphasis and financial resources for the purpose of attracting students into environmental engineering."

Many educators, environmentalists, and scientists agree with the new law's premise that environmental education must be improved. The legislation was strongly supported by a wide range of

Students in Washington state get a close encounter with Douglas fir trees.



Washington Forest Protection Assn. photo.

professional associations and organizations. Many witnesses noted that, despite substantial progress in recent years, environmental education is not a priority in most of the schools in the United States. There's a shortage of educational materials and trained educators to teach environmental concerns in grades K through 12. Few students receive even a rudimentary grasp of key concepts in environmental science, ethics, health, or related social sciences. Then too, as noted elsewhere in this issue, while the need for environmental professionals is growing, the number of students enrolling in the courses leading to those professions is declining.

While they supported a strong federal role in environmental education, many urged EPA to encourage and support development of successful programs, not to replace them; to complement, not duplicate, existing programs; to build on existing clearinghouses and methods. Several cautioned EPA not to reinvent the wheel. Said Terry L. Wilson, director of the Center for Mathematics, Science, and Environmental Education at Western Kentucky University: "In the field of environmental education, there are a number of well-conceived 'wheels' that can become viable parts of a national effort. What we may need are some axles to connect these wheels into a more coordinated whole. And don't forget to keep applying the grease."

So what now? What does the new law mean for EPA? For other federal agencies with environmental education programs?

For EPA itself, the new law directs the Office of Environmental Education to coordinate all federal statutes and programs administered by EPA "relating to environmental education."

For the federal government in total, the new law directs the EPA Office of Environmental Education to "work with the Department of Education and with other federal agencies, including

What Is Environmental Education?

Neither the original Senate bill (S. 1076) or House bill (H.R. 3684) considered in 1990 specifically defined environmental education. During public hearings, several witnesses noted the lack of a definition. The act finally passed contains this language:

"Environmental education" and "environmental education and training" mean "educational activities and training activities involving elementary, secondary, and postsecondary students, as such terms are defined in the state in which they reside."

Should EPA Prepare Curricula?

"A wide variety of expertise already exists in the areas of curricula development and production—in universities, in non-profit groups, and in research and education centers. In our view, EPA's role as lead agency under the bill should be one to encourage and to spark curricula development, education programs, and training materials—not to develop them ourselves in-house. Our preferred approach would be to link up with groups who have considerable expertise in these and allied fields."

—EPA Administrator William K. Reilly, statement to Congress, April 19, 1990

Science Advisory Board Recommendation

In a September 1990 report to Administrator Reilly, EPA's Science Advisory Board offered 10 recommendations on reducing environmental risk. One recommendation, on environmental education, is repeated in part here.

"In a democracy the support of individual citizens is important to the success of any national endeavor. In the national effort to reduce environmental risk, such understanding and support are essential, because both the causes of and solutions to environmental problems are often linked to individual and societal choice. Consequently, EPA must expand its efforts to educate the public in general and the professional workforce in particular, both in terms of what causes environmental risks and what reduces them.

"For example, EPA should work to reduce the gap between public perceptions of risk and the scientific understanding of risk. In many cases, public perception and scientific understanding are quite different, if only because scientists have ready access to information that the public does not. It is important that EPA increase its efforts to share risk information

with the public, because in the long run the public will have to approve EPA's risk-based action agenda . . .

"EPA also should take several specific steps to develop and sustain the nation's scientific capability and workforce. For example, the Agency should provide technical and financial assistance to universities to help them incorporate environmental subject matter into their curricula and to train the next generation of environmental scientists and engineers.

"In this regard, EPA also should support graduate and post-graduate training programs in the relevant scientific disciplines, and nurture the participation of the scientific community in interdisciplinary research. The nation is facing a shortage of environmental scientists and engineers needed to cope with environmental problems today and in the future. Moreover, professionals today need continuing education and training to help them understand the complex control technologies and pollution prevention strategies needed to reduce environmental risks more effectively."

To supplement federal appropriations, the new law creates the National Environmental Education and Training Foundation as a nonprofit charitable corporation. The foundation will seek private contributions to be used to help carry out EPA's environmental education programs. No contribution may be accepted if it is contingent upon conveying "a particular point of view favorable to the economic interests of the donor or its constituents or associates." And no contribution may be accepted if it contains an explicit or implied requirement which would benefit the donor and which is "not consistent with the environmental and education goals and policies" of EPA and the intent and purpose of the law.

What's ahead? The 1990 National Environmental Education Act poses new challenges for EPA and for environmental educators across the nation. The act's objectives are noble—and apparently nonpartisan and noncontroversial, for not a single organization or individual openly opposed the legislation.

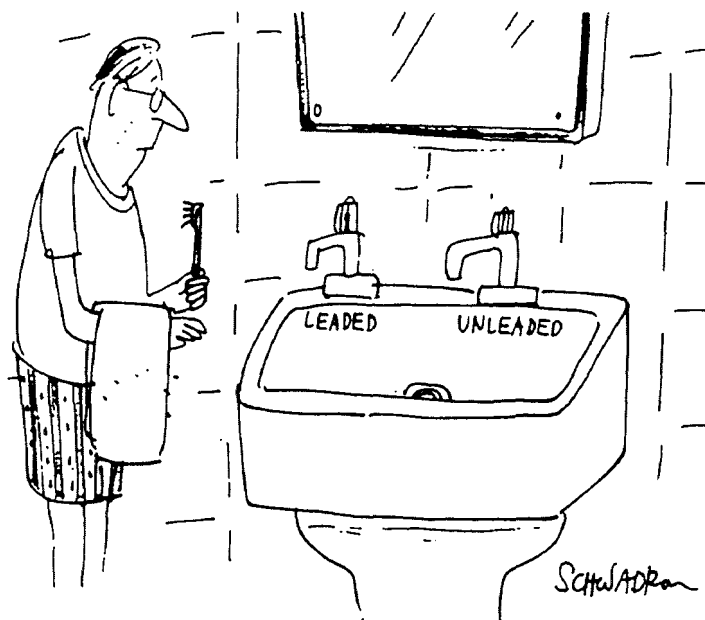
Privately, however, questions have been raised: Can EPA really fulfill the promise of the act? Will Congress appropriate enough money, year after year, to make a difference? Is the 1990 act more rhetoric than substance? Will it go the way of the 1970 legislation? Or will the new law really bring a new era of environmental education that substantially changes the way we live? As H. G. Wells might ask, will we win the race against environmental catastrophe? □

federal natural resource management agencies, to assure the effective coordination of programs related to environmental education, including environmental education programs relating to national parks, national forests, and wildlife refuges."

To institutionalize federal coordination of environmental education programs, the new law creates a federal task force on environmental education. Chaired by EPA, the task force includes representatives of the Departments of Education, Interior, and Agriculture, the National Oceanic and Atmospheric Administration, the Council on Environmental Quality, the Tennessee Valley Authority, and the National Science Foundation. The new law also creates an 11-member, private-sector advisory council on environmental education.

To implement the new act, Congress authorized appropriations of \$12 million for fiscal year 1992, \$12

million for fiscal 1993, \$13 million for fiscal 1994, \$14 million for fiscal 1995, and \$14 million for fiscal 1996. First funding of the new law—about \$7 million—is expected this fall.



Horley Schwadron. Reproduced with permission.

THE MANDATE

OUR GOALS

**We dare not treat
this planet
as though we
have a spare**

by William K. Reilly

Nothing better defines what we are and what we will become than the education of our children Today, education determines not just which students will succeed, but also which nations will thrive in a world united in pursuit of freedom in enterprise."

So said President Bush earlier this year when he unveiled the administration's new National Education Strategy, "America 2000." America 2000 is a national strategy—not a federal program—to ensure that America remains a leader in the world by becoming a leader in education. Secretary of Education Lamar Alexander has called it "a bold, complex, and long-range plan"—one embraced by the entire federal family. The strategy anticipates major change in America's 110,000 public and private schools, in every American community, in every home, in our very attitudes about learning.

The federal government's role will be limited—as it always has been: to help set standards, highlight examples, contribute some funds, encourage and nurture programs, to work in concert with state and local governments, schools and universities, business and industry.

America 2000 has six national education goals. By the year 2000:

- Every child will start school ready to learn.
- Every high school will graduate at least 90 percent of its students.
- Every student will leave the fourth, eighth, and twelfth grades with a solid foundation in English, math, science, history, and geography; and every school in America will teach its students to use their minds and prepare them for responsible citizenship.
- U.S. students will be first in the world in science and math.
- Every adult American will know how to read and will have the skills to compete in a global economy.
- Every school in America will be free of drugs and violence—and will offer a safe, disciplined environment where students can learn.

Environmental education is a key component of America 2000, and EPA is prepared to join this effort. Under the National Environmental Education Act signed into law by President Bush last year, EPA is establishing an environmental education office. For the first time in the Agency's history, our statutory mandates now include education in addition to enforcement and regulation.

Our two broad goals in education are to increase environmental literacy throughout the country and to encourage young people to pursue careers in math, science, engineering,

***Our success depends on
engaging those outside the
Agency.***

communications, and other fields essential to future environmental improvement. In addition, the office will have a mission of international outreach, of leadership in promoting environmental education around the world. Many countries already look to the United States for guidance in matters environmental: Education is a way to open doors and foster understanding on environmental issues of global concern.

Our new office will provide a focus for independent programs within the Agency, coordinating similar activities with other federal agencies. We will nurture public-private partnerships, serve as a clearinghouse for environmental education materials, provide seed money to state and local governments and private groups, and reach out to those underrepresented in environmental issues. And we will continue to recognize outstanding contributions through a number of award programs.

Our success depends on engaging those outside the Agency. We are relative newcomers to the field, and our purpose is not to duplicate the good work already underway across the country. As the Agency observed in its Report to Congress on the Office of Environmental Education: "Only

(Reilly is Administrator of EPA.)

through cooperative efforts and partnerships will we be able to accelerate the development and implementation of environmental education programs, individual environmental awareness, and the development of a more scientifically and technically literate workforce."

To kick off our new program, in November EPA and other federal agencies are convening a conference, "Building a Shared Vision for Environmental Education," to bring together in Washington, DC, an initial group of environmental educators to launch a series of partnership-building workshops. The energy, enthusiasm, and imagination of those already involved in environmental education are inspiring. We intend to provide a forum for the exchange of ideas, stimulate discussion, and get the word out about proven programs.

I'm impressed by what's out there. Last month, I visited Eleanor Roosevelt High School in Greenbelt, Maryland, to help launch America 2000 and its

Maryland counterpart. I conducted water quality experiments with future scientists in the school's innovative Environmental Studies class, met with students in a general assembly, and presented two trees on behalf of EPA to the school's ecology club. They replaced a tree that a bus driver had run over the week before, and one that had died last year. The bottom line: "no net loss."

Earlier, in February, I traveled to Austin, Texas, to join high school students taking water samples as part of an early warning system for the Lower Colorado River Authority. These students are learning how water quality serves as an indicator of the overall health of the Lower Colorado River watershed and the plants and animals that live there. Such experience in the field brings home the value of science. It shows how science is applied to real world problems to protect the resources we value. It also quickens the interest of students in science to see its practical value in managing the environment.

This past summer, I presented a check for \$10,000 to the Franklin Park Zoo in Boston, Massachusetts, for a project to introduce inner city children to careers in environmental management. The eight-week program offered hands-on experience in projects such as designing a wastewater filtration system for the tropical forest hippo pool and developing a composting system for the zoo's plant and animal waste. This is only one example of the environmental education programs undertaken by our 10 regional offices.

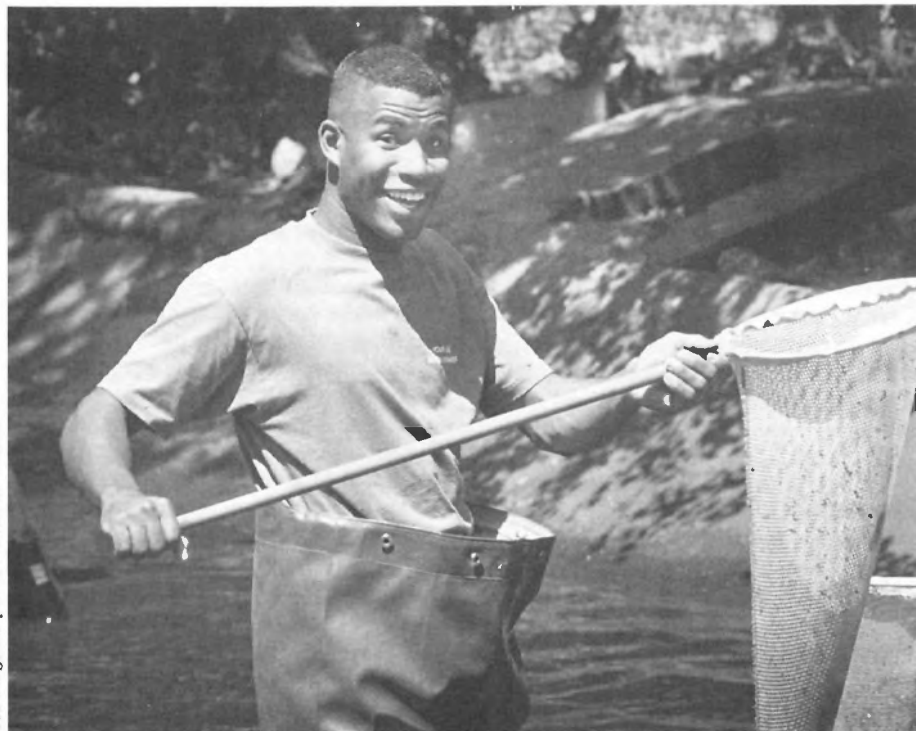
Under the new Environmental Education Act, we will be able to do even more—at the state and local levels, through public-private partnerships.

In all of the Agency's efforts, we have no intention of getting in the way of the good work now in progress or imposing uniform approaches to



Linda Smith photo. Bar-O Ranch.

Dozens of organizations, like California's Bar-O Ranch, already are actively involved in environmental education. This boy, a newcomer to the wilderness, developed a fascination for birds.



Relocating goldfish before draining and cleaning a waterfowl pond at the Franklin Park Zoo in Boston, Massachusetts.

Ted Fitzgerald photo. The Boston Herald.

FIRST STEPS

We hit the ground running

by Lew Crampton

On October 1, 1991, the provisions of the National Environmental Education Act of 1990 became effective. We at EPA are authorized, for the first time in our 20-year history, to launch a wide-ranging initiative to stimulate and support environmental education and environmental educators.

Depending upon the Congressional appropriations process, the Agency should be in a position to put its resources where its heart has been by providing grants and fellowships to promising environmental educators.

As relative newcomers to the field, we've spent much of the past year gearing up to implement the new law and learning from people who were already active. My charge to the staff in our new Office of Environmental Education has been to listen to anybody who would talk to us to ensure that our program is aimed in the right direction.

To make certain that EPA is listening and building partnerships and alliances, we are creating a formal advisory council to assess the national scene and help guide us on our way. The members of this council will be respected individuals from each of our constituency groups. Their advice will serve to ensure that our programs are on target.

Although the provisions of the new act did not go into effect until just recently, Bill Reilly had already supported a series of internal moves

(Crampton is EPA's Associate Administrator for Communications and Public Affairs, which includes the Office of Environmental Education.)

environmental education. That would be counterproductive. Rather, we intend to serve as a catalyst to make things happen, to encourage and support and publicize the innovative programs already underway.

And so, in the new fiscal year, we will distribute grants totaling about \$2.7 million—ranging in size from \$5,000 to \$250,000—to support promising, locally initiated, environmental education projects.

This year, we will award a major grant of about \$1.7 million to a consortium of universities and

To dwell at length in the house of ecology is to change the way we think.

non-profit organizations for a nationwide environmental education and training program. Additional funds will be made available in subsequent years under this program.

We will develop internship and fellowship programs to place up to 250 students and 50 teaching fellows in environment-related positions within the federal government.

We will offer new environmental education awards for outstanding teaching, for excellence in print, film or broadcast media education efforts, for literature, and for other contributions.

The new education act also establishes a bold new public-private partnership—a National Environmental Education and Training Foundation to foster private support for the benefit of environmental education activities. The new foundation is chaired by Drew University President and former New Jersey Governor Tom Kean. Earlier this year, I accepted the first contribution of \$10,000 to this foundation from Times Mirror Magazines in New York City. So we're off to a good start.

Why does all this matter? At heart, environmental education is about promoting stewardship, a lasting ethic that recognizes the importance of healthy natural systems to the future well-being of our country, indeed of the entire planet. That is the potential; that is the promise.

To dwell at length in the house of ecology is to change the way we think. It is to see whole systems and intricate relationships and new possibilities: the Central American leaf-cutter ant, equipped with jaws like scissors; the

dung beetle, which functions as a miniature waste treatment plant. It is to open ourselves to new variables and new knowledge. It is endless renewal . . . it is the richness and the reality of nature, its beauty and its starkness.

To understand the language of the environment is to cut across disciplines and cultures . . . to engage our intuition as well as our intellect . . . to draw inspiration . . . to nurture our souls and grasp as best we can the mysteries of life.

This planet is our home . . . our common property . . . our legacy. We dare not treat it as though we have another one to go to.

We cannot afford to keep cutting down our life-sustaining tropical forests. We can't survive without resources like the Chesapeake Bay or the Great Lakes. We must achieve sustainable, environmentally sound growth—the integration of our economic goals with our environmental needs.

Environmental literacy can help lead us to an ethic of stewardship—a sense of duty to care for and manage wisely our natural endowment, our productive resources, for the long haul.

In the end, environmental education boils down to one profoundly important imperative: preparing ourselves for life and all its surprises in the next century. When the 21st century rolls around, it will not be enough for a few specialists to know what is going on while the rest of us wander about in ignorance.

It is my hope, therefore, that by the turn of the century every citizen will be fluent in the principles of ecology and will have a working knowledge of the basic grammar and underlying syntax of environmental wisdom.

The Chinese philosopher Lao-Tsu wrote two and a half millennia ago:

In the end, we will conserve only what we love . . . we will love only what we understand . . . we will understand only what we are taught. (Emphasis added)

The first step toward stewardship is awareness. Today, under the Environmental Education Act, we are taking that step so that we and our children and our children's children may live in harmony with the natural systems on which all life depends. □

that enabled the new Office of Environmental Education to hit the ground running. As an example, the Agency invested in the development of a clearinghouse of detailed information on those environmental education products and activities which EPA has sponsored. We intend to have the prototype of this clearinghouse available for review and critique early next year. After we determine that it does, indeed, meet the needs of environmental education professionals, the operation will be expanded to include all environmental education materials developed by the entire federal government.

Again, our emphasis is upon producing a selective, truly useful, and effectively used clearinghouse. Likewise, we will be designing the system so that as much of the information as possible will be available through networks such as ECONET and the Alliance for Environmental Education's network of Environmental Education Centers.

Another initiative is a periodical called *Education Notes*. Our office is distributing this periodical to almost every elementary school in the nation. The intent and content are straightforward. We want to give teachers the kind of information and tools they can use immediately. From personal experiences to poetry to games, each issue of *Education Notes* will be filled with the kind of practical information that resourceful teachers can apply to increase the environmental component of their daily curriculum.

Another initiative is an important conference on developing partnerships in environmental education in Washington on November 19 through 21. At that conference, we will gather together representatives of key interest groups in environmental education to both learn from them and get their reactions to our plans. For example, the new Environmental Education Act calls for EPA to allocate several millions of dollars for grants in support of environmental education activities nationwide. To date, we have issued preliminary guidance on how to apply for these grants. Before this guidance goes final and, more importantly, before any grants are awarded, we expect the information we gather at our November conference to guide us in crafting an effective program. The hundreds of small grants to be awarded each year should help to unlock the tremendous creative

talents of educators nationwide and help stimulate the growth of a more environmentally aware, and responsible, citizenry.

Of particular emphasis in our initiative will be an expanded, aggressive internship and fellowship program to bring hundreds of additional teachers and students into positions with federal agencies and laboratories where they can develop and fine-tune their environmental education expertise. Here our emphasis will be upon minorities, native Americans, and others who may currently be underrepresented in the environmental and teaching professions.

People have asked me: Why are you getting all excited about this? What can teaching kids about living life gently when it comes to the environment really mean? What makes you think that all this can make a difference when it comes to solving some of the most complex technological and scientific problems of our age? Well, I've been in this field as a regulator and enforcer for over 10 years, and I've seen education work.

Two years ago, a young student was at the White House to receive an environmental youth award from the President. Not satisfied just to receive his award, in front of all the cameras, reports, and microphones, he asked the President if the White House had a recycling program. Today there is a recycling program in the White House.

Bill Reilly, Hank Habicht, and the 17,000 people of EPA have great expectations for our environmental education program. For this reason, it is important that we reach an understanding about what environmental education entails.

I don't mean that we need to spend time word-smithing any particular definition of environmental education—the job's too big and too important to get bogged down in such details. What we do need to achieve at the outset is an understanding of where each of us is coming from, to clarify the scope and mission of each major player in the environmental education field, and to get on with the job.

To succeed we need to develop a new definition of the three R's—Roles, Responsibilities, and Relationships. In terms of definitions, my tendency is to be inclusive rather than exclusive. Of course, we want to support environmental education activities which are proven effective. Yet we

also need to stimulate progress by supporting imaginative ideas which may sound strange but may yield great benefits. Just as the strength of an ecosystem, or a nation, is in its diversity, so the strength of our environmental education initiatives will be in their diversity.

But diversity also needs a context that provides overall direction to where we are going and how we intend to get there. I am sensitive to our need to plan strategically and to keep our energies focused on positive and progressive programs. This is clearly an area where all of us must work together.

Change for change's sake doesn't appeal to me. But the need to reform our educational system is so great that changes are not only inevitable, they are essential. We fully intend that our environmental education activities will encourage and engender positive change and will be closely linked to the America 2000 strategy set forth by the President and the nation's governors.

We prepare for the coming century through environmental education, through fostering environmental literacy. With more and more voices clamoring to be heard, it is important that basic assumptions and vocabularies are widely shared and respected throughout American society, if not the world. With more and more local initiatives needed, it is important that individuals have the knowledge to make wise choices.

Educated consumers can become environmental stewards; they can demand—and get—environmentally safer products, products with less packaging, and more recycled and recyclable products.

Informed citizens can take the initiative, as members of their communities or members of conservation groups, to address the daunting problems ahead of us. Like reading itself, environmental literacy is fast becoming an essential competence; almost certainly, it will be central to any successful strategy to grapple with the enormously complex issues of the next century.

At EPA it is our hope that by the turn of the millennium, every citizen will be fluent in the principles of ecology and will have a working knowledge of the basic grammar and underlying syntax of environmental wisdom. □

THE CHALLENGE

Will we end up where we're headed?

by Thomas H. Kean

Three years ago New Jersey tourism officials wanted to find out whether the state's new clean-ocean programs were restoring the confidence of beachgoers. They surveyed visitors to the shore and found startlingly widespread ignorance.

And where there was knowledge, it was usually twisted. For example, several people said they'd heard of "red tide"—and they thought it was a brand-name chemical. One woman knew that the New Jersey Department of Environmental Protection was conducting fly-over ocean testing, and she understood that to mean the department was lowering people out of a helicopter to dip their toes in the water.

Last summer, the *Wall Street Journal* released the results of a poll showing that 80 percent of Americans call themselves environmentalists. And yet in that same poll, nearly 55 percent could not recall a single instance over the past six months when they bought one product instead of another for environmental reasons.

