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Post-Rio: The Challenge at Home

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From the Editor

Individualism is a great American tradition. It is expressed today in the driver commuting alone to work; the detached, single-family suburban home; and the second family home on a strip of waterfront property. In a little over 200 years, this spirit has conquered a vast expanse of land from the Atlantic to the Pacific, produced one of the world's most powerful economies, and resulted in a lifestyle that is sought after by societies around the globe.

But America is much more than 249 million individuals. It is, in reality, a complex, intricate organism, just as the human body is made up of skin and blood vessels, bones, and lungs. If these systems are functioning well and working effectively together, the organism will be healthy and operate efficiently. These "life support" systems in our society include energy, technology, transportation, industry, the land and the use we make of it, and even people, the greatest resource of any society.

We need to view ourselves as a society composed of such systems and take the time to ask, Are our systems operating well? If we persist in seeing ourselves simply as a nation of individuals, fragmented by our own interests and concerns, it is logical to expect that the vital systems of support will deteriorate and threaten the quality, if not the very future, of the American venture.

There are already many signs of trouble, from traffic jams to industry struggling to remain competitive with the rest of the world, from pollution to decaying city cores. The challenge for this nation, as we try to become a better neighbor on the planet, is to lower our individual guards and declare our interdependence with each other and with the "life supports" whose condition will determine the health and strength of a future America.

John Heritage

Front cover: Encroaching development and its consequences must be addressed as the United States works toward sustainable development.

Photo by Larry Lefever for Grant Heilman Photography, Inc.

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The U.S. Environmental Protection Agency 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.

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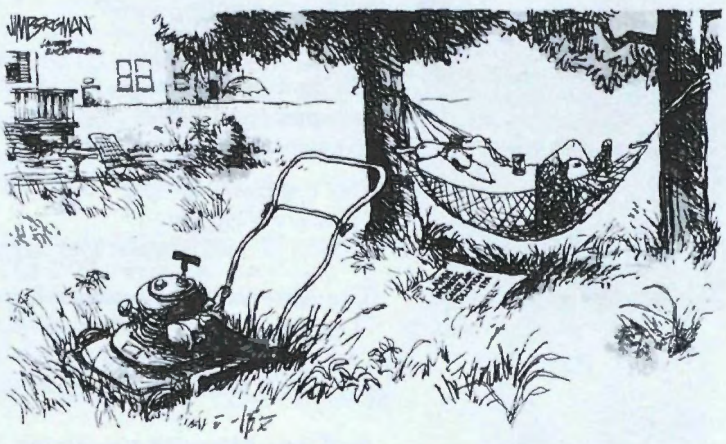
Battery-Powered Lawn Mowers To Be Studied for Smog Reduction

Under an agreement between EPA and a consortium of electric utilities and their associations, the environmental benefits of using electric instead of gasoline-powered lawn mowers will be studied. The consortium will distribute up to 1,000 cordless mowers to residents across the country in exchange for their gasoline mowers; they will then gather performance and customer satisfaction data from the residents. EPA will test the gasoline mowers to decide whether to issue emissions regulations. The consortium consists of the Edison Electric Institute, the Electric Power Research Institute, and the following utilities: Baltimore Gas & Electric, Boston Edison, Indianapolis Power & Light, New England Electric System, New York State Electric & Gas, Oklahoma Gas & Electric, Potomac Electric Power, Tampa Electric, and Western Resources.

The New York Times commented: " ... To most people, it is a lawn mower, but to the Environmental Protection Agency it is an 'uncontrolled mobile source' that becomes part of the suburban swarm adding measurably to smog on a summer's day. And the time has come, the agency says, to clean it up, along with weed eaters, leaf blowers, chain saws, and a lot of other off-road gas-powered machinery. A lawn mower can easily spew as much smog-causing hydrocarbon into the air in an hour as a modern car, experts on pollution say, even though the car has 30 times as much horsepower .... This is because modern cars have microprocessors that can precisely control an engine's mix of fuel and air, injectors to break the fuel into droplets of optimal size, and catalytic converters to catch anything that passes through the engine unburned. Lawn mowers and other outdoor machines have none of these. In fact, they have all the pollution control equipment of a '57 Chevy—without a muffler .... Ten utilities around the country will each give away 100 newly designed battery-powered mowers, taking their customers' old gasoline models in trade and asking them to test the new mowers in the field—or, more precisely, on the lawn—and report back on their performance. Meanwhile, the EPA will haul the old mowers into its labs to study their emissions ...."

The Baltimore Sun reported: " ... Don't tow your Toro to the nearest Baltimore Gas and Electric Co. [(BG&E)] office just yet. The great lawn mower giveaway is not quite ready, and it may not be such a sweet deal after all .... Yesterday, BG&E spokesman Art Slusark said his company does not yet have any of the 100 electric mowers it plans to distribute. The utility also has not figured out how to give them out, or even if the mowers will be free .... Electric mowers use very little electricity, industry spokesmen say. In fact, a single lawn cutting uses less electricity than it takes to burn a 60-watt light bulb for an hour, according to the Edison Electric Institute, a utility industry group. Using an electric lawn mower all year would cost less than $4 in electricity. Many people complain about fighting an electric mower cord as they mow. But the utilities plan to hand out a new cordless model made by Black & Decker Corp. It can run for an hour, which should be enough time to cut a quarter acre. Then, it must be plugged in for recharging ...."