The National Science Teachers Association conducted a survey of its own. It found among high schools in the United States, one-third offer no physics course, one-fifth no chemistry, one-tenth no biology, and a full three-fourths no Earth or space science. It's possible, then, that your child has no access to basic biology or Earth science in her own school.

These are three widely different surveys, to be sure, but their numbers add up. Compare them with the mounting problems of global warming, acid rain, ocean pollution, ozone depletion, wetlands loss, and the massive yearly extinction of countless species. They add up, or more aptly, subtract down, to a disturbing deficit of ecological understanding and action. It is what I call an environmental deficit. The world we depend upon for our sustenance cannot long sustain us at this rate of waste and wanton abuse of scarce resources. And yet few of us are learning or applying the lessons we will need to save our earth.

Several people said they'd heard of "red tide"—and they thought it was a brand-name chemical.

The environmental deficit is in part economic. By 1996, it could cost more than \$100 million a year just to operate and maintain the federal Superfund sites in my own state of New Jersey. Some experts estimate that the federal bill for Superfund cleanup will reach \$500 billion over the next four to five decades. This money could have been used to fund more Head Start programs, or solve the health insurance crisis, or fund any number of innovative urban enterprise projects. Instead it is the price we must pay for the "out of sight, out of mind" attitude toward waste disposal and pollution that prevailed for much of this century.

But for all the fiscal costs, there is another environmental deficit in this country. It is a deficit in awareness of our precarious position, a deficit in understanding how much we must do to change the Western world's abusive

policies—in short, a deficit in education.

We are in the midst of the Information Age, but lost in the reams of data is any rational method of thinking about how our decisions affect the world we inhabit. We are not teaching enough about how to connect science with policy. As Roy Vagelos, the chairman of Merck & Company, writes, "It is disturbing that the men and women who will be the country's leaders in the 21st century are not being equipped to think intelligently about the environment, energy, space, defense, and biotechnology."

We have confused information with intelligence. Our culture rewards mastery of the first and presumes mastery of the second. That's why "Trivial Pursuit" is so popular, and television game shows like "Jeopardy." But as David Orr of Oberlin College contends, education must be about more than collecting raw data. Our goal, he writes, should be "to connect intelligence, with its emphasis on whole systems and the long term, with cleverness, which is being smart about details." Orr argues that an economist who lacks even the basics of ecology cannot accurately calculate the Gross National Product: "We add the price of the sale of a bushel of wheat to the GNP while forgetting to subtract the three bushels of topsoil lost in the production."

If we allow our environmental deficit to grow, we risk danger both to our economy and the health and well-being of our posterity. To maintain a shallow understanding of the environment is to be transfixed by a small but tangible problem like Alar while ignoring a greater but more mysterious risk like radon.

During my term as governor, several hundred barrels of radium-contaminated soil were

(Kean is President of Drew University. He served as Governor of New Jersey from 1982 to 1990, chaired the National Wetlands Policy Forum in 1988, and is on the board of World Wildlife Fund.)



Browning-Ferris Industries' Garbage Museum in San Jose, California, is designed to show how much Americans throw away daily, how this practice damages the environment, and how recycling can help.

BFI photo.



Bob Samples photo. Project WILD.

unearthed in one New Jersey neighborhood. Several families were forced to leave their homes while we dealt with the problem. We looked everywhere for a place to dispose of the soil safely. Expert after expert assured us there was virtually no danger to human health as long as the soil was open to the air and not trapped under a building. Still, every New Jersey community we approached rose up in fear and anger at the suggestion that we dispose of it there. If people had known enough about the relative risks, my administration could have saved millions of taxpayer dollars and enormous political capital.

Addressing the need for better environmental education will be difficult given the present state of affairs. Simply put, our public schools are failing our children, and we must do all we can to reverse the course. Once you could live the American Dream through hard work and perseverance. But today that's no longer true. The 21st century worker will need to offer more than the sweat

of his brow; he will need to know computers, understand other cultures, and perform complex tasks.

In short, the citizen of the next century must be able to think intelligently and critically—and that critical thinking will apply to more of life than the job site. Our social, economic, political, and certainly our environmental problems are more complex than ever and demand intelligent choices from each citizen.

Thankfully, Americans are beginning to recognize the need for better environmental education. They understand that our nation's poor grades in science and math are ominous portents. And they are coming to the belief that they can't rely on the experts alone to heal the Earth. The *Wall Street Journal* study indicated that better than 50 percent believe it will take fundamental lifestyle changes, rather than scientific breakthroughs, to effect dramatic changes in the environment. One man told the *Journal*, "Changing the way

***Few of us are learning or
applying the lessons we will
need to save our earth.***

we live is a little more sure, the way I see it."

I see it the same way. At EPA Administrator Bill Reilly's request, I have agreed to head a new effort called the National Environmental Education and Training Foundation (NEETF), which is all about changing the way we live. NEETF is a non-profit partnership between government and private groups, chartered by federal legislation and aimed at fostering a new environmental ethic through the powerful tools of education and training.

Our vision is both compelling and collaborative: We want to promote a global commitment to meeting the needs of the present while ensuring that our children and grandchildren's children can meet their own needs. We want to instill in the minds of people throughout America and, indeed, throughout the world, the idea that sustainable development holds the key to a better life for us all.

Right now, there are hundreds of organizations, many of them outstanding, with clear and noble missions. Some are trying to increase the pool of environmental professionals in our country, while others try to build environmental awareness among all citizens. But these efforts are scattered around the country, and they often operate on a shoestring budget. For one reason or another, they don't get the publicity or the support they deserve. Many of them would benefit by talking with one another or joining forces on a project, if they had the chance. At the same time, many bright young people consider careers in environment-related areas but see little financial reward.

The foundation represents the first attempt in our nation's history to bring together these diverse individuals and

organizations. Our hope is that it will be an information clearinghouse, an idea center, and a fundraiser. We hope to teach, to cajole, to trumpet the good, and to collaborate.

- Through a resource bank and a comprehensive directory, the foundation will be a place to which the public can turn for information about and access to environmental education and training programs across the country.
- Through a staff of environmental experts, the foundation will help individual groups expand the reach of their own education and training efforts.
- Through annual competitive grants, it will support outstanding programs, recognizing and emphasizing those that can be duplicated elsewhere.
- Through a combination of grants and consulting, the foundation will be a catalyst for the training and retraining of professionals in all fields—from accountants to factory foremen to CEOs—to make them partners in creating a more environmentally sound and productive workplace.
- And through an endowment fund, it will provide scholarships and fellowships to deserving students who commit themselves to environmentally related research or careers.

The foundation's strength will be its public/private partnership. I say that from experience. Some of my proudest accomplishments as governor came about through a partnership between government and the private sector. One example was our state's hugely successful Commission on Science and Technology, which brought industrialists, academics, and government leaders together to promote investment in our state

through high technology "incubators" at a number of state universities. Another example was the National Wetlands Policy Forum, which achieved real breakthroughs because developers, environmentalists, bureaucrats, and academics worked together. The foundation will look for opportunities like these. It will give everyone a chance—the business owner and the bureaucrat, the activist and the philanthropist—to combine resources, both financial and intellectual, to build an environmentally safe and economically sound future.

The foundation will allow the teacher and the production line supervisor to talk together about how that particular factory cuts its environmental deficit and how it can cut it more. It will be a place where a town manager can turn for ideas about reducing waste in his or her municipality. It will be a place a corporate leader can call to find speakers, documentaries, or training manuals on the environment. It will be a meeting ground and a funding broker for environmental education and training organizations that want to join forces on common goals. And through its scholarships, it can be a breeding ground for the next generation of leaders in this area.

My hope is that the foundation can marshal the energy and all the research that is building across the country so we can begin to erase our environmental deficit, both fiscal and educational. An old Chinese proverb holds that "if we do not change our direction, we will end up where we are headed." The National Environmental Education and Training Foundation is our best hope of changing direction toward a sustainable economy and a safer world. □

"WHAT DID YOU LEARN IN SCHOOL TODAY?"

Much more than the three "R's"

by Jeff Welsch



Robert Queen photo. Wisconsin Department of Natural Resources.

Wisconsin parents are getting some unique responses to the time-worn question, "What did you learn in school today?" Let's listen in on the dinner conversation of the fictional Badger family.

Fourth-grader Bucky: "We did this really neat game in gym. The teacher made us play 'Hooks and Ladders,' and we pretended we were salmon and we had to get past a bunch of stuff to get to a safe lake. I got to be a fish trying to swim up the river, and there

were some kids pretending to be fishermen trying to catch me, and then I had to jump over a dam, but some more kids were eagles trying to grab me to eat me. Then when my friend Jimmy got to be a fish . . ."

Seventh-grader Becky: "That's weird! We got to do this neat experiment in science class to see how ground water gets contaminated and spreads to other people's wells. There was a big box filled with sand, with a bunch of monitoring wells in it. We had to try

(Welsch is a public information officer in the Wisconsin Department of Natural Resources.)

Environmental games
can make learning fun.



Mike Brisson photo. UW-Stevens Point.

to find where the contamination started by testing the pH of the wells with litmus paper. It was amazing how far the pollution spread—almost all the wells got contaminated, and the closest ones were real bad."

Four-year-old Betsy: "We made big bubbles with those rings that hold pop cans together. The man said we have to always throw them away because birds can get them on their necks and die."

Eleventh-grader Bobby: "I started a new water color in art class today. First, we all got a fact sheet on an endangered species to study—mine was on the Massasauga rattlesnake. After we studied the fact sheet, we had to sketch a habitat that would have everything the species needed to live

and have the proper environment so it could be safe and reproduce."

From the Wee Recyclers program for preschoolers to special materials developed for older students, with study guides and Project WILD (Wildlife in Learning Design) and Project Learning Tree activities for all grades, Wisconsin students are (always) exposed to environmental education.

But the interesting thing is, Wisconsin students can't sign up for Environmental Education class when they register for school—and they don't need to! That's because environmental education is infused throughout the curriculum at all grade levels.

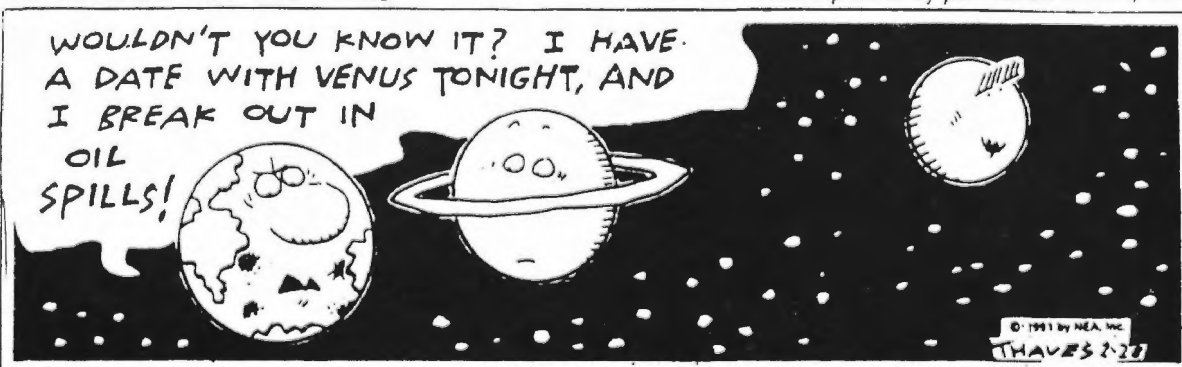
"Our goal has been to frame environmental issues as background

for basic educational activities," said Cathy Cliff, education section chief for the Wisconsin Department of Natural Resources. "Requiring K-12 courses in environmental education would be a significant burden on teachers and schools, which already have many required subjects to teach. Rather, we ask that reading, writing, and arithmetic be taught using familiar issues such as waste disposal, clean water, and wildlife management."

Infusing the environment into the curriculum is only one part of what makes Wisconsin's environmental education efforts a success. According to Cliff, the combination of history, tradition, partnerships, and action has led to the state's nationally recognized education program.

FRANK & ERNEST BOB THAVES

Frank and Ernest reprinted by permission of NEA, Inc.





Wisconsin schools integrate environmental issues into their regular curriculum.

“... we ask that reading, writing, and arithmetic be taught using familiar issues such as waste disposal, clean water, and wildlife management.”

“Taken singly, the environmental education programs that we’re using are not so different from what people are doing across the nation,” noted Cliff. “But when you add together the many facets of our program—all founded in the history of land stewardship and progressive tradition that is unique to Wisconsin and backed by state law—then you can see how we are different.”

Wisconsin’s agricultural heritage has instilled in many residents, urban and rural alike, a high regard for the land and its use. The state also carries the legacy of two great, pioneering environmentalists, John Muir and Aldo Leopold.

State laws requiring conservation education were already on the books in the 1930s. And since 1985, teacher-education graduates in science, social studies, agriculture, early childhood, and elementary education must have competency in environmental education. That competency requires that new teachers

have knowledge of the wide variety of natural resources, methods of conserving natural resources, interactions between living and nonliving elements of the natural environment, and the ways citizens can participate in the resolution of environmental problems.

Most importantly, environmental education in Wisconsin emphasizes teaching kids how to think, not what to think. “The premise is that our children learn how to think and evaluate problems and solutions, rather than learn what we think are the right or correct answers,” said Cliff.

A mathematics problem has one answer. But an environmental problem, like religion or politics, may have several answers.

“We want Wisconsin children to become adults who understand that each decision comes with a price tag on our economy, social structure, environment, emotions, traditions—and heirs,” added Cliff. “That knowledge, along with the tools to make informed decisions and the realization that we have to take responsibility for our own part in the problem, will result in better answers.”

Then there’s the cooperative approach. Environmental education is officially championed by the state’s Department of Public Instruction, which is supported by the Department

of Natural Resources, the University of Wisconsin’s educational system (the University’s Stevens Point School of Natural Resources, in particular), the University’s extension program, private nature centers, and the Wisconsin Association of Environmental Education. They all play major roles. Together, they train the teachers and provide the tools—study guides, fact sheets, Project WILD (Wildlife In Learning Design), Project Learning Tree, curriculum guides, and much more—so that teachers can be informed and feel comfortable with the subject matter.

Environmental education continues to move forward. New on the scene, and yet to make their full presence known, are a Wisconsin Environmental Education Board, the Center for Environmental Education, and the Environmental Education Grants Program.

What really has made environmental education work in Wisconsin, according to Cliff, is the approach taken to get things done. “We just do it,” she said. “We use the resources we have to do what we can. We do it well, and this generates more support for the program.”

What did Bucky, Becky, Betsy, and Bobby learn in school today? Much more than just reading, writing, and arithmetic. □

WHAT THE FAMILY CAN DO

Match a visual lesson to a verbal one

by Mary Metzger
and Cinthya A. Whittaker

Each time we wash the dishes, mow the lawn, prepare a meal, drive a car, do the laundry, or turn on a lightswitch, there is a resulting effect on the environment. Learning what these effects are and working to improve the results have become an immediate mission for many of us. But how do we ensure success for the long term?

This question can be answered in one brief imperative: *Share the knowledge with your children. Build their lives on the fundamentals of respect and nurturing of their planet.* After all, we will pass it into their hands, just as the previous generation passed it into ours. They must take an active role in the Earth's care—the sooner, the better.

Demonstrate by action how to assume responsibility, and explain why action is vital. Don't worry that the information you impart is too technical or advanced. Environmental information can be tailored to suit children's individual needs. You'll be surprised at their readiness and willingness to participate in the learning process.

The best advice we can offer is to start slowly. Do your homework. Focus on the issues that are of greatest concern to you. Perhaps you are concerned with your external environment—the water, land, or air. Perhaps the effects of consumerism weigh on your mind. There are a number of fine books and magazines on the market to help you decipher the mass of information.

As you focus your newfound knowledge on the children in your care, remember that when dealing with pre-school children, the basics are important. How can a three- or four-year-old understand the concept of air pollution if the concept of air is not even fathomable? Here's where creativity comes in—where memory of all those elementary school science

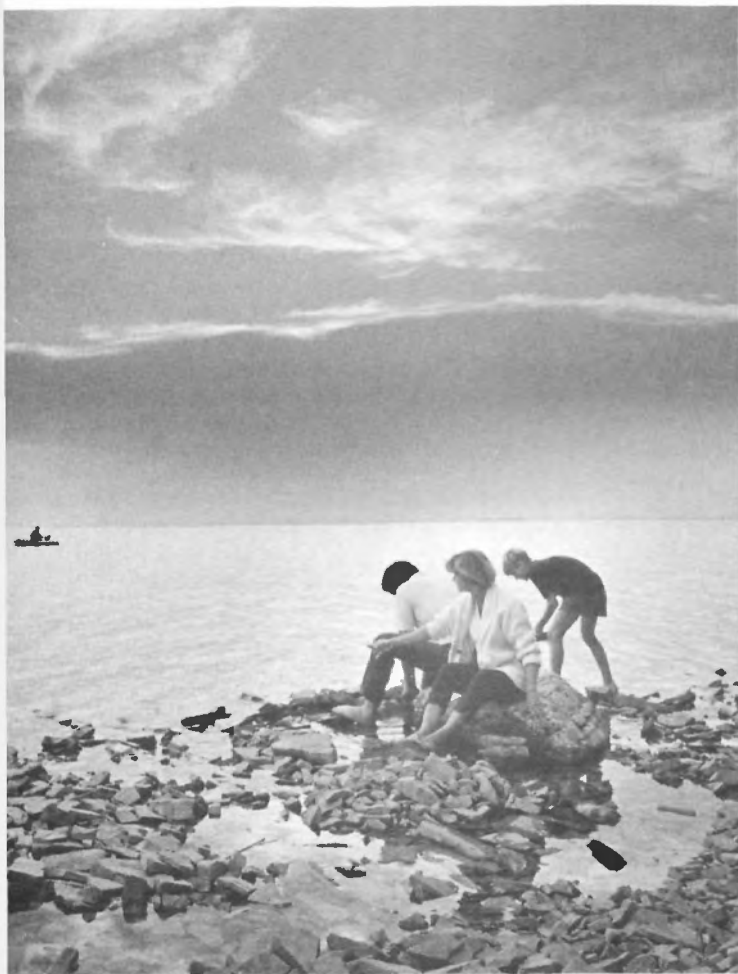


Sharing a sunset together on Big Bay de Noc near Garden, Michigan.

experiments will come in handy. Presenting a visual lesson accompanied by a verbal one is always much more effective, and much more likely to be retained. Using activities as a learning tool will not only teach specific concepts but also nurture a broader understanding of the interconnectedness of all nature's beings and natural processes.

Such activities and projects can run the gamut and can help you and your children appreciate the wonder of Earth's natural processes. As we mentioned before, they can take the form of "science" experiments or can be much simpler alterations to daily activities. Decide what's best for your family and begin acting! Here are a few ideas:

(Metzger and Whittaker are mothers and child-safety consultants. They also serve as lobbyists on Capitol Hill for child safety and accident prevention issues. Ms. Whittaker works for The Nature Conservancy, an environmental group.)



Mike Brisson photo.



Mike Brisson photo. UW-Stevens Point.

What lives at the shoreline? A family outing with nets can be a real learning experience.

Air

Since we mentioned the concept of air as being a particularly tricky one for younger children, try making a pinwheel and talk about how air moves although you can't see it. Open up the discussion to include wind power and energy.

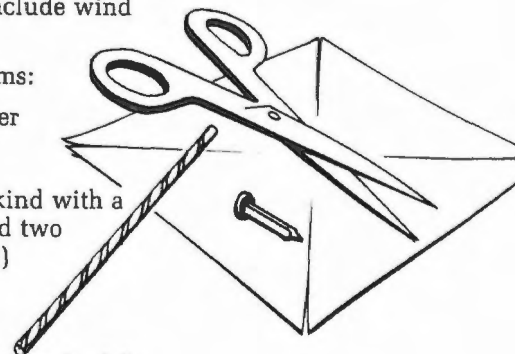
You'll need four items:

Square piece of paper

Straw

Paper fastener (the kind with a head, like a nail, and two prongs that open up)

Scissors.



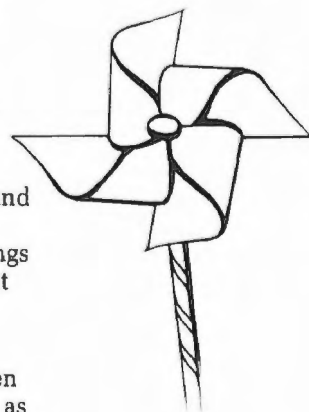
- Make diagonal cuts on each of the four corners of the paper toward the center. (Leave plenty of room in the middle to insert the fastener.)

- Pull one corner of each of the "triangles" toward the center so that the corners overlap slightly.

- Using the prongs of the fastener, make a small incision at the center and insert the fastener through the overlapping corners. Spread the prongs apart slightly but not so far apart that they won't fit into the straw.

- Insert the prongs of the fastener through one end of the straw to fasten the paper pinwheel to the straw. It's as simple as that.

* Note: If your children are interested in decorating the pinwheel, this should be done before the paper is cut and fastened to the straw.



Other activities: To further show "how air works," hang laundry together and talk about the sun's heat. While you're doing it, stretch a rubber band between two clothespins on the line. Check the rubber band in a few days, a week, and couple of weeks if it

lasts. If it deteriorates quickly, you may live in an area with poor air quality. You can talk more about the air pollution in your neighborhood and what can be done about it.

Water

To learn about the water cycle, try this simple experiment. You'll need:

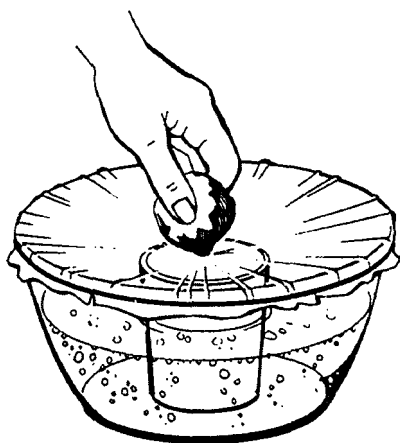
A large plastic bowl (if a clear plastic bowl is available, so much the better)

An empty mug or cup

A piece of plastic wrap large enough to cover the top of the bowl

A stone or other "weight."

- Place the mug upright in the middle of the bowl.
- Fill the bowl with a few inches of water (not so much that the water begins to fill the mug, which should remain empty).
- Cover the bowl with the plastic wrap, making sure it is securely fastened.



● Put the rubber band around the lip of the bowl to make it air tight. String or tape may be used for the same purpose.

● Set the stone or weight in the middle of the plastic cover directly above the mug. During the experiment, the weight of the stone will cause the water to collect in one spot over the mug so that it will fall into it.

● Place the bowl in a sunny place and watch. You'll soon see how the evaporated water condenses on the underside of the plastic cover and, when enough has collected, falls into the mug, like rain!

Water is the basis for all plant and animal life on Earth and as such should be considered precious and never wasted. Let your children conduct a home analysis and see where savings can be made.

To see just how dependent we all are on water, try this little experiment. When your household gets up in the morning, each of you should put a small notepad and a pencil in your pocket. Each time you use water during the day, make a note of it (i.e., tooth brushing, cleaning the fish bowl, filling ice trays, flushing the toilet). It won't be easy to tell how much water you use, but you'll be surprised at how many times you do use it. Your list should be very long. Think about how much is used, multiplied by the members of your household! This is an excellent project for older children.