Chicago Board of Trade to Run Auctions and Direct Sales of SO_2 Allowances

EPA has selected the Chicago Board of Trade to run the annual auctions and direct sales of sulfur dioxide (SO_2) allowances under its acid rain program. The first auction will be held in March and the first direct sale by June of next year. Auctioned allowances will be sold to the highest bidder; direct sales, which will be made on a first-come, first-served basis, are set by the Clean Air Act (CAA) at $1,500 per allowance, to be adjusted yearly for inflation.

Market-based trading of SO_2 allowances is the centerpiece of the acid rain program. Under the program, EPA will give existing sources (mainly power plants) free allowances based on emissions rates and previous fuel use. One allowance gives a plant the right to emit one ton of SO_2 a year. The plant's total emissions cannot exceed its total allowances. If a utility reduces its emissions more than required, it can put its surplus allowances on the market. To stimulate the market, the CAA requires that EPA set aside for auction or direct sale up to 2.8 percent of the allowances that it would otherwise make available to existing utilities. The auctions and direct sales will also provide allowances for new utilities, which are not automatically entitled to them under the Act.

The delegation to the Chicago Board of Trade begins with the first auction next March and continues for three years. EPA may extend the delegation; it may also revoke it. The board will not be compensated by EPA, nor can it charge fees to those who buy allowances.

Dexter Corporation Settles for $13 Million in Fines

Dexter Corp., a *Fortune* 500 company that operates facilities nationwide, has agreed to pay $13 million in criminal and civil fines for violations at its manufacturing plant in Windsor Locks, Connecticut. The plant manufactures specialty paper products that are used in the making of tea bags, food packaging, and disposable medical gowns. The violations were charged under the Clean Water Act and the Resource Conservation and Recovery Act; the settlement resulted from the combined efforts of the State of Connecticut, the U.S. Department of Justice, and EPA.

Dexter pled guilty to eight felony violations and agreed to pay $4 million in fines for illegally disposing of carbon disulfide, a chemical used in making viscose. During transfer of the chemical to a storage tank, some carbon disulfide remained in shipping drums; when the drums were turned over, the chemical, which is classified as an acute hazardous waste, was dumped on the ground. It was also discharged into the Connecticut River through an overflow pipe from the tank.

Dexter, whose facilities discharge more than six million gallons of wastewater a day into the Connecticut River, also will pay $7.2 million for routinely violating conditions of its National Pollutant Discharge Elimination System (NPDES) permit. Inadequately treated or, in some cases, untreated discharges of organic pollutants have depleted oxygen in the river; aquatic life has also been harmed by the discharge of toxic pollutants, such as chlorine.

The company will pay a $1.8 million penalty for failing to manage hazardous wastes in accordance with the law. According to EPA, it illegally treated, stored, and disposed of wastes; failed to notify the Agency of hazardous waste activities and to document transport; improperly managed containers during storage; and failed to maintain adequate records and to establish adequate financial assurances to close the facility safely.