Land

Increased pressures from our burgeoning population are placing serious stresses on the land—everything from overburdened landfills to exhausted soil. The best help a family can lend to this situation is to recycle. Once your home

recycling is set up, consider the trash found in our public areas:

● Organize your family, school, church group, or neighborhood to clean and recycle trash found in a designated area every week. It could be the local park, beach, or picnic area. You choose.

● Make a concerted effort to stick to your schedule of tending the area you have chosen once a week, or even once a month. Pick up all the trash you find, recyclable or not. Have a contest to see who picks up the most in a day and reward that person with an "eco-prize." It could be a nature book or poster, a T-shirt from an environmental organization—anything you can think of. If you recycle the metal cans you find at a place that pays you for them, the proceeds from your collection can be used to buy the prize. Or you could save your earnings over the course of a year and do something really special with the money, like making your group a member of your favorite environmental organization or adopting a whale or an acre of rain forest.

In summary, we have a responsibility to preserve and protect not just one another, but all those with whom we share the air, water, and land. Use your conviction, commitment, and knowledge to guide you and your children. Your positive action will prove to be one of the best legacies you leave to your children for it will encourage them to follow your lead as they grow into adulthood. There is so much more you and your family can do. □

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LEARNING THEATRICALY

Let's use the right brain

by Peyton Lewis



Howard Connolly photo.

In the musical play "Willa and Wetlands," three muskrats, right, invite Willa to join them in their lodge.

Last year Congress passed a new law calling for environmental education. Environmental education: Sounds good, but what does it really mean? Most of us who call ourselves adults never heard of it when we were growing up. There can be no question that we adults need environmental education ourselves. But to achieve any dynamic and long-lasting effect on the environment, we need to target young people, who

are the future of this planet. If we teach them to have concern for the environment, our children just might give us some lessons in responsible environmental action as well.

A case in point: A recent New York Times article on the "eco-smart" child detailed stories of vociferous children who are educating their parents about all manner of environmental issues—whether or not the parents want to hear. Children have the advantage of taking fresh approaches to the environment without suffering from bad habits that adults have spent a lifetime developing.

So how do we educate our children? What will appeal to the hearts and minds of children and help develop a new environmental ethic? One unique

and exciting approach is by presenting environmental information through the arts. The National Children's Theater for the Environment (NCTE) has developed a program that allows young children to process information in an experiential way so that the information becomes a part of them—and not just another fact they learned in school. Here's what we're doing and why we're doing it.

Traditional environmental education as confined to physical science classes has been less than successful in making children excited about the environment and anxious to approach solutions creatively. According to an EPA Task Force report released in 1990, focusing on science classes "fails to demonstrate and institutionalize the cross-disciplinary nature of environmental issues." Clearly, we need to think more broadly in our approach to teaching children about the environment.

The 1990 report stressed that we need to infuse the entire curriculum with environmental education so that children will be able to draw connections to the environment from a whole variety of disciplines. NCTE operates on the idea that children learn in many different ways, and we want to engage all of their senses in lively interactive learning.

When environmental subjects are confined to the science curriculum, one problem arises from the inherent tendency of many science teachers to appeal only to the analytical (left-brain) learning styles of children. According to a 1989 publication released by the National Education Association (NEA), studies on child learning reveal that the right and left hemispheres of the brain process information differently. The left hemisphere processes information sequentially, analytically, serially, and rationally. The right side grasps whole ideas, patterns, and connections and understands intuitively. The NEA affirms that young students approach reality through imagination, and the arts are an integral part of how they learn. NCTE, taking advantage of that research, has designed a nationwide effort to engage children's interest and involvement in the environment through a whole spectrum of art forms.

The centerpiece of the NCTE arts package is a live play performed for children in kindergarten through fourth grade at their own school. The play is designed to be performed in the round, so that students can be close to the performers and the actors can

(Lewis is founder and president of the National Children's Theater for the Environment. She was an EPA employee for 12 years, serving both in Region 6 and at Headquarters.)

interact directly with the children. The play stresses a humorous approach that avoids any hint of preachiness or talking down to the students. The performance is followed by a teaching videotape for use in the classroom, which reinforces the ideas first presented in the play. It is designed to lead children in follow-up classroom activities that engage them in art, drama, dance, music, sculpture, and poetry.

Through the videotape, children can join in the activities and produce their own art work expressing their understanding of the messages conveyed by the play. They can write their own songs and create their own dances and dramatic presentations. The poetry section prompts children to make action statements about steps they personally can take to preserve the environment. Each videotape is accompanied by a resource guide containing suggested classroom exercises and outside excursions that further reinforce important messages well after the NCTE performance. The program is designed to include a home-fun kit with activities that the children can do with their parents, further extending the reach of the project.

NCTE's pilot project was performed in May 1991 in the Alexandria, Virginia, schools. Funding was provided by the National Safety Council and EPA, with other assistance from the National Oceanic and Atmospheric Administration. Central to the project is "Willa in Wetlands," a musical play that tells of a little girl who enters the wetlands

because she has heard they hold a treasure. She is searching for gold or silver, but instead she finds another kind of treasure.

Along the way, Willa meets a number of animals and plants who live in the wetlands and comes to appreciate them through her exposure. She meets pink shrimp who don't want to lose their comfortable shrimp

The right side grasps whole ideas, patterns, and connections and understands intuitively.

beds. She is surprised to find a rock band made up of rockfish with a lead singer named Wild Rice. Wild Rice sings her a snappy Rap song that is as contemporary as today's school yard. Other wetlands creatures are a bald eagle ashamed of being bald, a trio of crabs concerned about their weedy homes, and three muskrats who want her to join their lodge in the marsh. The Great Blue Heron tells her what she can do to save the wetlands, and Willa realizes what the wetlands treasure really is.

Follow-up activities to this play include a trip to a real wetland where children can look and see and feel the environment. When children cannot make such a trip, they are encouraged to paint different habitats with watercolors or create soft sculptures in clay, fabric, or papier-mâché. A variety of exercises with pantomime and music allows the children to create their own experience of the wetlands.

NCTE plans to expand this program across the nation through the help of theater departments of major universities and community colleges. Because of the opportunity for stage performance and production experience for their students, the college and university theater departments are willing to deliver NCTE plays to the local elementary schools.

Besides seeking general operating funds, NCTE is looking for local funding to go to local universities for performances in local schools. We believe that this kind of local package will attract businesses that want to contribute toward environmental education in their own communities. NCTE is also seeking supplemental support for the promotion and distribution of NCTE programs from a variety of community-based voluntary organizations.

The first subject for an arts package was wetlands protection, followed by a package on indoor air pollution. The package concept is easily adaptable to accommodate many different environmental subjects, but the focus will continue to be on what the individual child can do to make a difference. It is very important not to overwhelm children with grim tales, but rather to focus on positive solutions.

NCTE also offers a full line of arts services tailored to the individual needs of groups that want to develop environmental education programs for children, including videotapes, workshops, educational materials, teacher training, and original plays. We can develop specific programs for educational institutions, corporations, government agencies, or community-based service organizations that wish to use theater or allied arts to teach an important environmental message.

Teaching environmental information to young children through the arts is just one of many ways to do it, but we believe it is a significant approach. Think back on your own elementary school experiences and recall which ones left a lasting effect. Can you still remember a poem you memorized? A song you learned? Remember what it felt like to be in the school play? It is these memories that we are trying to link with sound environmental messages that will last a lifetime. □

Howard Connolly photo.



The National Children's Theatre for the Environment uses humor and imagination to reach youngsters. This bald eagle, a character in "Willa and Wetlands," is ashamed of his baldness.

THE GAMES CHILDREN PLAY

Even Verminous Skumm is made of recycled materials

by Jack Lewis



Playmates Toys, Inc.

The Toxic Crusader and his band do battle with evil polluters.

Environmental education need not be confined to America's classrooms: Kids today do not have to stop learning about the environment once their lessons are over at school. They can continue picking up valuable ideas, often in extremely kooky ways, from the moment they return home to the moment they go to bed. How? By playing with environmental toys, by participating in environmental games, and—in some households—by playing computer games hooked into their family's personal computer. The range of educational or quasi-educational products catering to these various leisure markets is already quite extensive and constantly growing. Here's a brief and impressionistic survey of the fun-oriented environmental toys now available.

Two major lines of "action" toys—Captain Planet and the Toxic Crusader—present environmental themes in packages comprehensible to kids four through seven. "Action toys" are plastic figures approximately 4 inches high, with moveable arms and legs, retailing for a very affordable price in the \$3.50 to \$5 range. Customarily, they are marketed in clusters, complete with heroes and villains, and children first learn the characters' identities by watching syndicated TV cartoon shows that create a "pre-sold" market for spin-off products.

Captain Planet, the creation of the Turner Broadcasting System (in conjunction with DIC Enterprises), is a pro-environment superhero who stars in a popular cartoon show that airs in many major markets. Kids who like that show can become honorary "Planeteers" by joining Captain Planet's fan club, by buying his series of action toys (\$4.99 each), and by playing his special board game, Captain Planet and the Planeteers (\$12.99). Captain Planet and his Planeteers wear the white hat of eco-virtue; the Captain's enemies are, needless to say, the dregs of the Earth. For instance, among the "eco-villains" featured in both the action line and the board game is a character named "Verminous Skumm," half man and half rat, "an underground eco-villain plotting to mold the world into his own dirty image."

Captain Planet toys also typify the new trend toward green packaging and green manufacturing that is sweeping many sectors of the U.S. toy industry—and U.S. industry in general. For instance, purchasers of Captain Planet action toys are enticed with the following information printed on the package cover: "These figures are made with 100 percent recycled materials, and 10 percent of any sales proceeds go to the Planeteer Foundation, which fosters environmental protection activities." Each package also includes an "Environmental Tip," such as "Turn off appliances; don't waste electricity."

Playmates's Toxic Crusader toy line offers more of the same. First kids learn about the series' characters by watching a cartoon show based on the popular four-part cult movie, *The Toxic Avenger*. Then they run out and buy Toxic Crusader action toys and other paraphernalia, ranging from a grotesquely ugly costume called "Toxie's Hideously Deformed Dress-Up Set" (\$9.95) to "Toxie's Light-Up Battle

Mop" (complete with American flag!), perfect for cleaning up hazardous waste (\$7.40), to Toxie's Toxic Waste, "the green toxic glow-in-the-dark stuff that turned Toxie from nerd to hideously deformed creature of superhuman size and strength" (\$2.15). Toxie, of course, is the fearless Toxic Crusader, who like his more popular cousins, the Teenage Mutant Ninja Turtles, owes his super-human strength to a dunking in nasty environmental poisons. Monstrously muscular Toxie, a former 98-pound weakling, leads a "band of deformed do-gooders" as they do "battle with the evil pollutant mutant Dr. Killemoff" and his wicked cohorts.

For kids in the next age group—8 and up—there are plenty of environmental toys and games now on the market. The Kit Company's *Green House Game* (\$18), a board game aimed at children 8 and up, involves advancing from room to room in a big house and pausing in each room to determine what environmentally sound decisions a kid can make without leaving his home. Every good decision is rewarded with an "Environ-Mind Certificate" as well as an "ecopoint." Whoever first gets 10 ecopoints wins the game.

A broader universe of environmental problems is explored in Aristoplay Ltd.'s *Pollution Solution: The Game of Environmental Impact* (\$21), aimed at two to six players, ages 10 and up. This game requires players, either cooperatively or in competition, to clean up a mythical township by making decisions about water use, family planning, recycling, and other matters. Another intelligent board game is L. Dawson Mason's *Recycling: A Solid Waste Management Board Game* (\$19.95) for two to four players ages 12 and up. Players get award cards for "clean and consistent sorting" and "Fine!" cards when they make a recycling error. Organized on a more factual basis is the new *Great Lakes Pursuit Game*, marketed by Ohio Sea Grant; modeled after *Trivial Pursuit*, this \$24 game—aimed at teens 14 and up—consists of questions and answers that impart valuable information about the history, culture, geography, and other characteristics of the Great Lakes. The contestant who knows the most answers advances fastest around the playing board and wins the game.

Computer games are the aristocrats of environmental games; the most



In the computer game SimEarth, players can subject their planet to multiple disasters—and then rescue or destroy it.

Maxis photo.

expensive and the most educational, they are also the most sophisticated, catering to teens 13 and up and appealing to adults as well. Of these, two in particular—*Earthquest* and *SimEarth*—stood out in my estimation.

Earthquest (\$79.95), marketed by Earthquest, Inc., presents students with a lively and entertaining mini-encyclopedia covering more than 150 environmental, geographical, demographic, and historical subjects. The subject matter is brought to life through dozens of interactive plays (such as quizzes and games), imaginative computer graphics and animation, recorded samples of music and languages (including Croatian and Swahili!), 43 maps, and a variety of charts and tables. High-tech *Earth Questers* begin as members of the Earthquest Exploration Team and aspire through skill and daring to become "Global Environmental Heroes." As of September 1991, *Earthquest*—formerly only a Mac-compatible product—is IBM-compatible as well. (As *EPA Journal* went to press, Earthquest Inc. had recently released a brand new computer game, entitled *Ecology*, which computer game fans may want to investigate.)

SimEarth, a new computer game from Maxis (\$69.95), is even more ambitious than *EarthQuest* in that it does not confine the player to planet

Earth. Earth is only one of seven ready-to-evolve planets that the *SimEarth* player can subject to varying conditions of climate, evolution, mutation, pollution, and continental drift. Through skillful manipulation of this complex software package, the player can experience the often surprising impact that diverse factors have on each other when they interact. Wars occur, volcanoes erupt, the Greenhouse Effect causes flooding, and nuclear accidents occur, all to accompaniment of weird music and sound effects. These cataclysms—usually avoidable, if intelligence prevails—teach youngsters about the Gaia hypothesis: the concept that planetary worlds are living systems that adapt to changing conditions. Students will learn more specific, nitty-gritty information by playing *EarthQuest*, but *SimEarth* will give them a thrill that game does not provide: the Godlike power of making (and breaking) whole planets through shrewd planning, malicious misplanning, or some playful combination of the two.

Playfulness is the saving grace of the new green toys now available for home use. Environmental problems are serious, but let's not overtook the value of playfulness in learning to deal with them. What's more, who says kids should have all the fun? If environmental issues start to weigh you down and that sour feeling of apocalyptic gloom just won't go away, imagine Captain Planet, Verminous Skumm, Toxie, Dr. Killemoff, plus a passel of Planeteers and Earth Questers, all marching into your home and fighting for (or against) Planet Earth right in the privacy of your den. □

IN PURSUIT OF THE LORAX

Who's in charge of the last Truffula seed?

by Jennifer Zicht

It reads like one of today's environmental disasters: Greed reigns. Industrialist destroys forest despite warnings of forest-right-to-lifers. Land wasted, air polluted, water fouled.

Name the forest spokesman, Lorax. Call the industrialist, Once-ler and the trees, Truffulas. Put the language of the story in whimsical rhyme, and you have one of the most poignant and sobering pieces of environmental literature written for a six-year old—*The Lorax*, by the late great Dr. Seuss.

This book has all the attributes of good literature while serving as an excellent environmental tool. Dr. Seuss's prose is lively, if not zany, clear, and logical. The story rivets the reader's attention, and the message is

so amusing and thought-provoking that readers won't put it down.

As an educational tool, *The Lorax* gives readers all the details leading to the tragedy. It shows how an ecosystem functions and how it ultimately disintegrates as a consequence of an individual's selfish actions. It presents both sides of the controversy in an unbiased fashion. Above all, *The Lorax* gives the reader a sense of commitment. As the Lorax retreats from the wasteland, he leaves a stone monument with the word "unless" etched upon it. The meaning: "Unless someone like you cares a whole awful lot, nothing is going to get better. It's not." The tale ends optimistically when the reader is asked to plant the last existing Truffula seed.

For many young children, *The Lorax* may be a first introduction to environmental education. Like many other books, it can have a powerful and lasting influence on a child's thinking. As the world's environmental problems escalate and environmental education programs in schools increase, the need for quality books and periodicals, not to mention textbooks, educational kits, and video programs, will grow.

Since President Bush signed the National Environmental Education Act last November, book companies, wildlife organizations, special interest groups, and others have published hundreds of environmental books for children. The books come in all forms: heavy duty non-fiction, light-reading "think green" guidebooks, activity pamphlets, coloring books, picture books, and fiction. Magazines have stepped up coverage as well. More and more environmental listings fill the pages of the *Children's Magazine Guide*.

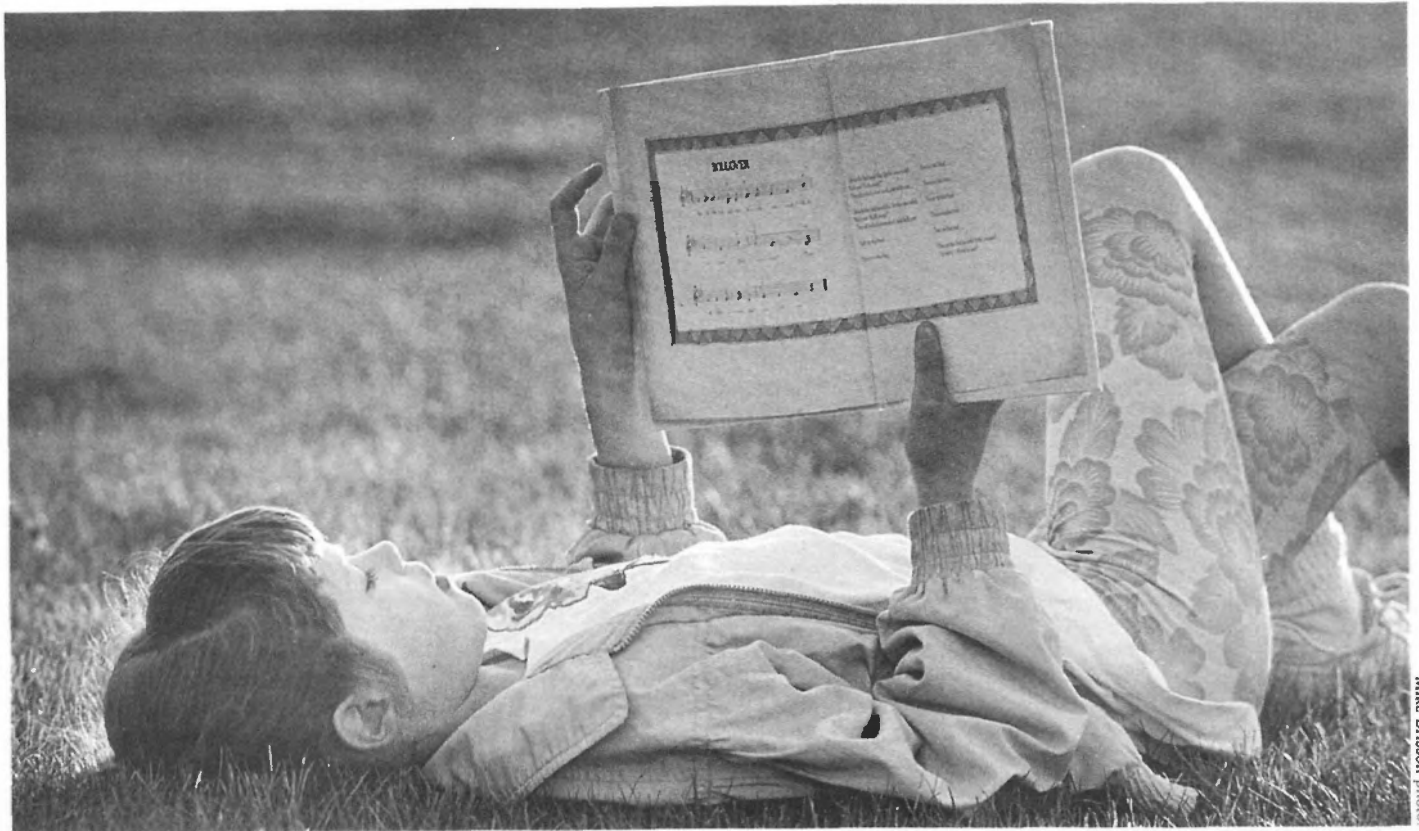
What are children getting in the way of quality literature? Are the messages as wholesome and unbiased as Dr. Seuss's?

Continued on next page



A creation of the late Dr. Seuss, The Lorax helps young children understand that natural resources are not limitless.

(Zicht is a free-lance writer in the Washington, DC, area.)



Mike Brisson photo

Book stores and libraries now offer many children's books on environmental subjects.

Non-Fiction

Children need current and accurate information to gain awareness and knowledge for accessing today's problems. To partially fill that need there is a wealth of books for older readers—age 12 and up—dealing with single topics that range from famine to ozone depletion. The books, averaging a hundred or so pages, generally feature black and white photographs in fairly uninspiring formats.

In most cases, professional writers, not experts in scientific fields, write them. Often these writers have no background in science. In defense of professional children's writers, magazine editor and writer Ross Bankson states, "The writer's job is to interpret, expand, and simplify concepts. The writer acts as a filter between scientist and reader, eliminating the jargon and complexities and leaving behind crystal clear prose." Unfortunately, many writers don't rely on scientists or experts at all, but on secondary sources. This leads to factual errors and out-of-date material. All too often, many writers fail to cite scientific experts or include documentation, bibliographies, and footnotes.

Well-written and academically sound books do exist. Laurence Pringle, author of more than 50 books, is one of the foremost science writers for children. *Water: The Next Great*

Resource; Lives at Stake: The Science and Politics of Environmental Health; Rain of Troubles: The Science and Politics of Acid Rain; and Global Warming: Assessing the Greenhouse Threat are a few of his works geared for ages 12 and older. Pringle's clear writing draws readers into the subject. Expert opinions from both sides of a controversy fill his pages. His books always include bibliographies tailored to the age group.

Another award-winning author, whose methodology parallels Pringle's, is Kathlyn Gay. Her books include *Silent Killers: Radon and Other Hazards, Ozone, Acid Rain, Water Pollution, and The Greenhouse Effect*. Not only is her writing clear, but she often acknowledges experts in her texts and includes footnotes, bibliography, and a list of sources to contact.

Although these single-issue books provide excellent explanations and background information, they can't possibly keep up with new events in the environmental arena. "Take CFCs, for example," says life science teacher George Martin of Bethesda, Maryland's, Thomas W. Pyle Middle School, "there's no way a book published three months ago can keep up with the politics of that topic. Only periodicals and other media sources can keep up with the latest developments."

There is probably a greater need for

books dealing with single issues for younger readers in elementary school than for older readers. Young readers don't have the math or reading skills that give them access to adult periodicals and books. For the elementary school crowd, many book publishers market series books with beautiful illustrations, snazzy layouts, and bite-sized texts. In comparison to the drier textbook look of the non-fiction books for older readers, these slim volumes grasp the reader's attention immediately.

One such volume in the Nova series is Evan and Janet Hadingham's *Garbage! Where it Comes From, Where it Goes*. This book is a real page-turner. It's filled with eclectic facts like TV toss-outs and tinsel trash. It offers an array of backyard garbage activities—such as "garbage graveyard." (Parents with pristine lawns will especially appreciate this project.) Other engaging and amusing sections include: the poo-poo train, the case of the vanishing trash bag, garbage pirates, and Chicago's 1893 traveling trash oven. Old photographs and prints augment the color photographs and comics.

Tony Hare's *The Greenhouse Effect*, a British import, offers smashing layouts with colorful diagrams and photographs. In the section entitled "Stoking the Furnace," an eye-catching

illustration covering nearly two pages shows a hot air balloon rising. Curved segments of the balloon, each a different color, note the percentage of a greenhouse gas entering the atmosphere. Beneath the balloon spreads a landscape, filled with tractors, trucks, junked refrigerators, and cows, each with an arrow designating a particular greenhouse gas. More books should invest in high quality diagrams like this one.

"Sometimes a simplified text can't explain a difficult concept, but a diagram can," exclaims Ross Bankson.

Unfortunately, many series books fall flat when it comes to text: too many difficult words in a paragraph; words not defined; concepts not explained. Elementary school children lack the background to understand these books and the junior high kids shrug them off as being too juvenile.

Nature Books

Wildlife and habitat books for all ages are plentiful. Recent books explore everything from species extinctions in Madagascar to whales and elephants. With marvelous color photographs and beautiful paintings, these books can only encourage young readers to explore their natural world. To many environmental educators, if a child is encouraged to wonder about the natural world early on, the chances are good that he or she will develop a life-long commitment to it.

Activity Books

Activity books for "turning the earth green" abound. The Earthworks Group's *50 Simple Things Kids Can Do to Save the Earth*, Linda Schwartz's *Earth Book for Kids—Activities to*

Help Heal the Environment, and *Going Green: A Kid's Handbook to Saving the Planet* by John Elkingon, Julia Hailes, Douglas Hill, and Joel Makower are just a few. Enterprising children ages seven and older will relish these "how-to" guidebooks crammed with activities and projects galore that they can do on their own.

"In most families, it's the kids, not the parents, who initiate recycling and other activities to help their environment," says Craig Tufts, naturalist and director of the National Wildlife Federation's urban wildlife programs. "Kids don't have to change their behavior markedly to make a difference; adults have to change ingrained behavioral patterns." With these nifty guides, kids can explore water wastage, excess packaging, recycling, toxins, endangered habitats, and hundreds of other environmental topics. In Linda Schwartz's *Earth Book for Kids*, youngsters first learn about oil spills, then try their hand at cleaning up a miniature spill in a kitchen pan. After this experiment, kids, as well as parents, have a better understanding of the complexities of an oil spill cleanup.

In some books, activities seem linked to stances taken by lobbyist and special interest groups. In one guide, children are encouraged to tell parents and neighbors not to buy animal products, not to use disposable diapers, and to avoid pets bred in captivity. "Activities that help increase understanding and make a child think for him or herself are good and positive environmentally," believes George Martin. "Activities where someone is telling a child what to believe and what to do are detrimental. Kids have to go into the world making

their own decisions; they shouldn't be someone's pawns in a cause."

Magazines

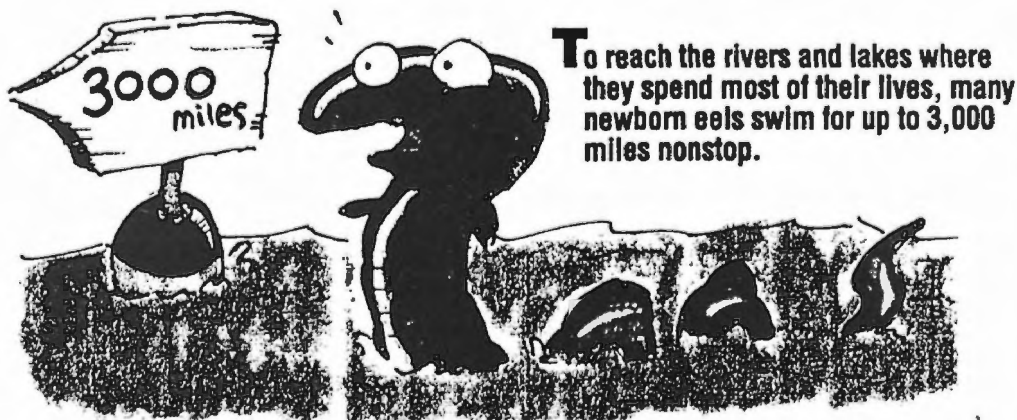
Magazines offer one of the best ways for children to learn about their environment in a leisurely and enjoyable fashion. Where many good books are inaccessible to young reader's abilities or inclinations, articles are not. Children's magazines, targeted to the home market, rather than the school market, are entertaining and splashy, with brief and up-to-date articles. Since the competition among children's magazines is fierce, more thought, effort, and money is put into the articles to entice the readers and keep them enthralled.

Twenty or more excellent children's magazines, devoted to geography, wildlife, and current events, feature well-researched articles on current environmental problems. Many of these magazines, like National Wildlife Federation's *Ranger Rick*, National Geographic's *WORLD Magazine*, and Children's Television Network's *3-2-1 Contact*, just to name a few, employ inviting layouts, colorful graphics, and color photographs to capture the reader's interest visually, while attacking some hard issues.

These magazines, especially *Ranger Rick* and *WORLD*, are known for unbiased reporting, research, and the use of educational consultants. Often they will approach environmental issues by selecting photographs of appealing subjects that draw the reader into a story: a cuddly animal for an extinction story; a fancy racing car with a trail of exhaust for a fossil fuel story. Frequently, games, activities, and projects supplement these stories. Short pieces on noteworthy children who have done something good for their environment often accompany articles.

Frequently, a magazine will devote an entire issue to environmental concerns. Recently, *Faces: The Magazine about People*, put out by Cobblestone Publishing, devoted an issue to recycling and its history. Topics included: recycling in Greek and Roman myths, art from trash, recycling around the world, and fashioning beads from discarded magazines. *3-2-1-Contact* devoted its April issue to a series of environmental issues, including air and water pollution, alternative forms of energy, and famine.

P3, the Earth-based magazine for kids, is the only children's magazine



A "Factoid" from *3-2-1 Contact*, a children's magazine.

Reprinted with permission of Children's Television Workshop.

devoted entirely to environmental issues. "P3" stands for the earth, the third planet from the sun. P3's text entices with puns and plays on words; its hip cartoons, drawings, and wild layouts amuse. Features in one issue included: "The Fossil Fuel Gas-ETTE," with a cartoon showing picnickers flinging fried chicken at one another at the fossil fuel fan fried chicken fest; "P34Me.C?"—an official P3 poster; "Fool for Fuel," a pencil game where readers help the driver of the gas-guzzling car to the Solar Trade-O-Mat so he can buy a mean, clean, sun-powered machine; and "Eco-kids," featuring kids doing good things for their environment.

"We started our magazine because there was a real need," says Jackie Kaufman, publisher and one of the founders of P3. "Kids are not protected from anything these days. They see everything on TV. We're the source to explain the issues—and give them a perspective on these issues." For many children, P3's inviting layouts and small nuggets of information may be the only introduction they have to their environment outside school.

Of all the magazines, P3 probably encourages children's activism the most. Many of the articles conclude with letter-writing projects to the President, executives of large corporations, and governmental officials. "Our magazine's goal is to give kids a perspective on issues and to tell them they have the power to change things," says Jackie Kaufman. "Although small, letter writing is a decisive tool. Kids can really pull a lot of weight. The proof is in Starkist dolphin-safe tuna." Some educators believe it is good to encourage activism, but that it shouldn't go unleashed. "Kids need to do their research, they have to know about the issues, they must develop the skills and knowledge before they take action," believes George Martin.

In this same vein, children's magazines and some activity books feature children as role models. What kind of children do parents want their own offspring to emulate—a teenager who single-handedly prevents a developer from building a condo near his home, or a BLT (Balloon Launch Terminator), trying to prevent kids' groups from launching helium balloons because they threaten the lives of sea animals who mistake the soggy balloons for food?

Fiction

It's impossible to assess the importance of fiction. Although a work of fiction will not help with last minute answers to an acid rain project, it can offer far-reaching environmental messages to readers of all ages. By empathizing with characters, a child can vicariously travel to a new world and see that world from a different perspective. From the point of view of fuzzy and cuddly Wumps, toddlers see the Wumps' green world destroyed by Pollutians in Bill Peet's *The Wump World*. From the point of view of child sleuths, older readers investigate the mysterious "environmental" death of a robin in Jean Craighead George's *Who Really Killed Cock Robin?*

The messages in fiction, like those in nonfiction, are not always wholesome. An author can present any number of issues by distorting truth and giving a very biased opinion, thus warping young minds. Children, especially young children, are more impressionable than adults, and they often lack the background for deciding whether something is wrong or right. It's important that adults take the effort to weed out some of these messages, or at least put them into context.

The role of books and magazines is important in environmental education. They need to enlighten, teach, and inspire children to become aware of their world and its problems. Books must help children develop the skills needed to wrestle with problems. "Ultimately," states George Martin, "you want kids to go out into the world thinking for themselves. Environmental problems will affect them in every aspect of their lives, in any field they pursue. They are the ones that have to come up with the solutions." Books will serve in that struggle. Here's Dr. Seuss:

"So . . . Catch!" calls the
Once-ler. He lets something fall.
"It's a Truffula Seed. It's the last
one of All! You're in charge of
the last of the Truffula Seeds.
And Truffula Trees are what
everyone needs. Plant a new
Truffula. Treat it with care. Give
it clean water. And feed it fresh
air. Grow a forest. Protect it from
axes that hack. Then the Lorax
and all of his friends may come
back." □

TOWARD ENVIRONMENTAL RESPONSIBILITY

How do we become literate?

by Anthony D. Cortese

Traditionally, governments have relied on command and control regulation to protect the environment. However, the diverse and diffuse nature of human activities, which are causing environmental transformation and degradation, clearly require that we use every possible tool to change the behavior of individuals and institutions. As articulated by the EPA Science Advisory Board in its recent report, *Reducing Risk*, these tools should include market incentives; technology transfer; technical assistance; research and development; the provision of information to government, industry, and the public; and education and training.

Need for Environmental Professionals

A major shift in the relationship of humans to the environment will require a long term societal effort in environmental education. Because virtually every human activity affects the environment, we need several kinds of well-trained interdisciplinary professionals.

Lawyers and other specialists are needed to develop government and industry policy, laws, and regulations to protect the environment. Scientists are needed to understand the natural world, the effects of human activity on the environment, and the fate and transport of pollutants. Health specialists should help us understand the effects of pollution on humans and



Dealing with environmental problems is going to require not only skilled technicians but increasing numbers of interdisciplinary professionals. This specialized class is for asbestos workers.

advise policymakers on strategies to reduce hazards. Engineers are needed not only to control pollution and clean up contamination, but to develop technologies and products which will prevent pollution and minimize waste. Economists are needed to evaluate the costs of pollution and resource destruction against the costs of strategies and policies to prevent or reverse them. Geographers and planners are needed to develop solutions that are socially, culturally, politically, and economically appropriate for different parts of the world.

Unfortunately, there is a great shortage of such highly trained personnel. It has been estimated, for example, that 100,000 new professionals will be needed in the United States alone to deal with hazardous waste problems by 1995. Further, the education and training of the current workforce is incomplete. Most professionals are trained to deal with a subset of environmental problems, such as air pollution, water pollution, or hazardous waste. They are not trained holistically to deal with issues in an integrated and comprehensive fashion. This only exacerbates the intermedia problems that have emerged in the last two decades. For example, until 1980, pits, ponds, and lagoons were used to contain industrial wastes in order to prevent the wastes from contaminating surface water. Little regard was given to the serious ground-water pollution that resulted. Many recently recognized problems, such as indoor air pollution, wetlands protection, global climate change, stratospheric ozone depletion, deforestation, and loss of biodiversity, are not systematically included in most of the academic degree programs educating professionals.

Finally, current programs produce people largely oriented toward controlling, remediating, or cleaning up environmental problems. We must change our philosophy to anticipating and preventing pollution as the strategy of choice. Economic development and industrial strategies that reduce consumption of resources,

the use of toxic substances, and the production of wastes are essential to prevent further environmental degradation and to protect human health. Further, they are often the only effective solution (e.g., removing lead from gasoline), and they are less expensive in the long run.

We need a concerted national and international strategy to ensure that there is an adequate and continuing supply of environmental professionals. These professionals must be trained to understand environmental issues in a holistic and integrated fashion involving population, natural resources, and pollution and both to anticipate and to prevent as well as to control and remediate environmental problems.

Environmental Literacy and Responsibility

All members of society consume resources and produce pollution and waste. It is essential, therefore, that they all understand the importance of the environment to their quality of life and that they have the knowledge, tools, and the ethic to carry out their daily lives in ways that minimize the impact of their actions on the environment. That is, the ability to have a sustainable future is entirely dependent on having the next generation of human beings be environmentally "literate and responsible."

Environmental literacy and responsibility require a new education strategy at all levels—K-12, colleges, and graduate and professional schools. The environment should not be solely a special topic or a subject for professionals who will work on environmental problems. Because the environment provides the basis for life and is a major determinant of the quality of life, it must be a fully integrated and prominent part of all education. This is especially important for the education of professionals in business, engineering, science, medicine, architecture, economics, government, science, demography, and law. With such knowledge and understanding, these professionals will help make our productive sector and

government more efficient in the use of natural resources and energy and reduce adverse impacts of their activities on society. Business and industry will be more competitive and successful and will improve community and government relations.

What would it mean for professionals to be environmentally literate and responsible? A focus on two professions—business management and medicine—provides some insight.

Environmental degradation and pollution are among the most important concerns for business and industry. Environmental pollution affects the health and productivity of workers, the general public, fisheries, agriculture, and forests. Depletion and destruction of natural resources will constrain short and long term economic growth. Societal remedies such as laws, regulations, taxes, and legal and financial liability for environmental damages and restoration will increasingly limit business decisions. Investors and consumers increasingly are demanding environmentally responsible products and activities. The costs of controlling pollution and managing wastes are increasing rapidly. So too is citizen opposition to industrial activities and pollution and waste management facilities. All these may affect the right or the ability of industry to operate in many locations. Moreover, job seekers, particularly graduating students, are increasingly questioning the environmental record and commitment to environmental stewardship of potential employers. The ability of corporations to remain competitive and to sustain their activity will increasingly depend on their response to environmental issues.

Business school students should be taught how products sold and services rendered affect the environment. They should understand the significance to environmental quality of facility design and location, choice of technology and process, management of unwanted byproducts, mergers and acquisitions, real estate transactions, and investments. They should be taught what business's legal and financial liability is for pollution and



At Tufts University, faculty from various disciplines learn how to incorporate the teaching of environmental issues into their specialties.

waste, how environmental regulation by government will affect their business, and what they can do to reduce compliance costs. The value of business decisions, technologies, products, and services that encourage less energy and resource intensity must be part of their education.

Since environmental effects and depletion of resources are not incorporated in the conventional pricing of goods and services, business students must be taught the principles which account for these effects in both the short and the long term, and how current methods of short term analysis mitigate against environmental protection. Future business leaders should understand how consumer and investor pressure for environmentally responsible products, services, and manufacturing will affect business competitiveness. And they should be taught the social responsibility of business in minimizing environmental impacts throughout the entire production cycle—from the extraction of resources through production, use, and final disposal.

Unfortunately, such training is rare in business schools. Sixteen major corporations have supported an effort through the National Wildlife Federation to develop special courses on environment and business and to develop a book of case studies that can be used for teaching in business schools. Government and industry have formed a new non-profit institute, the Management Institute for Environment and Business, to develop programs for integrating environmental education and research into business schools. However, no business school

requires environmental management education, nor has environmental management been integrated into its curriculum.

Traditional physician training is designed around the medical model of "finding and fixing" a health problem. Practicing medicine in a world subject to pressures from population and industrialization requires that we reorient our thinking to creating and ensuring health, not just curing disease. Human beings owe their existence to the natural environment and cannot be completely isolated from infectious and toxic agents transmitted through the environment. All physicians, and especially primary care physicians, should understand the relationship of environment to health. They should be able to detect, diagnose, and treat environmentally related disease, know how to obtain information about environmental hazards, how to advise patients on strategies to reduce exposure to hazards, and be able to refer patients to environmental and occupational medicine specialists. This will require basic training in epidemiology and biostatistics, biological, chemical, and radiation toxicology, human activities that cause environmental hazards, pathways of human exposure to environmental agents, strategies for elimination and reduction of exposure to environmental agents, treatment of environmentally induced diseases, and nutrition. Physicians should also have a basic understanding of how natural ecosystems function and provide resources essential for life; how human activities stress natural resources; and should understand ecological

principles such as the ability of an ecosystem to support human populations on a sustainable basis, and the strategies for managing population growth.

There is an acute shortage of occupational and environmental medicine specialists. According to a survey by Dr. Barry Levy in 1985, two-thirds of the U.S. medical schools require occupational medicine training. However, the median time is four hours in four years, and there is no training on the effects of exposure to environmental hazards in the outdoor environment, in the home, or during recreation. In addition, there is no ecologically based training.

The Tufts Initiative

How do we make environmental education an integral part of the nation and the world's education? With the strong direction and support of President Jean Mayer, Tufts has made a major commitment to ensuring that all students graduating from Tufts in the Schools of Engineering, Liberal Arts, Medicine, Veterinary Medicine, Nutrition, and the Fletcher School of Law and Diplomacy are environmentally literate and responsible citizens. This is being done through the Tufts Environmental Literacy Institute (TELI), which develops the capability of faculty in a wide variety of disciplines to incorporate the teaching of environmental issues and perspectives within their teaching specialties.

Established in 1990 with support from the Allied Signal Foundation and later with additional support from Union Carbide and EPA, TELI conducts a two-week intensive workshop each spring on environmental science, engineering, policy, and management for faculty from a variety of disciplines. The program is conducted by environmental specialists from academia, government, industry, and environmental groups. Faculty, with modest financial and technical support, work on revising their regular curriculum to integrate environmental issues and perspectives during the summer. Revised curricula are

reviewed by other faculty and, after evaluation, are made available to faculty at other universities as part of a larger strategy to extend the reach of TELI programs.

The results to date have been very encouraging. In its first year, TELI developed the capability for 25 Tufts faculty members to incorporate the teaching of environmental issues into such diverse curriculum as mechanical engineering, economics, history, international diplomacy, drama, sociology, and chemistry. This year, 45 faculty members from Tufts and 10 other universities, including universities in Brazil and Canada, participated in the program. A member of the Supreme Soviet, a Korean development economist, an Indian university president, and a Brazilian university faculty member joined Tufts environmental specialists in conducting the program. As a result, between 5,000 and 8,000 students have been, or will be, exposed to environmental issues and perspectives in non-environmental courses in 1991 and 1992.

For example, an engineering professor has redesigned the freshman course in Engineering Design involving 200 students. Using the university itself as a case study, students identified ways to reduce the use of fuel, electricity, water, and solid materials and the production of pollution and wastes in three major Tufts buildings. An economics professor developed a course in Environmental Economics and Policy which involved executing a major project in cost/benefit and life-cycle cost analysis on products used by Tufts dining services, water conservation, fertilizer use, transportation, and composting. A language professor has revised all six major courses required for a major in Spanish to include environmental readings from Spain and Latin America and to make environmental issues and controversies the subject of paper topics and debates. Two civil engineering professors have modified their courses in geotechnology, soil mechanics, and foundation engineering to use environmental problems such as landfills, sludge disposal, and waste containment and cleanup along with more traditional examples, such as dam building. A direct result has been the formalization of a new MS degree in environmental geotechnology. A drama professor is using an

environmental theme as the basis for two acting courses. In both, acting is being taught, but the environment is the topic or theme for many in-class exercises and homework assignments (e.g., personal storytelling, scenes from existing plays, and selected readings about the environment).

Our long-term goal is to have TELI serve faculty from high schools and other universities in the Northeastern United States and universities in developing countries. The strategy for the latter is to develop the capability of universities to establish their own TELI unique to their culture, but connected with Tufts. We are planning to conduct a training program for faculty from the Universities of Sao Paulo, Mato Grosso, and Brasilia in Brazil in the summer of 1992. By developing the capability of 500 faculty members from Tufts and other universities over the next 5 years, 75,000 to 100,000 students will receive broad, continuing and repeated exposure to environmental issues in the context of their regular disciplinary studies.

EPA's Role in Environmental Education

EPA should consider environmental education as one of its most important tools to motivate environmentally responsible action. Because environmental issues are multidisciplinary, interdisciplinary, and extremely complex, neither universities nor other governmental science agencies, which are organized along traditional disciplinary lines, are likely to make environmental research and education a major priority. EPA should play a dual role of providing direct support for environmental education and of leading an intergovernmental and intersectoral effort to develop a long term societal strategy for environmental education. This is extremely important because it is impossible to take environmentally responsible action unless we are motivated and have the knowledge and tools to do so. □

(Dr. Cortese is Dean of Environmental Programs at Tufts University.)

SHORTFALL IN THE WORKFORCE

Where will we get
the scientists
and engineers?

by Maureen Delaney



J. D. Sloan photo. Copyright 1990.

As fewer students prepare for careers in science and technical fields, an increasing demand for these professionals is predicted to exceed the supply. Pictured is a hazardous materials worker training session.

A crisis is looming in our workforce. Leaders in industry and government are faced with a convergence of trends that has enormous implications for the future: Labor needs in science, engineering, and technology are growing, while at the same time there has been a dramatic reduction in numbers of students preparing to meet the demands of these vital occupations.

Congress, the Department of Labor, and others have studied this gathering crisis and, step by step, are coming to grips with it. They have made strides to inform various segments of our society of the critical shortages anticipated. They have called for action from all sectors to address the critical needs. The single most important objective is to prime the educational pipeline, beginning with kindergarten, in order to cope with the workforce realities of the 21st century.

These developments are of great concern to the environmental sector since our success in meeting the environmental agenda relies on a high-technology workforce.

A 1987 report prepared by the Hudson Institute for the U.S. Department of Labor, titled *Workforce 2000*, has been the catalyst for current

efforts to address the workforce issues facing the United States as we approach the next century. *Workforce 2000* highlighted three major trends which need to be taken into account by those concerned with sustaining the technological leadership this country has traditionally provided. In order to ensure the existence of a viable workforce, both industry and government will need to find ways to address these predicted technological and demographic changes: an increased need for educated workers; a much higher proportion (85 percent) of women and minorities among new entrants into the workforce by the year 2000; and a marked decline in the pool of young workers.

The first issue that has been identified is the need to meet coming demands for educated workers. This will require improvements in our approach to education and training. It is anticipated that between now and the end of this century, the majority of all jobs will require some post-secondary education. There will be a dramatic increase in new jobs for such occupations as engineers, mathematicians, and scientists. In fact, the growth rate in those occupations should reach at least 25 percent by the

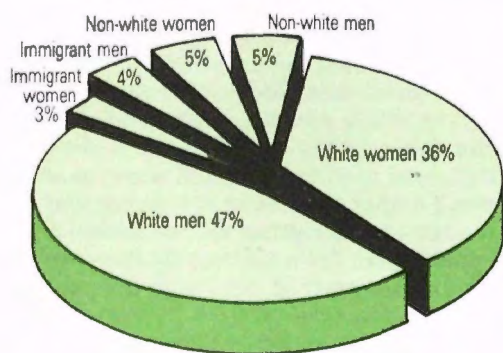
(Delaney is Chief of EPA's national recruitment program.)

The single most important objective is to prime the educational pipeline, beginning with kindergarten . . .

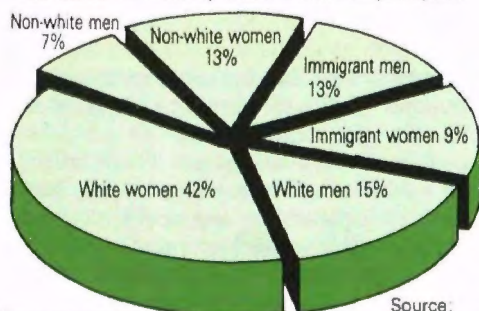
year 2000. However, the number of students entering science and mathematics fields has declined significantly, and there has been a noticeable decline in achievement in these subjects as well.

For example, a 1987 study by the UCLA Higher Education Research Institute has found that freshman interest in science majors has declined by one-third in the past two decades; interest in engineering is down by one-quarter; and interest in computing careers has fallen by more than two-thirds in four years. Declining student interest in science and engineering has serious impacts at advanced levels of study; in contrast, the participation of foreign nationals has increased dramatically. Today, over 44 percent of students in graduate engineering programs are foreign students.

The Changing Labor Force (1985-2000)
1985 Labor Force: 115,461,000



Net New Workers, 1985-2000: 25,000,000



*(Due to rounding percentage figures may not add up to 100.)

Source: U.S. Department of Labor

A second significant issue in terms of the dynamics of the U.S. labor pool will be the dramatic increase of women and minority group members among entrants to the workforce. Women will represent about two-thirds of the new entrants to the workforce, and "non-whites will make up 29 percent . . . , twice their current share" (*Workforce 2000*) by the year 2000. This is an important consideration. Traditionally, women and minorities have been tracked in the education pipeline toward subject areas that involve marginal mathematical and scientific theory. Given this trend, we as a nation are not preparing the workforce of the future to assume the important roles necessary to maintain a highly technical society.

The third major factor to take into account regarding labor resource realities of the 21st Century is the aging of the workforce. By the year 2000, the number of workers between the ages of 16 and 24 will decline by almost two million. The decline in new entrants to the labor pool, coupled with the increased technological nature of the work, will create a shortage of people prepared to address the serious technological needs of the future, including needed developments in the environmental field. While a more mature labor force has many positive attributes, one issue is clear: There will need to be additional training of individuals already in the workforce to compensate for a lack of incoming qualified entrants.

In order to meet our technological goals and maintain a leadership role in the world, the United States will have to do a significantly better job of attracting students to mathematical and scientific studies and supporting career preparation in these fields. For organizations in the business of addressing environmental issues, it is important to understand the looming crisis concerning the makeup of our

labor force. The next step is to get involved in finding solutions to the problem: This should be made a matter of priority.

Strategically, we must encourage all students who have an interest in science and technology to develop the skills needed to sustain our technological society. In order to preserve our future labor pool, we need to attract minority groups and women into these non-traditional areas of study. And beyond academic course decisions lies the critical choice every student faces regarding occupational options as an engineer or scientist. EPA has a responsibility to reach out and help students understand the real challenges and rewards of environmental careers in science and technology.

EPA's workforce needs reflect the needs of the environmental sector in general. Over one-third of all present EPA employees have science or

Science and Engineering Pipeline, from High School Through Ph.D. Degree (1977-1992)

1977 All high school sophomores	4,000,000
High school sophomores with S & E interest	730,000
1979 High school seniors with S & E interest	590,000
1980 College freshmen with S & E intentions	340,000
1984 Baccalaureate degrees in S & E	206,000
Graduate study in S & E	61,000
1986 Master's degrees in S & E	46,000
1992 Ph.D. degrees in S & E	9,700

Source: National Science Foundation

During the next five years alone, EPA will hire at least 1,500 scientists and engineers at all levels of the organization.

engineering backgrounds. During the next five years alone, EPA will hire at least 1,500 scientists and engineers at all levels of the organization. Looking toward the longer term, EPA has given its national recruitment program the theme, "Preserving our Future Today."

EPA's responsibility extends beyond concerns for ensuring that trained graduates are available for our own workforce. Attaining the nation's environmental goals is predicated on shared responsibility. Therefore, the Agency has an obligation to be concerned about the supply of engineering and science students who are preparing to meet environmental challenges in industry, at state and local government levels, and in communities.

Moreover, EPA recognizes the importance of contributing various kinds of support in order to boost the capacity of our academic institutions to produce the skilled talent the United States will continue to need, and the Agency has developed strategies to address the concerns identified. For example, EPA has launched an Academic Relations Program which will target campuses nationwide in a comprehensive education and recruitment program. This umbrella program encourages active EPA/campus interchanges through such means as student employment programs, seminar series, visiting professor engagements for EPA officials, research grant programs, equipment loans, and tuition assistance. In coordinating these activities, the program will use a network system to maximize the use of EPA resources and distribute opportunities.

In addition, a major new initiative is being implemented to support minority academic institutions. Administrator William K. Reilly recently approved an action plan, proposed by the Agency's Minority Academic Institutions Task Force, that



KAL. Copyright 1991. Cartoonists & Writers Syndicate.

commits EPA to providing unprecedented support to minority campuses. The action plan includes the following activities at minority academic institutions:

- Creating three centers based at academic institutions for development of environmental curriculum
- Providing scholarships and fellowships
- Developing a workshop series with private sector support
- Providing major equipment and research instrumentation acquisitions
- Creating an Academic Center of Excellence in environmental science or engineering.

These activities, together with an emphasis on student employment programs, cooperative education, and tuition assistance, are intended to help minority academic institutions to become leaders in training the environmentalists of tomorrow.

The 1990 environmental education legislation authorized two new programs that will directly support students and education professionals in pursuing environmental study and experience. By providing government-wide opportunities for relevant work experience, these internships and fellowships can be powerful tools to attract individuals into environmental careers and to build their understanding of the complex issues we face.

Revitalizing the nation's scientific and engineering educational efforts is a tremendous task that will require the combined efforts of government, industry, educational professionals, and communities. EPA is committed to being a leader in identifying, supporting, and developing the scientists and engineers of the future through a myriad of programs. Through such efforts today we can create the opportunities needed to develop potential scientists and engineers to preserve our future. □

Resources for Environmental Job Seekers

The following private publications list environmental or natural resources jobs exclusively.

- **Earth Work:** New, monthly, 36-page magazine that includes both extensive listings of jobs and colorful features. Only job listing published from within the conservation community. Broad-based—from student through CEO and supergrade—covering positions in nonprofit organizations; universities; local, state and federal government agencies; and private companies. Jobs listed at no charge. Published by the Student Conservation Association, Department HM, P.O. Box 550, Charlestown, New Hampshire 03603-0550. Call 603-826-4301.

- **Environmental Opportunities:** Established monthly job listing under the sponsorship of Antioch/New England Graduate School. Best known listing; edited by career consultant Sanford Berry. More than 150 jobs each month in 10- to 11-page newsletter format; includes calendar summary. Variety of jobs; particularly strong in environmental education and seasonal positions. P.O. Box 4957, Arcata, California 95521.

- **The Job Seeker:** Bimonthly job classified that includes a strong component of environmental science jobs with private companies and others. Easy-to-scan 16-page newsletter. Route 2, Box 16, Warrens, Wisconsin 54666.

- **Environmental Careers:** Publishes paid display ads from private companies seeking environmental professionals in specialized jobs. Available free by writing: PH Publishing, Inc., 760 Whalers Way, Suite 100-A, Fort Coldins, Colorado 80525.

Information on employment vacancies at EPA headquarters may be obtained by calling (202) 260-5055 (24-hour recording). Also, information on jobs with EPA regional offices and environmentally related positions at other federal agencies is available from the U.S. Office of Personnel Management (check listings for OPM Federal Job Information Centers in the blue pages of your telephone book.)

—Destry Jarvis (Executive Vice President, Student Conservation Association)

INFORMING THE PUBLIC



Ed Ford photo. Wide World.

Making a point on Earth Day 1970. Twenty years later, environmental issues are more complex than ever.

TWO-WAY ENVIRONMENTAL EDUCATION

**Shouldn't one listen
as well as speak?**

by Peter M. Sandman

Education is something we want to do to people we think are ignorant. Children are the model. They don't know their times table, so we'll teach it to them and then they'll know it.

But education is also something we want to do to people we disagree with. There is an important bit of sleight of hand here. What we really want, often, is to shut our opponents out of the issue altogether; if that's not possible, then we want to persuade them that we're right and they're wrong. But if we acknowledge that what divides us is a disagreement—not even a disagreement predominantly over facts, but one over values—then shutting them out and even persuading them begin to feel like improper goals. In a disagreement, one ought to listen as well as speak. Disagreeing is a

two-way process. Education, on the other hand, is comfortably one-way.

Hence the growing interest in environmental education among environmental regulators. Fifteen years ago, when regulators wore white hats, and "I'm from the government and I'm here to help you" wasn't a joke, environmental education was widely seen as something of a frill. It is now accorded a somewhat higher priority.

People are getting in the way, demanding impossible levels of protection from essentially trivial risks, stonewalling on the lifestyle changes needed to get serious risks under control, questioning the wisdom and even the integrity of the regulators. In irritation and frustration, out of the corners of our mouths, we mutter, "Let's educate 'em." Regulated industries, of course, are right there

with us: What better use for environmental protection dollars than to teach people they are afraid of the wrong risks?

Of course, people are afraid of the wrong risks. In most of the disagreements between the American public and the environmental professionals, I am on the professionals' side. I accept most of the conclusions drawn in *Reducing Risk*, the 1990 report of EPA's Science Advisory Board: that the public pays too much attention to the health effects of pollution and too little to its ecosystem effects; that the public worries too much about short-term local risks and too little about long-term global ones; that in responding to public priorities, EPA misses some huge risks while it throws money at some tiny ones. I even accept that the public's technical ignorance is one of the factors contributing to these problems. But it isn't the major factor. And an education program is doomed to failure if it is grounded in the false conviction that the way to get people to believe what we believe is simply to teach them what we know.

Any environmental controversy can be divided into a technical dimension and a moral-emotional dimension. The key technical issue is how much damage is being done (to health, environment, or both) and how much mitigation can be achieved at how much cost. The key moral-emotional issues are such matters as these: Who benefits? Who's in control? Is it fair? Can I trust the people in charge? Did they give me a choice? Do they respond respectfully to my concerns? In an article in the November 1987 issue of *EPA Journal*, I labeled these two issue clusters "hazard" and "outrage," respectively.

The public is preoccupied far more with outrage than with hazard. The engine that propels the fight over safe-versus-dangerous, in other words, is good-versus-evil. Environmental issues that generate very little outrage—radon, for example—rouse the



Wide World photo.

public much less than the high-outrage issues like incinerator siting or industrial effluent. Technical information, however well taught, is unlikely to change these priorities because they are not grounded in technical judgments in the first place.

What happens when you try to teach outraged people how low the hazard is? First, they don't believe you. Outraged people naturally tend to resist learning that they are technically wrong. (You and I do the same thing when we are outraged.) And when outraged people do somehow manage to absorb new information, their values are unlikely to reflect the change.

Try this simple thought experiment. Imagine a roomful of citizens listening to an expert on pesticide risks, perhaps someone like Bruce Ames of the University of California. Ames has conducted research suggesting that natural carcinogens in food are several orders of magnitude riskier than pesticide residues. To summarize Ames's argument in a single oversimplified sentence: Broccoli is more carcinogenic than dioxin. As Ames tries to convince his audience of this, he faces an uphill battle. But let's assume the best. The audience is calm, there is no cancer cluster in town, the food is good, there's plenty of time, and Ames is a persuasive speaker with a lot of data to back him up. So over the course of an hour or two, he succeeds in convincing people that, in fact, broccoli is more carcinogenic than dioxin. This is something they didn't know before, and now they know it. The education goal has been achieved.

Up comes another speaker. "Now that we know that broccoli is more carcinogenic than dioxin," the second speaker inquires, "which one do we want the EPA to regulate, the broccoli or the dioxin?" How would the audience respond?

If you think the audience would still favor strong regulations controlling industry's callous, unconscionable poisoning of the environment with dioxin and not worry too much about what God might have done to the broccoli, you understand the resistance of outrage to technical education. As long as dioxin generates a lot of outrage, and broccoli very little, explaining their relative hazards is unlikely to affect the public's concerns, fears, or policy choices.

The solution, I think, is to make our educational programs two-way rather than one-way and to make them sensitive to values as well as to data. At its best, this is what environmental education has always meant. But it isn't what technical professionals usually mean when they mutter darkly about the need to educate the public. Many professionals are themselves understandably outraged at the public's mistrust; they are in no better mood to learn than the public is.

I propose a division of labor. Let's agree that technical professionals are the experts on what's hazardous and what isn't. (They're wrong sometimes and overconfident often, but they know more than the rest of us.) Let's also agree that citizens are the experts on what's outrageous and what isn't. Finally, let's agree that hazard and

A bird rescued from an oil spill gets a bath. Scientists have ranked oil spills among relatively low-risk environmental problems. Even so, public concern about such spills runs high, partly because they involve an "outrage factor."

outrage are both legitimate aspects of risk, both deserving of regulatory attention.

People's price for respecting the professionals' domain of expertise, I think, is a sense that the professionals respect theirs. From Community Right-To-Know requirements to Superfund cleanups, the fast-accumulating experience of risk communicators tells us that people can learn what the professionals want them to learn about the hazard if they are convinced that they will remain free to insist on the outrage, to insist that values as well as data must control the regulation of risk. An environmental education program that works, in short, will be freedom-enhancing rather than freedom constraining. It will help people see the ways in which they are right as well as the ways in which they are wrong. And as it teaches the public about hazard, it will teach the professionals about outrage.

What does this mean in practice? Instead of groundrules, let me suggest a few questions to ask yourself about any environmental education program, but especially one aimed at reducing public concern about risks the professionals consider small:

- Is the purpose of your education program to help people decide which environmental risks they want to tolerate and which they want to oppose—or is it to corner them so they feel they must tolerate the risks you want them to tolerate?
- Does your education program deal with such "outrage factors" as trust, fairness, control, and dread? When you tell people about a risk that is high in outrage and low in hazard, are you discussing only the hazard?
- When you compare risks, are you "bracketing" a risk you consider low by identifying other risks that are higher and lower, or are you telling people only about the risks that are higher?

- How sure are you of your data? How sure do your materials sound?

- What are the strongest arguments to be made against your own position? Does your education program make them?

- How do you feel about the intended audience of your education program? Respectful? Or a little angry, perhaps even contemptuous? Does it show?

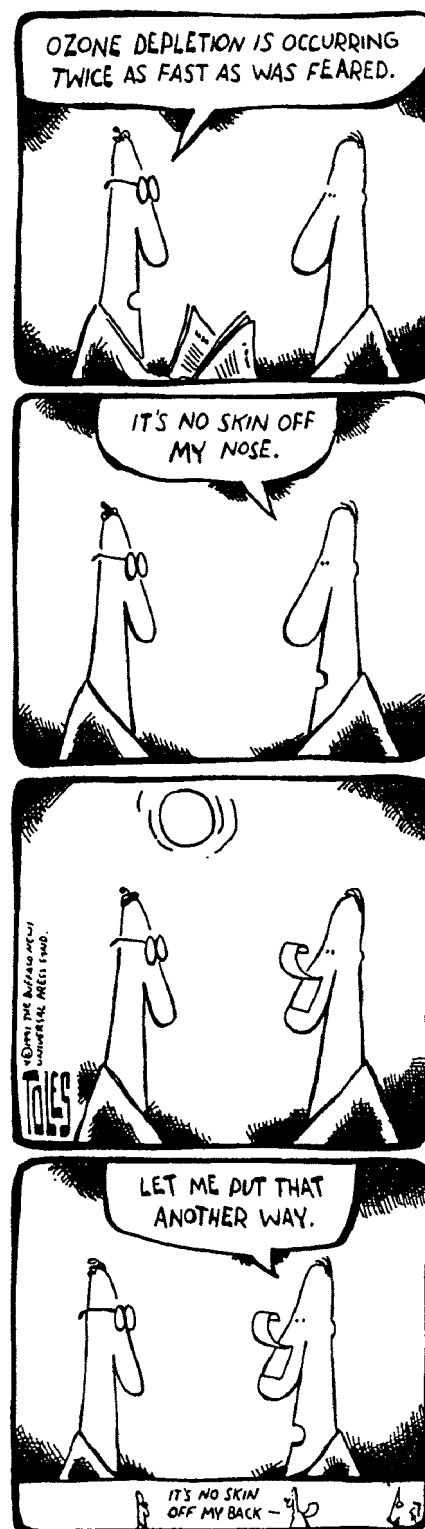
- Is your program one-way or two-way? Do you expect to learn anything? Are there ways for people to teach you why they see the issues differently than you do? Do you want to know?

- Think of an issue about which you feel passionately—abortion, gun control, pornography, whatever—and imagine an education program on that issue developed by an expert on the other side. What signals of understanding or insensitivity, open-mindedness or closed-mindedness, would you be looking for? What such signals are you sending?

Finally, for groundrules (and more questions), let me suggest either of two books by Billie Jo Hance, Caron Chess, and Peter M. Sandman: *Improving Dialogue with Communities: A Risk Communication Manual for Government* (Trenton, New Jersey: Division of Science and Research, New Jersey Department of Environmental Protection, 1988) and *Industry Risk Communication Manual* (Boca Raton, Florida: CRC Press/Lewis Publishers, 1990). □

(Dr. Sandman is Director of the Environmental Communication Research Program, Cook College, Rutgers University.)

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THE RESOURCE OF PUBLIC BROADCASTING

Hundreds of TV and radio stations already help

by Lee H. Monk

The 1990 National Environmental Education Act contains a provision that specifically calls on EPA to work with "noncommercial educational broadcasting entities" to educate Americans on environmental problems. Educational broadcasting is uniquely positioned to do just that and over the last decade has, in fact, provided many programs on environmental issues to the public.

Educational, or public, broadcasting reaches vast numbers of Americans. Nationwide there are more than 400 public radio stations and more than 330 public television stations. Many of these stations are local, and independently operated. As such, they are acutely aware of the needs and concerns of their local communities.

What's more, public broadcasting gets good marks from the public on educational value. In a recent survey, 91 percent of respondents gave public broadcasting a B+ on how well the industry is doing in increasing people's understanding of news events and public affairs. Public broadcasting got an A- performance grade on helping to educate children informally.

Ultimately, public broadcasting considers all of its programming—both television and radio—to be educational: children's programming, drama, music and dance, science and nature, skill-building how-to's, as well as its much acclaimed public affairs and documentary programming.

Public broadcasting reaches not only into homes but directly into schools as

well. More than twice as many teachers use public broadcasting programming and other instructional materials than use other broadcast and cable services, according to survey results announced by the National Education Association (NEA).

Public television has been a pioneer in the uses of noncommercial programming for more than 30 years. It has presented high quality, noncommercial educational preschool programming, instructional programming for students in K-12, and college credit and postgraduate courses; it has also provided literacy training, continuing professional education, and job training and retraining programs.

One of public television's more recent innovations has been "interactive" educational programming, which involves viewer participation. The Satellite Educational Resources Consortium (SERC), composed of public television stations and state departments of education, delivers each school day live, interactive, for-credit high school courses to students in 23 states. SERC also provides live, interactive teacher in-service and staff development training seminars and workshops.

And public broadcasting has not been content to educate and inform solely through over-the-air broadcasting. Almost all public television stations provide outreach activities to supplement and support their programming. One notable example is KERA-TV, Dallas, which sought to bring all segments of the Dallas community together to discuss common concerns such as racism.

On a wider scale, an organization called the Public Television Outreach Alliance leads and supports local stations in creating television projects with community impact. For example, in 1990, the Outreach Alliance concentrated on the environment with its "Operation Earth" campaign. Race

to *Save the Planet*, a series of 10 one-hour programs was the centerpiece of a yearlong effort designed to encourage individuals to search for solutions to both local and global environmental problems. This series was part of more than 35 hours of programming on the environment. Other components include three college-level telecourses and a live business teleconference, not to mention a wealth of print materials to help stations create their own environmental awareness projects.

Public radio and television both continue to feature programs on environmental subjects. Public radio currently offers several such programs: Examples include *American Energy Update*, *The Environment Show*, and *Pollution Solutions*; in addition, *Terra Firma* consists of three- to five-minute radio modules that provide provocative probes into the dysfunctional thinking behind the environmental crisis. Other more general radio programs, such as *All Things Considered* and *Morning Edition*, regularly touch on environmental topics.

As for public television, several major prime-time programs exploring environmental issues are slated for the 1991 fall season:

- *On After The Warming*, journalist James Burke reports from the year 2050, where humans and Earth have survived the global warming. Plus *Hot or Not: The Global Greenhouse Debate*.
- *The Infinite Voyage*, a quarterly science series, will look at the ways that humans study and explore the world around them.
- *Land of The Eagle* is the first television series to attempt a comprehensive account of North American wildlife and wild places.
- *A National Geographic Special—Hawaii: Strangers in*

(Monk is the Director of Communications for the Southern Educational Communications Association, the largest regional public broadcasting organization in the nation serving education, public television, and public radio in 49 states, with members in 17 states, the U.S. Virgin Islands, and Puerto Rico.)



Against the Odds, produced by KMBH-TV, Harlingen, Texas, focuses on efforts to save the Kemp Ridley sea turtle.

Paradise—follows conservationists as they make dramatic attempts to ward off the extinction of Hawaii's magnificent plants and animals.

- *Nature* will celebrate its 10th year with a special on American birds; NOVA plans an episode on an experiment that could mean limitless supplies of energy; while *Scientific American Frontiers* looks at sea turtles.

So where does public broadcasting get all this programming? From just about everywhere. Public broadcasting stations produce much of their own programming. Other programming is produced by independent producers, both here and abroad. The reservoir of producing entities is vast. And most programs rely on funding from many sources: public broadcasting stations, national public broadcasting organizations like the Public Broadcasting System (PBS), National Public Radio (NPR), and the Corporation for Public Broadcasting; government agencies; private corporations and foundations, and the viewing public.

Once a program or series is produced, it can make its way to the viewing public in one of several ways. Since each station is independent, the management of an individual station may decide to air a program acquired directly from a producer. Stations also receive programs via satellite from the Public Broadcasting Service as well as the four public broadcasting regional organizations. The Southern

Educational Communications Association (SECA), for instance, distributes via satellite nearly 800 hours of general audience programming to public television stations every year, nearly 70 percent produced by its membership. As do other regional organizations, SECA provides stations with materials they can use to promote these programs to their viewing public.

Examples of environmental programming distributed by SECA include: *The Beaches Are Moving* on the barrier islands, from North Carolina Public Television; *Florida Crossroads: Last Ditch* on the dredging and restoration of the Kissimmee River, from Florida Public Broadcasting; *Future Conditional* on global warming from South Carolina Educational television; *Against The Odds* on efforts to save the Kemp Ridley sea turtle, from KMBH-TV, Harlingen, Texas; *Energy: Progress Revisited* with ABC's Forrest Sawyer on the history of man's application of energy and speculation on our future, from Georgia Public Television; *Gertrude Bolm: Guardian Of The Rain Forest*, a profile of a woman who has devoted her life to the preservation of the rain forest, from KUHT-TV, Houston; and *Coastal Naturalist*, a quiet walk through the Georgia Sea Islands with a naturalist who knows, loves, and can respect the area, also from Georgia Public Television.

Any public television station in the country may pull down from the satellite programming that is

distributed by the regional organizations such as SECA. This programming is often free to stations, whereas the programming distributed by PBS is not. Each public television station is independent and makes its own decisions on programming.

The distribution of educational or instructional programming to schools works in much the same way. SECA administers the National Instructional Satellite Schedule (NISS), which provides satellite distribution of the most popular instructional programming. During the last school year, 43 states with more than 24 million students subscribed to the NISS service. Other services also distribute instructional programming.

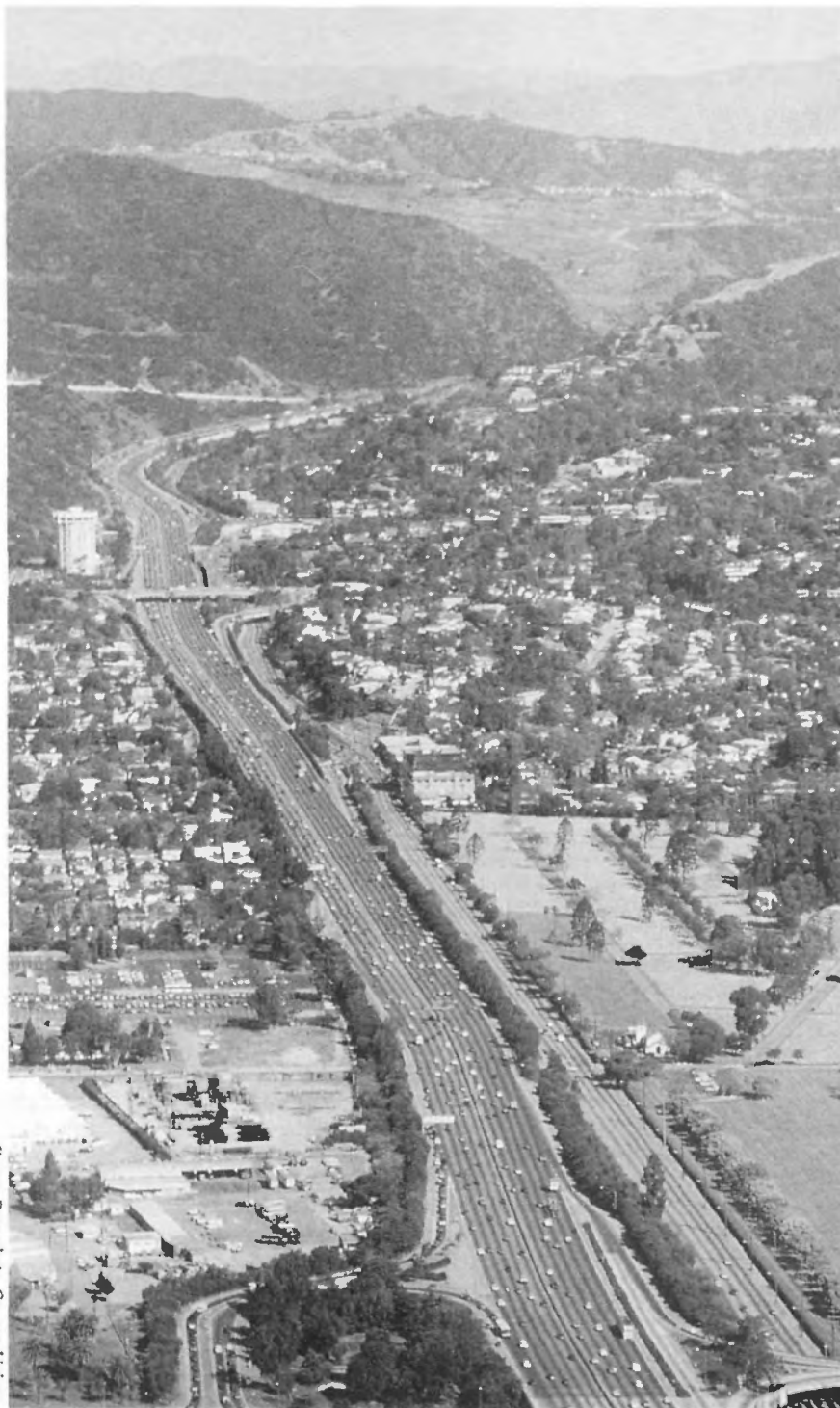
Public television's technology is also suited to other methods of disseminating information. Teleconferencing, for instance, is a very efficient means to reach distinct groups of people. Several years ago, SECA produced a teleconference designed for school administrators in all 50 states on asbestos removal in school buildings. Many public stations produce teleconferences for governmental agencies or private firms. And all public stations have the facilities to be receiver sites for teleconferences.

To summarize: Noncommercial educational broadcasting has the resources, the technology, and the grassroots relationships with the education community to help EPA provide information to the public and school children on vital environmental issues and problems. □

IT WILL TAKE MORE THAN EDUCATION

Solo-driving addicts must feel it in the pocketbook

by James M. Lents



Detroit may have given figurative birth to the automotive age, but America's love affair with the auto began in Los Angeles.

With its seemingly endless suburbs connected by crisscrossing freeways, Los Angeles is the first major metropolitan area in the world that was literally built around the auto.

Today, the area is the world's single largest market for gasoline. Its 13 million residents drive 9 million motor vehicles 240 million miles a day, guzzling 15 million gallons of gasoline and diesel fuel.

Yet, despite the promises of Madison Avenue, driving is not what it used to be. Long gone are the days of the free wheeling motorist.

More typical today is area resident Bruce McGowan, recently featured in the *Los Angeles Times*, who spends three hours a day commuting to and from his job as a computer operator in stop-and-creep traffic.

To get the most out of these otherwise wasted hours, McGowan does office work—on a portable desk he carries in his car—when traffic grinds to a complete halt.

He and millions like him have created a burgeoning market for cellular phones, mobile fax machines, refrigerators that plug into cigarette lighters, portable televisions, and bucket seat massagers to soothe frazzled nerves and cramped muscles.

Clearly, overdependence on the auto, which causes 60 percent of Southern California's infamous smog, constitutes a major environmental problem.

Education has encouraged ridesharing in Los Angeles, but smog and traffic jams are still the rule.

The bottom line is that motorists will not give up their solo driving habit in large numbers without direct feedback or incentives.



South Coast Air Quality Management District photo.

Promotion of electric cars and vans may help reduce Los Angeles' use of 15 million gallons of gasoline and diesel fuel daily.

Over the long run, cleaner autos—and ultimately electric cars—will help, but in the interim what is the solution? What role can environmental education play?

Here in the Los Angeles metropolitan area, the South Coast Air Quality Management District (SCAQMD) has engaged in a major educational effort to woo people out of their single occupant cars and into carpools and other ride-sharing arrangements.

Under SCAQMD's Regulation XV, employers are required to implement incentive and education plans to encourage ridesharing. The employer's incentives are mandatory, but worker participation is voluntary.

SCAQMD supplements this regulation with advertising and educational outreach efforts to promote the benefits of ride sharing.

After more than three years' experience with the program, I am happy to report that we have had some success. A recent study of employers covered by the ride sharing rule found

that ride sharing increased by 5 percent over a two-year period. Ride sharing increased most at firms where top management was strongly committed to the concept.

Education played a major role in increasing the level of ride sharing at these companies. Company meetings, newsletters, videos, pamphlets, and other efforts helped increase ride sharing.

But strong incentives also played a major role. Incentives, such as cash payments and prize drawings, have been effective in encouraging increased ride sharing.

Over the past three years, we have found that environmental education alone cannot get large numbers of drivers to share rides. This is because the link between ride sharing and the environment is not directly perceptible.

Long after joining a carpool, the individual motorist will still see smog on the horizon and a traffic jam on the freeway. Alternatively, the motorist may live and work in a clean air area,

but his emissions contribute to downwind air pollution.

The bottom line is that motorists will not give up their solo driving habit in large numbers without direct feedback or incentives. For better or worse, this can be accomplished only by assigning a price to solo driving commensurate with its environmental damage.

This is what SCAQMD is beginning to do with its ride-sharing regulation. Rewarding those who rideshare and denying the benefits to solo commuters sends a signal that solo commuting entails an environmental cost.

To further increase carpooling, we are looking to extend incentives to non-work trips to shopping centers and special events centers, such as stadiums and concert centers. Initiating parking fees where parking is free, or offering parking discounts for carpoolers, are likely to be integral to this program.

So what we've learned is that education can help encourage ride sharing, but it's going to take strong financial incentives and disincentives to get people to give up their addiction to solo driving. □

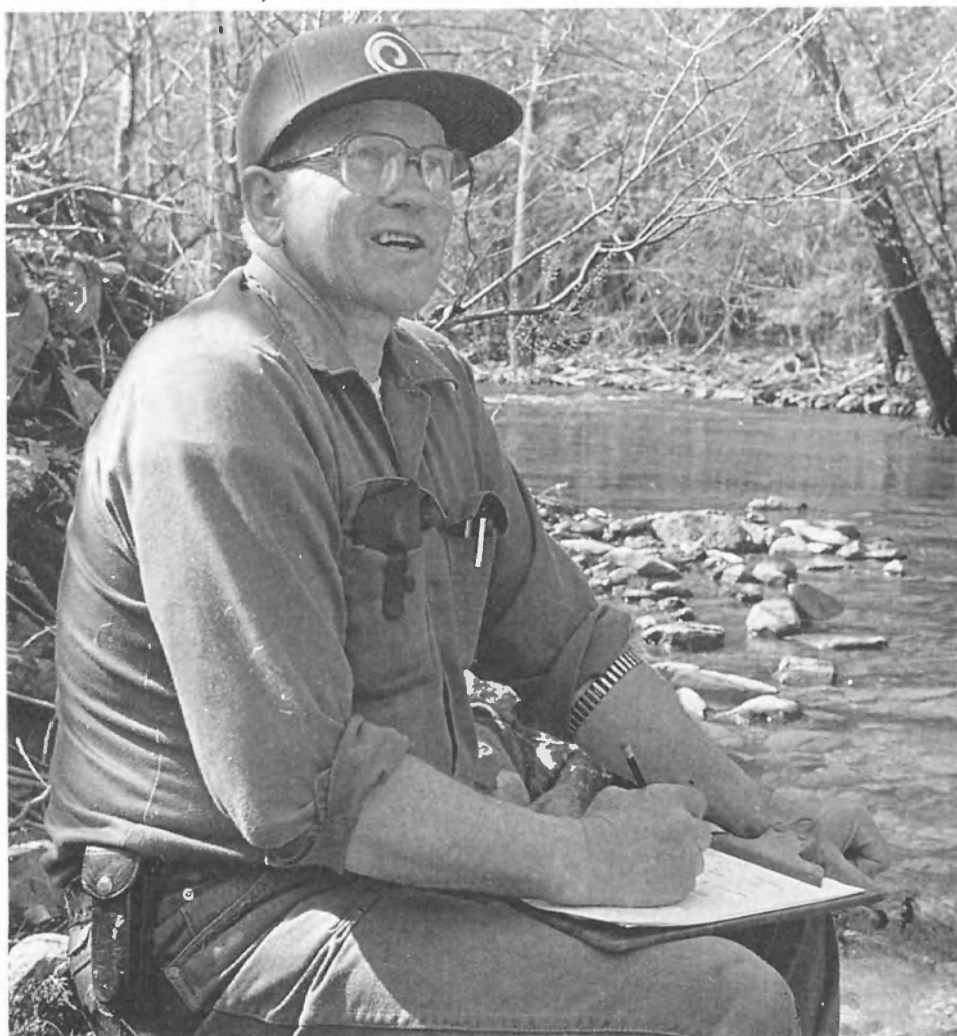
(Dr. Lents is executive officer of the South Coast Air Quality Management District, the air pollution control agency for Los Angeles, Orange, and Riverside counties and part of San Bernardino County.)

THE GREENING OF GRAYING AMERICA

What can a Senior Environment Corps do?

by John T. Grupenhoff

*Carl Amick,
a Save Our
Streams volunteer,
surveys the habitat
of the
Little Bluestone River
in West Virginia.*



Chris Dorst photo. The Charleston Gazette.

An enormous underutilized human resource is available to help deal with our environmental problems. Many of our 60 million seniors (persons over 50)—25 percent of our population—are deeply concerned about the increasingly polluted environment we are leaving as a legacy to our children and grandchildren.

Senior Americans have the experience, skills, and time to make a significant contribution. Until now, however, no systematic national effort has been made to tap that potential through environmental education and action; the emphasis in that regard has

been on young people.

There are many ways in which senior Americans could have an impact. Consider, for example, their potential as environmentally aware consumers:

- They control 70 percent of the total net worth of all U.S. households.
- They own 77 percent of all financial assets in this country.
- They purchase 43 percent of all domestic cars.
- They represent 40 percent of all consumer demand.

Senior Community Infrastructure

Many seniors could become involved in environmental issues through massive, existing governmental and non-profit institutions. There is a vast federal, state, and community services apparatus—including a system of regional offices (congruent with EPA's), state units on aging, 650 area agencies on aging, and 8,500 community projects, many of which could take on an environmental component. More than 30 non-profit national organizations, such as the American Association of Retired Persons (AARP) and the National Council on the Aging (NCOA), serve senior interests. Of these, AARP is the largest (over 33 million members), with regional and state offices, over 3,000 local chapters, and considerable experience in the development of voluntary service programs for its members. Its membership magazine, *Modern Maturity*, is second only to *Reader's Digest* in total circulation.

The NCOA, serving professionals in the aging field, has as one of its 10 constituent units the National Institution of Senior Centers (NISC), an association of over 2,500 of the more than 14,000 senior centers across the United States (more than the 8,600 McDonald's fast food outlets!). Senior centers have professional management and appropriate facilities which could be used for environmental and action activities. Recently, the NISC Delegate Council unanimously agreed to join with the senior Environment Corps to promote the development of "senior environment teams" in these centers.

Also, a massive senior media network, including hundreds of newspapers and newsletters as well as radio and TV programs across the nation, is constantly seeking useful information to present to senior audiences: Certainly these outlets would participate in environmental education activities if asked.

The Senior Environment Corps

The recently established non-profit Senior Environment Corps has been organized precisely for this kind of senior environmental education and action, through community organization and involvement.

Initially it will focus on developing a nationwide network of senior environment teams at senior centers. A team portfolio of education and action modules will be developed for recycling, energy conservation, water and air pollution, pesticides and toxics, environmental consumerism, and "mentoring" of young people on environmental matters, to name a few.

Nationally, members of the Corps will be unified by the idea of environmental protection, held together by a dedicated communications structure, and identified to each other and the public by clothing items (hats, jackets, etc.) carrying the Corps logo and title.

EPA and Seniors

EPA can help seniors help the environment in a number of ways:

- By developing an understanding of the importance of reaching out to the senior community and helping seniors become "empowered" through environmental education and organization
- By surveying the senior organizations and their communications apparatus and developing, in concert with senior leaders, an environmental education and action program
- By supporting development of educational and action materials pertinent to seniors, utilizing and reshaping already existing materials, including putting them in larger type, along the lines suggested for the senior centers
- By supporting a national conference to provide the "kick off" for the national effort, followed by regional volunteer training meetings
- By supporting a systematic and continuous information flow to the senior media network.

Senior Environmental Education Provisions

The National Environmental Education Act contains two provisions concerning senior environmental education for senior citizens (over age 50):

- One provision adds a "senior American" to the Environmental Education Advisory Council and Task Force called for by the new law.
- The other requires EPA to: "describe and assess the extent and quality of environmental education programs available to senior Americans and make recommendations thereon; describe the various federal agency programs to further senior environmental education; and evaluate and make recommendations as to how such educational apparatuses could best be coordinated with non-profit senior organizations across the nation, and environmental education institutions and organizations now in existence."

Clearly, there is enormous potential for improving our environmental situation through cooperation of EPA, established senior organizations, and the newly emerging Senior Environment Corps; the structures already exist to assure success. In these efforts, it will be vital to emphasize the "action" aspect of senior involvement. □

(Dr. Grupenhoff is founder of the Senior Environment Corps. During deliberations on the National Environmental Education Act, Grupenhoff advocated the amendments which were adopted by Congress concerning senior Americans.)

CURIOSITY MIGHT SAVE THE DAY

How can we protect the quality of life?

by Jacques-Yves Cousteau

Editors' note: On November 17, 1988, Captain Cousteau gave a talk to EPA headquarters employees in Washington, DC. The following excerpts from that talk we believe are particularly germane to the subject of environmental education.

I have often wondered if the impulse, this tremendous curiosity I have always felt—which is to look through keyholes at what happens in nature—was exceptional or natural. And the more I observe nature, the more I think that the impulse toward exploration is built into almost every organism, including plants.

"Plants send feelers, their roots, as far as they can. They have terrible fights for space, as much as humans or animals. I think this drive for exploration is built in every living thing, sometimes from necessity, sometimes from sheer curiosity.

"Since 1966, first with my two sons and then with Jean-Michel alone, we have been going on our expeditions, always keeping in mind that our work is not only to explore, but also to try to learn lessons about the deterioration of our planet and the damage done to it by human beings . . .

"We are acting like Attila on the Earth today. All this mechanical killing, destroying, dynamite fishing, using nets with mesh too small, draining marshes and lagoons, cutting passes in atolls, and changing the courses of rivers—all these things are not pollution, but they are increasing the effects of pollution. The result is really a synergistic effect between pollution and other forms of destruction.

(Cousteau is an explorer, oceanographer, and founding President of The Cousteau Society.)

"On top of that, of course, comes the elimination of species. Almost one million species have disappeared since the beginning of the 19th century. Forever. That's eight percent of the total known census of living creatures, exhausted for future generations. Some of those organisms which have disappeared—most are plants—could perhaps have given us medicines or other useful products. But now they will never be of any use anymore.

"It is the fluids of life—air and water—that are in danger. As you know, there is, by weight, a lot more water than air, which means that theoretically air is even more vulnerable than water. Up until now, I have given more attention to water than to air; but I'm beginning to change my mind because what is happening today, not only with acid rain but more importantly with the warming of the planet, is mainly damage to the atmosphere. The fate of humankind is intertwined with these problems: pollution, mechanical damage, and heating of the planet, which is another form of pollution. And all of these problems are direct consequences of overpopulation. I can never repeat it enough. The problem of overpopulation was clearly outlined in the first years of the Club of Rome, but for some unexplainable reason, overpopulation has practically disappeared from environmental literature. I don't understand why. Overpopulation has never been more pressing; it has never been more tragic.

"When I went to school, the population of the Earth was not quite three billion. Now there are five billion. For the near future, the population of the Earth will increase by one China every 10 years. How long can that be carried on?

"Yes, it is probably possible, by increasing production, by improving the distribution of resources to the poor nations, to feed 15 billion people in the future. Not very well, but

decently. It is probably possible to have 15 billion people survive on Earth. But what kind of life are they going to lead? Are we here to ensure mere survival? Or are we here to protect the quality not only of our own lives, but of the lives of the people who will come after us in the next generations?

"When Calypso went recently to examine the radioactivity problem on the island of Mururoa, where the French test atomic bombs, we were thinking more of future generations than about us. And when we see the population growing to such an extent, when we see the rich nations become richer and the poor nations become poorer while they grow in population, the number of time bombs that are planted around us—radioactivity, overpopulation, destruction of nonrenewable resources—is such that we're inclined to yell, 'Stop it!' We have to do something; we have to put tremendous pressure on our governments to stop these things. Our indignation must be told. It must be broadcast. We have to proclaim it; we have to yell it; we have to show it, not hide it in the corner of ourselves.

"There must be public pressure to force the decision makers to take action. I'm saying this to you because I was there when EPA was created. I was there to see the first triumphant beginning of EPA. The entire world was envying the United States for its creation of EPA. From the beginning, there were environmental laws that are still there, and legal instruments that are at your disposal. They still exist, and they can and should be used. No other country on Earth has anything comparable. None.

"So you have the legal tools, but because of political pressure, because of lobbying, you do not make full use of them. We suffer when we see this. I've seen the change in the government. You are suffering from government decisions, from



The Cousteau Society photo. Copyright 1987. All rights reserved.

Cousteau's mission: Not only to explore but to learn about environmental deterioration and the ways in which human behavior damages the planet . . . and to share this knowledge.

On Education Versus Instruction

" . . . Education has nothing to do with learning how to compress acetylene without an explosion or how to make an atom bomb. That's instruction. A person is well educated when they know how to act or to behave in difficult situations. Since antiquity, the problems of education have consistently been the subject of masterpieces in tragedy and theater, in the books of our souls. No masterpiece has ever been written on mathematics or chemistry or physics, all of which are labeled education. But it's only instruction. When we made education number three of the [Cousteau] Society's priorities, we didn't mean instruction. We mean education. To oversimplify, when we give information to the public about the environment, The Cousteau Society is instructing the public: When we discuss what the long-range consequences could be and what solutions would serve humankind in the long run, we are participating in the education of the public . . .

" . . . We are social beings, and to live in society with the high degree of mind that we have requires education. As soon as education declines, the behavior of societies goes to chaos. It's a danger that is comparable to the atomic bomb . . ."

—Jacques-Yves Cousteau, from the *Calypso Log*, February 1989. Reprinted with permission of The Cousteau Society. For more information, contact The Cousteau Society, 930 W. 21st Street, Norfolk, VA 23517.

government indifference.

"This Agency has to remain independent. I'm saying this openly and envying the possibility. We don't have anything like the EPA in France. We have the Ministry of the Environment, which is a slave to government decisions, as they have proven many times. They are not free; they are not independent. Theoretically, you have a degree of independence that is greater than that of any similar organization on Earth. So we are waiting and praying that you use it."

After the talk, Cousteau took questions. Here is one of the questions:

Q "Do you think it's possible that an environmental ethic can actually be instilled into the teachings of the major religions? What better way of changing people's behavior than by teaching from the pulpit?"

A "Yes, but you see, people can do very little for the environment. By behaving well, yes. But take a housewife who buys a product for her

washing machine. She goes to the supermarket, and she has a choice among three or four products. None of them is clearly environmentally clean and guaranteed by EPA. At the moment, the choices are made according to advertising and publicity, not according to the environmental quality of the product. So what can the average citizen or average housewife do? They can use unleaded gasoline instead of leaded gasoline; that's done already. But for the household products, for the medical products, there is no control. There is no recommendation based on environmental quality. Yet Canada has started something in that direction. Canada now has a law that a product in general use must bear a seal of appropriate quality for the environment. How this seal is given, by whom, I haven't learned. But I do know that the first step has been taken . . .

" . . . If we are educating the average citizen, at least he or she must be given the possibility of making the right choice. Today citizens don't have that opportunity." □



THINKING GLOBALLY

A UNIVERSAL TASK

by the Dalai Lama of Tibet



Tibet House photo.

Ken Andrusko photo.

The Himalayan Mountains symbolize the enduring grandeur of the planet, yet they represent a fragile ecosystem. Tibetan culture reflects a deep reverence for nature and wildlife.

Scientific predictions of environmental change are difficult for ordinary human beings to comprehend fully. We hear about hot temperatures and rising sea levels, increasing cancer rates, vast population growth, depletion of resources, and extinction of species. Human activity everywhere is hastening to destroy key elements of the natural ecosystems all living beings depend on.

These threatening developments are individually drastic and together amazing. The world's population has tripled in this century alone and is expected to double or triple in the next. The global economy may grow by a factor of five or 10, including with its extreme rates of energy consumption, carbon dioxide production, and deforestation. It is hard to imagine all of these things actually happening in our lifetime and in the lives of our children. We have to consider the prospects of global suffering and environmental degradation unlike anything in human history.

I think, however, there is good news in that now we will definitely have to find new ways to survive together on this planet. In this century we have seen enough war, poverty, pollution, and suffering. According to Buddhist teaching, such things happen as the result of ignorance and selfish actions, because we often fail to see the essential common relation of all beings. The Earth is showing us warnings and clear indications of the vast effects and negative potential of misdirected human behavior.

To counteract these harmful practices we can teach ourselves to be more aware of our own mutual dependence. Every sentient being wants happiness instead of pain. So we all share a common basic feeling. We can develop right actions to help the Earth and each other based on a better motivation. Therefore, I always speak of the importance of developing a genuine sense of universal responsibility. When we are motivated by wisdom and compassion, the

***The Earth is showing us
warnings and clear
indications of the vast effects
and negative potential of
misdirected human behavior.***

results of our actions benefit everyone, not just our individual selves or some immediate convenience. When we are able to recognize and forgive ignorant actions of the past, we gain the strength to constructively solve the problems of the present.

We should extend this attitude to be concerned for our whole environment. As a basic principle, I think it is better to help if you can, and if you cannot help, at least try not to do harm. This is an especially suitable guide when there is so much yet to understand about the complex interrelations of diverse and unique ecosystems. The Earth is our home and our mother. We need to respect and take care of her. This is easy to understand today.

We need knowledge to care for ourselves, every part of the Earth and the life upon it, and all of the future generations as well. This means that education about the environment is of great importance to everyone. Scientific learning and technological progress are essential for improving the quality of life in the modern world. Still more important is the simple practice of getting to know and better appreciate ourselves and our natural surroundings, whether we are children or adults. If we have a true appreciation for others and resist acting out of ignorance, we will take care of the Earth.

In the biggest sense, environmental education means learning to maintain a balanced way of life. All religions agree that we cannot find lasting inner satisfaction based on selfish desires and acquiring the comforts of material things. Even if we could, there are now so many people that the Earth would not sustain us for long. I think it is much better to practice enjoying simple peace of mind. We can share the Earth and take care of it together, rather than trying to possess it, destroying the beauty of life in the process.

Ancient cultures that have adapted to their natural surroundings can offer special insights on structuring human societies to exist in balance with the environment. For example, Tibetans are uniquely familiar with life on the Himalayan Plateau. This has evolved into a long history of a civilization that took care not to overwhelm and destroy its fragile ecosystem. Tibetans have long appreciated the presence of wild animals as symbolic of freedom. A deep reverence for nature is apparent in much of Tibetan art and ceremony. Spiritual development thrived despite limited material progress. Just as species may not adapt to relatively sudden environmental changes, human cultures also need to be treated with special care to ensure survival. Therefore, learning about the useful ways of people and preserving their cultural heritage is also a part of learning to care for the environment.

I try always to express the value of having a good heart. This simple aspect of human nature can be nourished to great power. With a good heart and wisdom you have the right motivation and will automatically do what needs to be done. If people begin to act with genuine compassion for everyone, we can still protect each other and the natural environment. This is much easier than having to adapt to the severe and incomprehensible environmental conditions projected for the future.

Now on a close examination, the human mind, the human heart, and the environment are inseparably linked together. In this sense, environmental education helps to generate both the understanding and the love we need to create the best opportunity there has ever been for peace and lasting coexistence. □

(The Dalai Lama is the winner of the 1989 Nobel Peace Prize.)

THE PEACE CORPS JOINS IN

Can teaching English help the upper Tisza?

by Judy Braus

When it first flows into Hungary from the Soviet Union, the Tisza River is relatively clean—especially when compared to its infamous neighbor, the Danube. But before long the water quality of the Tisza begins to plummet.

The Szamos and Kraszna rivers, flowing from Romania, dump heavy metals, phosphates, and other pollutants into the Tisza as it makes its way south. At Tokaj, near the lower end of the Upper Tisza, the Bodrog River, flowing from Czechoslovakia, dumps more tainted water. And along its 600-kilometer path through Hungary, the Tisza relentlessly receives in-country pollution, including waste and run-off from chemical factories, power plants, and agricultural fields.

Pollution of the Tisza River is just one example of many serious environmental problems facing Hungary. Like the rest of Central Europe, the country suffers from acid rain, smog, hazardous waste disposal, habitat destruction, and other

environmental problems. But there is a bright spot in the doom and gloom of the pollution and degradation. Armed with enthusiasm and innovative ideas and backed by an agency-wide commitment to environmental education, U.S. Peace Corps volunteers have begun tackling environmental problems at the grass roots level, working in camps, schools, and communities across Hungary.

An environmental education workshop conducted in the dead of winter in a small town near the Czechoslovakian border gave many volunteers their first opportunity to get involved with Hungary's environmental problems. During the workshop, more than 60 volunteers working as English teachers and their Hungarian colleagues took part in sessions focusing on air and water pollution, solid waste, and natural resource issues—as well as on teaching strategies for incorporating environmental education into their English teaching lesson plans. They also studied strategies for motivating

students to get involved in local environmental issues and for helping students develop lifelong problem-solving skills.

As a result of the workshop, many of the volunteers immediately began incorporating environmental topics into their daily lesson plans. During site visits, Kathryn Rulon, Associate Peace Corps Director for Education, found that volunteers were successfully using environmental content to teach English, encouraging student creativity, and empowering students to make a difference: "I couldn't believe how many of the volunteers were creatively adapting environmental content to match the interests and concerns of their students. I'd walk into classrooms and the students would be debating energy issues, writing environmental poetry, or performing pollution raps. Environmental education and English teaching are a natural fit!"

Several volunteers also took the activities and lesson plans developed during the workshop to camp. They



On assignment in Hungary, Peace Corps volunteers teach English and environmental literacy at the same time.

Paul S. Conklin photo. Copyright 1990, Peace Corps.

"I'd walk into classrooms and the students would be debating energy issues, writing environmental poetry, or performing pollution raps."

sponsored several successful summer English-Environment camps throughout Hungary, where they conducted environmental education activities focusing on pollution, natural resource issues, and energy. In addition, many joined with their Hungarian colleagues to develop country-specific role plays and scenarios dealing with environmental topics.

As for the problems in the upper Tisza River, one Peace Corps volunteer, Kevin Anderson, channeled his concern into a concrete proposal for action. Before the workshop, Kevin had been working with the Nyireggyaza Chapter of the Hungarian Ornithological and Nature Protection Society to band sand martins and also to organize a summer environmental camp. Through his work, he discovered that the Upper Tisza not only supports the largest colony of sand martins in Europe, but it is also rich in forest and wetland habitats that provide homes to some of the most diverse wildlife in the country. He realized that a public awareness campaign would be important, given that many of his neighbors in the rural town of Nyireggyaza consider the area an undeveloped "wasteland" that would be more useful if it were developed.

It was after attending the winter workshop, where he met with Steve Wassersug, manager of the Regional Environmental Center in Budapest, that Kevin decided to apply to the Center for a grant. He and Dr. Tibor Szep, a leader of a local environmental group, drafted a proposal requesting funds to help protect the Upper Tisza River watershed. Specifically, they requested support to survey the upper Tisza River and the riverside forests; to educate the public and members of the group about the ecology of the upper Tisza River; to disseminate information to both national and international environmental groups and the public; and to provide training for participants in research techniques, environmental

education, and "environmental English."

In spring, Kevin and his colleagues celebrated their success: the Regional Environmental Center presented them with \$10,000 to begin implementing their Upper Tisza River Project Plan. Already the group has conducted a 10-day research camp on the Tisza to help train members to collect data and monitor water quality. They have also purchased a boat, a video camera, and maps of the area to use in their river surveys. They hope to add the data they collect to the new Tisza Basin Database, which is being developed by a large environmental non-governmental organization in the Upper Tisza region.

Kevin's success—and the successes of other volunteers—has given a boost to the Peace Corps's environmental efforts throughout Central Europe. This fall, "environment volunteers" will start their pre-service training in Hungary, Czechoslovakia, and Poland—heading to their sites in February. And next spring, two environmental education workshops for volunteers teaching English and for their host country colleagues are scheduled to take place in Hungary and Czechoslovakia.

A growing environmental ethic is even evident in the offices of Peace Corps staff. In the Hungary office, paper is reused and recycled. Bottles and cans are collected for recycling. And the staff is looking into using recycled paper stock for all their office needs. There's also an expanding environmental education resource library, open to Peace Corps volunteers and their counterparts.

In a country where environmental problems have been pushed aside for so many years, Peace Corps environmental education efforts can make an important contribution to in-country initiatives. After all, thinking globally and acting locally is what the Peace Corps is all about. □

(Braus is an environmental education specialist with the U.S. Peace Corps.)

ENABLING OTHERS TO ACT WISELY

Help from tiny primates with a big charisma

by Seth Rosenthal



This tiny monkey, the golden lion tamarin, was the focus for a conservation education project sponsored by World Wildlife Fund in Brazil.

Parades, radio and television shows, and other activities help educate Brazilians on the need to protect the endangered Atlantic forest, the tamarin's habitat.



A. Young photo. World Wildlife Fund.

Lou Ann Dietz photo. World Wildlife Fund.

Puppet shows. Mobile teaching vans. Summer camps. Educational television. Zoo and museum exhibits. T-shirts and posters. These may sound like pedagogical gimmicks, but in fact they are part of highly sophisticated strategies used by conservation groups in the developing world to educate local people about their natural resources.

Environmental education efforts have arrived not a moment too soon. Science can help us understand the magnitude of our impact on the environment. Technology can give us tools to manage our natural capital. But only education can bring about the lasting changes in attitudes and perceptions that will shape the behavior of future generations.

As part of its ongoing mission to preserve the abundance and diversity of life on Earth, World Wildlife Fund (WWF) promotes local solutions to global conservation problems. And this process of working with government agencies, private conservation groups, citizen groups, schools, scientists, land owners, and indigenous peoples is essentially an educational one. For WWF, environmental education means empowering individuals, communities, and societies to make enlightened decisions about managing their natural resources.

For that reason, a broadly based scientific education is rarely of use to people who are struggling every day to feed their families and raise the quality of their lives. As WWF sees it, the key is to address local wildlife and ecosystems in a manner appropriate to each community. So although most education projects supported by WWF share a common intent and theme, no two are the same.

Educational efforts may be centered around a particular issue: the killing of endangered sea turtles for profit by financially strapped Mexican communities; the invasion of a park in Africa by slash-and-burn agriculturalists who lack better alternatives; the deterioration of a coral reef ecosystem in the Philippines from destructive fishing practices like the use of cyanide and dynamiting.

Or the efforts may be more general: using zoos, museums, national parks,



Posters and traveling exhibits are used by Poco das Antas Reserve staff, supported by World Wildlife Fund, to raise public consciousness about the Brazilian ecosystem.

and schools to promote an understanding of how basic ecological concepts relate to local natural resources. Educational projects can stand alone or, as is more often the case, serve as an integral component of a larger effort to preserve an important ecosystem or wildland area.

Building enthusiasm at this local level has prompted leaders of WWF-funded projects to call on a wide array of innovative techniques. But according to WWF Vice President Diane Wood, the techniques are not simple game playing. "What may appear to an outsider to be isolated, fun activities are actually well-thought-out initiatives selected because they are the best means to communicate an environmental message and get people to take action," she says.

Among these initiatives are video and slide presentations of local flora and fauna, guided visits to zoos and museums, visitors' centers and interpretive trails in national parks, radio and television broadcasts, plays and puppet shows, mobile teaching units, youth conservation camps, and, in at least one case, an ecology choir.

The choir is just one part of a far-reaching program run by the municipal zoo of Sorocaba, Brazil. Other activities include a short course that trains 11- and 12-year-olds to serve as volunteer zoo guards, explaining animal behavior to zoo visitors, a "green protectors" club for local teenagers, an ecology course for primary school teachers, a

correspondence course that reaches thousands of children, and a children's bird watching club.

Golden lion tamarins, tiny primates with big charisma, were the starting point for a WWF-supported conservation education project begun in 1983 in Rio de Janeiro State, Brazil. Today, staff members at Poco das Antas Reserve, supported by WWF, engage the local community through radio and television shows, lectures, posters, T-shirts, and traveling exhibits. In the process, they generate enthusiasm not just for golden lion tamarins but for an entire endangered ecosystem: Brazil's Atlantic forest.

If the ultimate goal of environmental education is empowering people to take action, then a local group located near the Gulf of Fonseca in Honduras sets a high standard. Shrimp farming, salt production, tannin extraction from wood, indiscriminate fishing, and local fuel-wood needs were putting increasing pressure on the gulf's mangrove ecosystem. In 1988, local fishermen, concerned with the visible deterioration of the mangroves, joined together to educate the local populace about their ecological value and to promote their rational management.

The Caribbean Natural Resource Institute (CANARI) has founded a multifaceted project in St. Lucia that helps local people find viable alternatives to environmentally destructive practices like dynamiting coral reefs, collecting sea bird eggs, overfishing, overharvesting wild sea moss and white sea urchins, and

cutting mangroves to produce charcoal. The project has not only set an important ecosystem on the road to recovery, it has also become a role model for reconciling resource management and economic development.

Creative programs like this are springing up in almost every country where WWF is active; our field workers rarely travel without discovering a new education group or project that wasn't there the year before. Extrapolating general lessons from this vast multiplicity of local efforts is difficult. What we can say is that education will continue to play a vital role in addressing conservation problems in the developing world while at the same building for a sustainable future. □

(Rosenthal served as a consultant with World Wildlife Fund.)

Resolving Environmental Conflicts

A Book Review by
Marcelle DuPraw and James Laue

Suppose you find yourself living in a neighborhood that relies on an outmoded and contaminated water supply system. You make phone calls to all the right agencies, pen inspired letters to the editor of your local paper, and attend numerous town council meetings—all with no tangible results. A lawsuit is out of the question: Even if you had the necessary financial resources, you firmly believe that you should not have to pay out of pocket to get public services other citizens get for free. What other recourse do you have?

In the fall of 1979, a small group of Fitchburg, Wisconsin, residents found themselves asking just this question, as recounted in one of the seven case studies presented in *Environmental Disputes: Community Involvement in Conflict Resolution* by James E. Crowfoot and Julia M. Wondolleck (Washington, DC: Island Press, 1990;

263 pp.). The answer they discovered: mediation.

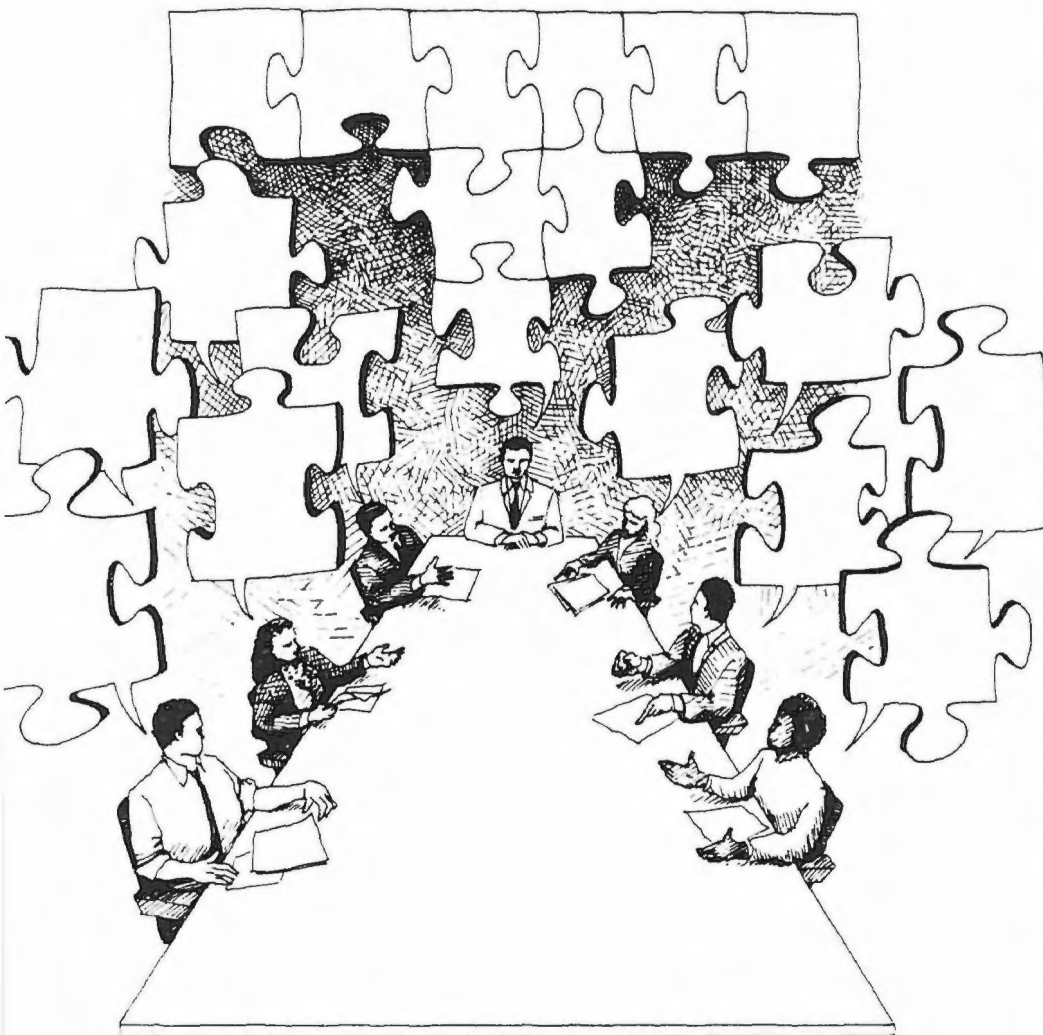
At the time, Fitchburg (population: 13,000), a suburb of Madison, had a municipal water utility that serviced the town's center. However, most of its residential neighborhoods relied on water from private wells sunk by developers in the 1940s and 1950s. Residents of the Greenfield neighborhood—served mainly by shallow, temporary well systems constructed by developers who counted on their being replaced in a decade or so by municipal water service—began experiencing water quality problems in the late 1970s. Residents reported low water pressure, and subsequent monitoring by the Wisconsin Department of Natural Resources (DNR) found a seriously high bacteria count in well water.

Early on in this case, a group of residents formed the Greenfield Neighborhood Association. By withholding payments and applying pressure on one developer through the Wisconsin DNR, the group was able to convince the developer to make necessary well system repairs. However, when problems associated with another private well system became apparent in 1978, the development company—South Side Development, owned by the Kowing family—was not as responsive.

Direct appeals to the Kowing family and initial complaints to the DNR brought unsatisfactory results. It was only after increasing numbers of complaints that the DNR began a regular water quality monitoring program in the summer of 1978, found excessive bacteria levels, and declared the water flowing through the Kowing system to be unfit for human consumption.

Repairing the existing system was found to be unfeasible, and the DNR declared that the Kowing system must be replaced. The trouble was, no one was willing to foot the bill. Legal uncertainties prevented the DNR from pressing the Kowing family to take care of the problem. Instead, the DNR ordered the town of Fitchburg to extend the municipal water supply system to the Greenfield neighborhood.

But Fitchburg town officials balked, believing that extending the water supply system would disrupt their land use plan and impose an unprecedented financial burden on the town. They contested the DNR's order



Drawing by Lucinda Levine

in court, disputing the seriousness of the water quality problem and arguing that the Kowings ought to be held accountable. Negotiations were attempted. A tentative agreement was reached but then fell through.

When the DNR suggested mediation in November 1979, all parties welcomed the idea. The neighborhood saw the process as a potentially viable way of getting the system replaced at an acceptable cost to homeowners. Fitchburg town officials were willing to participate because they wanted to appease the angry citizen activists and because, during the mediation process, the DNR was willing to suspend temporarily its order for the town to take action on the water quality problem. And the Kowing family agreed to participate because they thought mediation might provide a way to negotiate an end to their responsibility for the water system.

With the blessing of all of the parties, the DNR then arranged for mediator Ed Krinsky of the Wisconsin Center for Public Policy to manage the process. Participants held four meetings and many smaller consultations over a one-year period. All agreed that the water supply system did need to be replaced, so discussion focused on various ways of replacing the system, means of financing it, and design criteria.

The mediator's role included maintaining order during discussions, ensuring that all parties had a chance to be heard, and keeping track of ideas for solutions and agreements as they emerged. With Krinsky's assistance, participants came up with a fresh option: drilling new wells in the Greenfield neighborhood rather than extending the existing municipal system. This alleviated the city's concerns about opening up new areas to development, and consequently the town was willing to assume responsibility for the project. Under an agreement signed in February 1981, the Kowing family contributed \$10,000 and three parcels of land for new wells and expansion of Greenfield Park. The DNR agreed not to insist on upgrades to the existing system while the town was installing the new one.

The Fitchburg case is a classic success story for environmental dispute resolution. Crowfoot and Wondolleck highlight three key characteristics that distinguish environmental dispute settlement

processes from other means of dealing with such conflicts: voluntary participation of the parties, face-to-face interaction, and consensus decision-making on both process and outcomes. Throughout the book, they integrate case data with the conceptual frameworks they develop and (in Chapter 3) present a comparative analysis of environmental dispute settlement (EDS) processes used in each case.

All the case studies are documented in detail and presented in a clear and helpful comparative framework. The book offers impasse-breaking ideas for environmental activists, policy makers, and regulators on a broad spectrum of environmental issues: water quality (Fitchburg), natural areas preservation versus development (the San Juan National Forest mediation and the Sand Lake Quiet area negotiation), agriculture versus environmentalist conflicts (the Common Ground Consensus Project), urban renewal and planning (the Malden Negotiated Investment Strategy), urban river development (Pig's Eye), and ground water (the Wisconsin legislation negotiation).

The organization and typography of the book may distract readers from its useful case descriptions and analysis, however. Case studies are intermingled in a linear fashion with chapters, and seven enumerated case studies alternate with five numbered chapters without graphic distinctions. In addition, it may have been more accurate to identify Crowfoot and Wondolleck as editors rather than authors of the book since they have written only two of the chapters; five colleagues shared in the creation of the other 10 cases and chapters—Lisa Bardwell, Sharon Edger, Nancy Manring, Kristen Nelson, and Martha Tableman.

The book will certainly reward the reader's serious attention, however. By closely examining and comparing a rich range of cases, it reveals important lessons and strategic questions citizens' groups should ask when contemplating strategies for resolving environmental disputes. The seven case studies presented range from clear successes to partial settlements to failed attempts at mediation. Even the latter are illuminating. For example, the "Pig's Eye" case, which involved development along the Mississippi River in St. Paul, Minnesota,

underscores the importance of parties having a clear understanding of the role of the mediator/facilitator and compelling incentives to negotiate in good faith if the effort invested in mediation is to pay off. Other hard-won lessons to be gleaned from this book include:

- The importance of an effective organizational framework to facilitate communications within the citizens' group and between the group and other disputants, both before and during negotiation and/or mediation
- The value of an effective working relationship between a group of concerned citizens and an agency that can help advocate their interests
- The potential offered by mediation to provide a forum in which disputants can clear up misconceptions and together generate solutions previously unimagined
- The contribution a mediator can make to negotiations by attempting to "level the playing field"

In addition, the book offers several approaches citizen groups can use to persuade local officials at least to try mediation as an alternative to litigation.

Dedicated broadly "to those individuals and organizations working for environmental change," this book is clearly aimed at educating and empowering citizen groups. The authors end with a word of encouragement "to you, the leaders and members of today's citizen and environmental groups" to "continue to seek enhanced environmental quality for all citizens [and to share] your experiences and the lessons learned with each other." Its formatting flaws notwithstanding, this book will serve as a valuable resource to groups travelling that road. □

(DuPraw is an Associate at the Conflict Clinic, Inc., and Laue is Lynch Professor of Conflict Resolution, both at George Mason University in Fairfax, Virginia. DuPraw and Laue help disputants resolve environmental and other public policy disputes through conflict analysis, design of conflict resolution processes and systems, facilitation, mediation, negotiation training, and the development of conflict resolution theories.)

A Well Water Tale

by Ross Ettlin

Through the backyards of America, through the Alaskan tundra, through blazing heat and freezing cold, through Hurricane Hugo ... sample collectors for EPA's National Survey of Pesticides in Drinking Water Wells (NPS) persevered under sometimes arduous circumstances and came home with stories to tell. These were the front-line workers—some 300 specially trained federal, state, and contract technicians—who did the legwork for the NPS, the first survey of its kind to be conducted on a nationwide scale. The \$12 million survey was jointly sponsored by the Office of Drinking Water and the Office of Pesticide Programs.

NPS samplers spent two years in the field, travelling roughly 180,000 miles in a dedicated quest for drinking water samples for laboratory analysis. In their travels, they visited 1,349 wells and gathered some 30,000 well water samples to be lab-tested to determine the frequency and concentration of pesticide and/or nitrate residues. The wells they sampled included both

rural domestic wells and community water systems and ranged from old-fashioned rope-and-bucket devices to the latest high-tech systems. In addition to collecting water samples, NPS samplers administered questionnaires in an effort to gather information on pertinent factors that relate to the contamination of ground water (see box).

From the beginning, even at the pilot stage of the survey, samplers encountered unexpected adventures. In the rural counties where the pilot testing took place, the sight of a group of young strangers driving around town in a late-model American car, occasionally stopping to scribble something on a clipboard, made local citizens very suspicious. The technicians found themselves frequently being interrogated by the police, who had received numerous calls from worried residents. Typically the police officers asked for credentials—and in one instance, called then-director of the survey Jim Boland to verify that there really was

such a thing as a National Pesticide Survey and the samplers really were who they said they were.

This experience provided a lesson in public relations. The survey team realized, says Boland, that "people didn't trust us because they didn't know us." As a result, the team launched an extensive communications effort, which became one of the hallmarks of the survey. After EPA held a town meeting to explain to residents the nature and intent of the survey, the reception samplers received was dramatically improved. Residents were eager to have their wells tested, and most were willing to fill out questionnaires.

Ironically, some of the local skepticism about what was going on turned out to be not entirely unfounded, just misdirected. Certain opportunistic and unscrupulous people tried to take advantage of the survey backdrop by using scare tactics: telling people their water was contaminated and trying to sell them expensive devices to put on the end of their faucets. EPA quickly enlisted the cooperation of the regions and the states to launch an outreach and education program. Through this program, people were informed that their wells were not necessarily contaminated just because EPA was conducting a survey and warned against devious salesmanship. As a result, the faucet device scam quickly came to an end.

Once the survey was fully underway, samplers had day-to-day logistical problems to contend with. When water samples were sent to any of the eight testing laboratories involved in the NPS, they needed to be packed in ice to keep them at precisely 4 degrees Celsius. If the samples happened to get too warm or too cold, their chemical composition would change and they could not be used for standardized analysis.

Continued on next page



During two years in the field, sample collectors for EPA's nationwide survey of pesticides in drinking water wells gathered a total of 30,000 samples.

EPA photo.

Moreover, because of statistical design requirements, samples had to be collected throughout the year, not just during convenient seasons. When samplers traveled to Iowa in the dead of winter, the temperature was minus 17—minus 47 with the wind chill factored in. That's more than 80 degrees colder than it was when samplers went to Alaska. It was so cold that workers had to hold the samples between their knees to keep them from freezing during preparation for shipment. "It's not easy trying to

label bottles with numb fingers," said Jeff Dawson, a sampling team leader who speaks from experience.

In California, field workers had just the opposite problem. The air temperature was 120; the water temperature, 92. That sample required the most ice—but still just a fraction of the 27 tons of ice used in the study.

In Alaska, believe it or not, the problem was a lack of ice. "There just wasn't a Seven-Eleven nearby where samplers could buy 20 pounds of ice," Boland said. The samplers had to carry

ice along with the bulky sample kits with them on the plane trip to the sampling site. A moose carcass had to be removed from the plane to make room for all of the equipment and ice.

When samplers were working in Chandler, Georgia, a small town near Savannah, Hurricane Hugo hit. As coastal residents evacuated their homes, the team worked feverishly to complete all of the samples scheduled for the day. It was nearly impossible for the team to keep the rain from filling the sample bottles. "It was pouring down in sheets like I've never seen before," Dawson said. When samplers traveled back to South Carolina four weeks after the hurricane, they were amazed by the cooperative spirit of people. "Even with the extensive damage, people were still willing to stop cleaning up and give up 60 minutes of their time for the survey," said Bruce Rappaport, data analysis and training manager for the NPS.

So was the business of gathering NPS samples really so important that it was worth braving Hurricane Hugo, not to mention 180,000 miles of legwork? When you consider that half the population of the United States relies on ground water for its drinking water supply, the value of surveying the potential contamination of well water by pesticides and nitrates is obvious. Says Jeanne Briskin, the present director of the survey: "The survey results . . . will help us to identify and better regulate risky pesticides and improve state pesticide management plans. And the procedures used in the survey will provide a guide for state and local ground water studies." □

(Ettlin, a recent graduate of the University of Maryland, was an intern with EPA Journal).

Goals and Findings of the National Pesticide Survey

The National Survey of Pesticides in Drinking Water Wells had two primary goals:

- Phase 1: To estimate the frequency and concentration of the presence of pesticides (126 chemicals and their breakdown products detectable with multi-residue methods of analysis) and nitrates in drinking water wells nationally.

- Phase 2: To improve EPA's understanding of how the presence of pesticides and nitrates in drinking water wells may be associated with patterns of pesticide use and the vulnerability of ground water to contamination. For statistical analysis, information on factors such as pesticide and fertilizer usage and animal husbandry activities in the vicinity of wells, climate conditions such as rainfall, local geologic conditions, the age of wells, etc. was obtained from a number of data sources, including questionnaires administered by NPS samplers.

Based on the laboratory test results analyzed in Phase 1 of the survey, EPA estimated that 10 percent of community drinking water wells and about 4 percent of rural domestic drinking water wells nationwide have detectable residues of at least one pesticide. However, fewer than 1 percent of the wells had pesticide residues

above levels considered protective of human health. The two most frequently detected pesticides were atrazine and degradates of dacthal (DCPA); both pesticides are weed killers.

EPA also estimated that more than half of the nation's wells contain nitrates: About 1.2 percent of the community wells and 2.4 percent of the rural wells showed a total of more than 250,000 nitrate detections above 10 parts per million, the maximum contaminant level established to protect human health.

The analyses performed in Phase 2 of the NPS showed that a wide variety of factors influence the contamination of drinking water wells by pesticides or nitrates. Among other factors, the value of crops grown in a county, the amount of nitrogen fertilizer sold, the amount of fertilized pastureland, amount of rainfall, and well depth were associated with detections of pesticides or nitrates in the wells.

Although the NPS can not prove that any of these factors cause well contamination, many of its results are consistent with the findings of other studies. The survey results contribute additional support toward taking a pollution prevention approach toward protecting drinking water and ground water.

Henry David Thoreau

by Jack Lewis

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About This Feature . . .

Since the earliest days of the American republic, many great men and women have laid the foundation for the work EPA is doing today. This feature about Henry David Thoreau inaugurates a new series about such ground-breaking individuals; it will appear from time to time in the *Journal*. Incidentally, under the new National Environmental Education Act, the "Henry David Thoreau Award" will be given in recognition of outstanding contributions to literature on the environment. Other awards are named for Theodore Roosevelt, Rachel Carson, and Gifford Pinchot.

He was condemned by many as a misanthrope, a misfit, a hermit. Certainly Thoreau did not suffer fools gladly, but he did have a heart. The two great loves of his life were his brother John and the wonders of nature. John died tragically of lockjaw in January 1842, and Thoreau was never quite the same again. It was then that he turned to the contemplative life, which he associated with a state of oneness with nature. Some thought he carried this passion too far: For instance, it is reported that Henry was inordinately fond of wading naked through the streams of Concord.

To many of his neighbors in Concord, Thoreau was known not as the Sage of Walden but as "the fool who burned the woods down." In 1844, while cooking fish at a spot on the perimeter of Concord woods, Henry accidentally sparked a major forest fire that for decades blighted one of the most beautiful places in America.

Thoreau's world-famous essay, *Civil Disobedience*, grew out of a night in July 1846 when he was detained in Concord jail for nonpayment of the poll tax. Henry had refused to pay the tax because of its association with the institution of slavery. His maiden Aunt Maria, without asking Thoreau, paid his tax and secured his release. Henry,

wanting to continue his protest, was furious. Ralph Waldo Emerson is reputed to have visited Thoreau in his jail cell. "Why are you here?" Emerson asked. "Why are you not here?" Thoreau replied.

When asked by the alumni association of Harvard, his *alma mater*, to name his occupation, Thoreau termed himself a schoolmaster, surveyor, gardener, farmer, house painter, carpenter, mason, day-laborer, pencil-maker, and—last of all—"a Writer, and sometimes a Poetaster."

Even after a century and a half, Thoreau speaks best for himself:

From *Walden*

"I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived . . . I wanted to live deep and suck out all the marrow of life, to live so sturdily and Spartan-like as to put to rout all that was not life, to cut a broad swath and shave close, to drive life into a corner, and reduce it to its lowest terms, and, if it proved to be mean, why then to get the whole and genuine meanness of it, and publish its meanness to the world . . .

"Near the end of March, 1845, I borrowed an axe and went down to the woods by Walden Pond, nearest to

Provided courtesy of Charles Overly Studio, Sudbury, Massachusetts.



The cabin that Thoreau built at Walden Pond.

where I intended to build my house, and began to cut down some tall, arrowy white pines, still in their youth, for timber. It is difficult to begin without borrowing, but perhaps it is the most generous course thus to permit your fellow-men to have an interest in your enterprise. The owner of the axe, as he released his hold on it, said that it was the apple of his eye; but I returned it sharper than I received it

"The scenery of Walden is on a humble scale, and, though very beautiful, does not approach to grandeur, nor can it very much concern one who has not long frequented it or lived by its shore; yet

this pond is so remarkable for its depth and purity as to merit a particular description. It is a clear and deep green well, half a mile long and a mile and three quarters in circumference, and contains about sixty-one and a half acres; a perennial spring in the midst of pine and oak woods, without any visible inlet or outlet except by the clouds or evaporation

"The mass of men lead lives of quiet desperation. What is called resignation is confirmed desperation

"It is an interesting question how far men would retain their relative rank if they were divested of their clothes" □

Milestones

1817 Born in Concord, Massachusetts, July 12.

1827 Earliest known essay, *The Seasons*, is published.

1837 Graduates from Harvard College.

1845 In March, begins building his Walden cabin, located on land owned by Emerson. Moves in on Independence Day. Total cost of the cabin: 28 dollars, 12 1/2 cents.

1846 Arrested and thrown in jail overnight for nonpayment of taxes.

1847 Leaves Walden Pond in September, having finished the major part of *Walden*.

1849 Publishes *A Week on the Concord and Merrimack Rivers*. Only 218 copies are sold in four years.

1854 Publishes a much revised version of *Walden* in August. It takes five years to sell off the first edition of 2,000 copies. (In all editions and all languages, *Walden* has since sold millions of copies.)

1860 Contracts tuberculosis after catching a severe cold while surveying tree stumps.

1862 Dies in Concord on May 6, at the age of 44.

Walden Pond. This cairn has marked the location of Thoreau's cabin since 1872.



Herbert W. Gleason print.

William Matuszeski is the new Director of the Chesapeake Bay Program.

Matuszeski came to EPA in 1989 as a Special Assistant in the Office of Water. He then became the Associate Assistant Administrator for Water in 1990.

Prior to moving to EPA, Matuszeski held several positions, totaling 13 years of service, at the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce. He was Executive Director of the Department of National Marine Fisheries Services from 1988 to 1989, Director of the Office of Private Sector Initiatives from 1986 until 1988, Acting Deputy Assistant Administrator for Ocean Services and Coastal Zone Management and National Ocean Services from 1982 until 1986, and Director of State Programs in the Office of Coastal Zone Management from 1976 to 1982.

From 1970 to 1976 he was on the staff of the Council on Environmental Quality. He served as Special Assistant to the Director at the U.S. Information Agency in Washington, DC, from 1969 until 1970. He was also a volunteer for the Peace Corps in Venezuela for three years.

Matuszeski recently assisted the Government of Ecuador in the design and implementation of the first comprehensive coastal management programs in Latin America. He also developed a multi-year agency-wide budget to implement the new U.S.-Mexico Border Environmental Plan.

Matuszeski has a Bronze and a Silver Medal from the Department of Commerce.

He is a 1963 graduate of the University of Wisconsin with a B.A. in government. He received his law degree from Harvard Law School in 1966.



Matuszeski

Abby J. Pirnie is the new Director of the Office of Cooperative Environmental Management in the Office of the Administrator.

Since joining EPA in 1978, Pirnie has held several positions—most recently in the Office of Information Resources Management. Pirnie was the Director of the Program Systems Division for two years and Director of the Information Management and Services Division for three years.

Her first EPA position was as a regulatory impact analyst in the Office of Policy, Planning, and Evaluation (OPPE) from 1978 to 1980. From 1980 to 1984, she served as a Special Assistant to the Director of the Office of Water Enforcement and then as Special Assistant to the Director of the Office of Water. In 1984 she returned to OPPE as a special assistant to the Director of the Office of Management Systems and Evaluation; she then served as the Chief of the Environmental Results Branch in that office until her move to the Office of Information Resources Management in 1986.

Before coming to EPA, Pirnie worked as a consultant for Booz, Allen, & Hamilton and as a market researcher for MCI and Xerox's Advanced Business Concepts Group. She has taught in both public and private schools.

Pirnie, awarded two EPA



Pirnie

Bronze Medals, received the Lee J. Thomas Excellence in Management Award in 1989. She graduated from Smith College in 1971 with a B.A. in French Literature and earned an M.A. in education from Smith in 1972 and an M.B.A. from the University of Santa Clara in 1976.

David W. Ziegele has been selected to assume the position of Director of Underground Storage Tanks in the Office of Solid Waste and Emergency Response.

Ziegele started at EPA in 1981 as a program analyst in OPPE. During his five-year tenure in the office, he also served on a rotational assignment as senior program analyst in the Office of Air and Radiation in Durham, North Carolina.

In 1986 he was named Chief of the Program Planning Branch in the Office of Policy, Planning, and Evaluation. A year later, he became Director of the Program Evaluation Division within the same office, a position he held for three years.

Ziegele moved in 1990 to OSWER as Acting Deputy Director of Underground Storage Tanks; he became Acting Director of the office in 1991.

Before coming to EPA, Ziegele served as a Peace Corps volunteer in West Africa and as a country desk assistant. He also served as a



Ziegele

Special Services Officer at Peace Corps Headquarters.

He is the recipient of an EPA Gold Medal and two EPA Bronze Medals.

Ziegele is a 1976 graduate of the University of Iowa, where he received his B.A. in general studies. He also received an M.A. in Public Administration from the University of Southern California in 1984.

Terence Harvey is the new Director of the Environmental Criteria and Assessment Office in Cincinnati, Ohio.

Before his recent move to EPA, Harvey was the Director of Public Issues Management at the Monsanto Company in St. Louis, responsible for external contacts on issues including environmental safety of new and existing products ranging from pesticides to animal health products. Before taking this position in 1989, he was Director of the company's Regulatory Affairs Office for six years.

Harvey had previously worked in the Food and Drug Administration, serving, since 1969, in a variety of offices within its Bureau of Veterinary Medicine. He served as a veterinary medical officer from 1969 to 1976 and temporarily as acting chief of the Pharmacology/Toxicology Branch between 1975 and



Harvey



Gorn



Davidson



Walker



Skinner

1976. He went on to become the chief of the Non-Food Producing Animal Branch that same year, a special assistant to the director in 1978, and an acting associate director for surveillance and compliance in 1981. Harvey also acted as director of the Division of Therapeutic Drugs for Non-Food Animals in the Office of Scientific Evaluation from 1982 to 1984.

Harvey earned a B.S. in veterinary medicine in 1966 and a D.V.M. degree in 1968, both from the University of Illinois.

Michael H. Gorn has been selected for the new position of Historian in the Management and Organization Division of the Office of Administration and Resources Management.

Gorn came to EPA from Andrews Air Force Base, where he was Command Historian of the U.S. Air Force Systems Command since 1989. From 1985 until 1989 he worked in the Office of Air Force History at the Pentagon, and from 1981 to 1985 he served as a staff historian in the Air Force Systems Command History Office.

He began his career in 1978 as the Chief of Archives at the New England Genealogical Society in Boston, Massachusetts, a position he held until 1981.

He is the author of two books and several articles and has written many book reviews for various historical publications.

Gorn received several awards from the Department of the Air Force, most notably the Meritorious Civilian Service Medal.

He received both his B.A. and M.A. degrees in history from California State University. In 1978, he received his Ph.D. in history at the University of Southern California.

Gordon M. Davidson has been named Director of the Office of Federal Facilities Enforcement within the Office of Enforcement, a position he has held in an acting capacity since September 1990.

Previously, Davidson was Deputy Director of the Office of Federal Facilities Enforcement and its predecessor organization, the Federal Facilities Hazardous Waste Compliance Office. Davidson came to EPA from International Technology Corporation, where he managed compliance and regulatory programs from 1986 to 1987. Before that, from 1984 to 1986, he was Deputy Manager of the east coast office of Geo/Resource Consultants, where his duties included managing EPA's RCRA/CERCLA Hotline.

From 1980 to 1984, Davidson consulted with local governments and EPA on hazardous waste issues. He also served as a member of EPA's Technical Assistance Team in support of the Superfund removal program. Davidson teaches part-time at Duke University's School of the Environment graduate program in environmental management.

He is a graduate of Wittenberg University in Ohio, where he earned his B.A. in biology. He also earned his M.A. in Environmental Management from Duke University in North Carolina.

Michael J. Walker is the new Enforcement Counsel for Pesticides and Toxic Substances in the Office of Civil Enforcement.

Before coming to Washington in 1985, Walker served as a general attorney in EPA's Region 5 office in Chicago. In 1979, he began work in the Legal Support Section of the Water and Hazardous Materials Enforcement Branch there and moved, in 1981, to the Office of Regional Counsel. Two years later, Walker served in the Air, Water, Toxics, and General Law Branch.

Once in Washington, he worked in the Pesticides and

Toxic Substances Enforcement Division in the Office of Enforcement and Compliance. He served as a general attorney-advisor from 1985 to 1987, then became a supervisory attorney-advisor in 1987 and later the acting Associate Enforcement Counsel.

Walker has a University of Wisconsin B.A. degree in biology/conservation and a J.D. degree from the University of Toledo. He has received a dozen EPA-related awards.

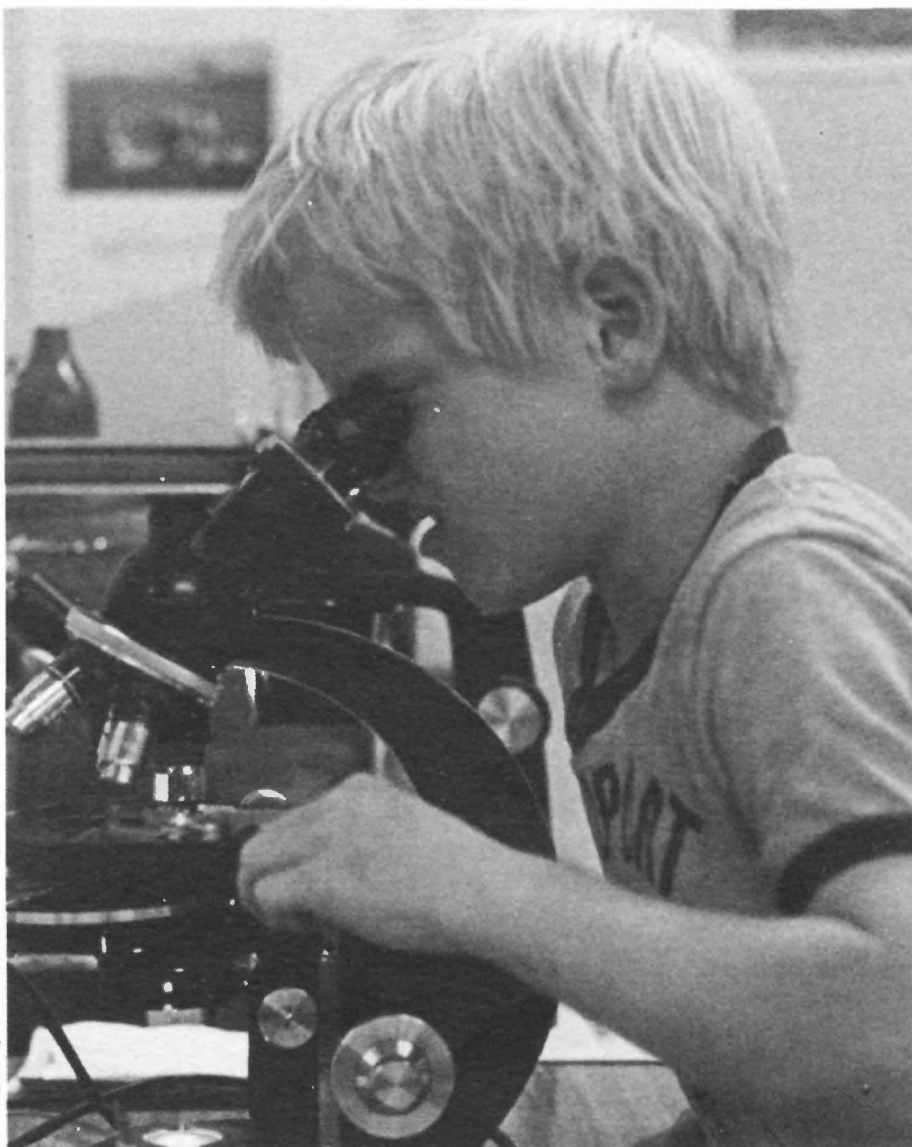
John H. Skinner, Deputy Assistant Administrator of the Office of Research and Development (ORD), has been appointed as Chairperson of the Agency's National Human Resources Council.

Since joining the EPA in 1972, Skinner has held positions of Branch Chief, Division Director, and Office Director for the Office of Solid Waste. In 1985 he became ORD's Director of the Office of Environmental Engineering and Technology Demonstration. In 1990 he was appointed as ORD's Deputy Assistant Administrator and will continue in that capacity while serving as chair of the council. □

California Department of Fish and Game.



Oregon Department of Fish and Wildlife.



Florida Game and Freshwater Fish Commission.



Dave LaHart photo.



Back Cover: On the Ecology Trail: Students examine a deer's skull and antlers at the Central Wisconsin Environmental Center. Photo by Mike Brisson.

WEB OF LIFE
ECOLOGY TRAIL