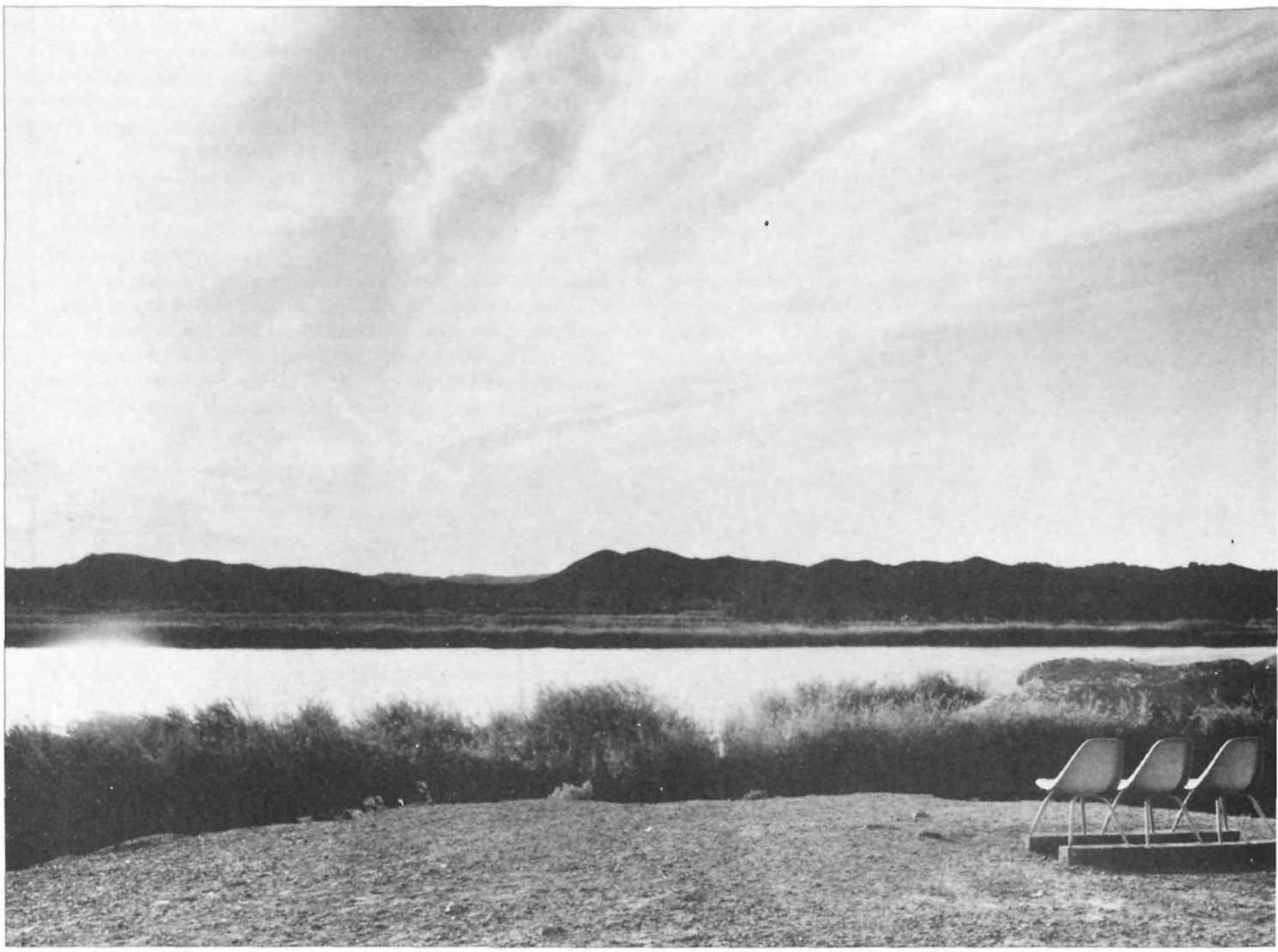
New Rule to Protect Agricultural Workers from Pesticides

A new regulation issued by EPA is designed to limit exposure of agricultural workers to pesticides, to reduce health effects when exposure occurs, and to educate workers about the hazards of using pesticides. The rule, which substantially revises standards set in 1974, will affect 3.9 million people—not only farmworkers, but also those who work in forests, nurseries, and greenhouses. In announcing the new standards, Administrator Reilly said: "Agricultural workers throughout America now have a far greater opportunity to protect themselves and their families. These workers will know, often for the first time, when they are working in the presence of toxic pesticides, understand the nature of the risks these chemicals present, and get basic safety instructions."

The Wall Street Journal commented: " ... The regulations will raise national standards closer to those in California, which has the nation's toughest pesticide-handling laws, said Linda Fisher, head of the EPA's pesticide division. But Shelley Davis, a lawyer for a migrant-worker group, called them a 'baby step forward.' The revisions, the first in 18 years, will cover not just traditional farm laborers but for the first time employees of greenhouses, nurseries, and forests as well. There are an estimated 20,000 to 300,000 poisonings of agricultural workers a year, with about 1,000 fatalities. Hard statistics aren't available because record-keeping is so poor. To limit worker exposure, the EPA will require that by April 1994 employers train workers in pesticide safety, post safety information, and place warning signs to keep workers out of freshly sprayed fields. Quarantines barring re-entry to freshly sprayed fields currently are in place for only about 50 agricultural chemicals. The new rules will set quarantine times, ranging from 12 hours to three days, for all other pesticides, depending on the chemical's toxicity. In a change affecting pesticide makers, new restrictions on quarantines and protective equipment will have to be displayed on product labels .... "

The New York Times reported: " ... The rules, issued Thursday, require employers to train workers in the handling of pesticides and post warnings of risks. Their implementation was caught in a struggle between the Agriculture Department, which said they could hurt the agriculture industry, and proponents of stiffer regulations .... The EPA said compliance could cost companies up to $60 million a year. Under the new regulations, employers must train workers to use protective equipment, like gloves or goggles, and provide a place for them to wash and get emergency medical care. Employers must post notices at treated fields warning workers in Spanish and English of pesticide risks, and they must bar workers from the fields for 12 to 72 hours after spraying, depending on the type of pesticide used and conditions. The rules would be phased in over the next two years. By April 15, pesticides must carry labels warning that they are not to be used in a way that would lead to human exposure .... Advocacy groups for farm workers cheered some aspects of the regulations but said they did not do enough to insure that workers were trained about pesticide exposure .... The rules would not apply to Government-sponsored pest control, livestock uses, home gardens or lawns, research on unregistered pesticides, or post-harvest activity. Farm owners and their immediate families are exempt from the training, decontamination, and emergency assistance rules, the EPA said .... " ◊

American Landscapes



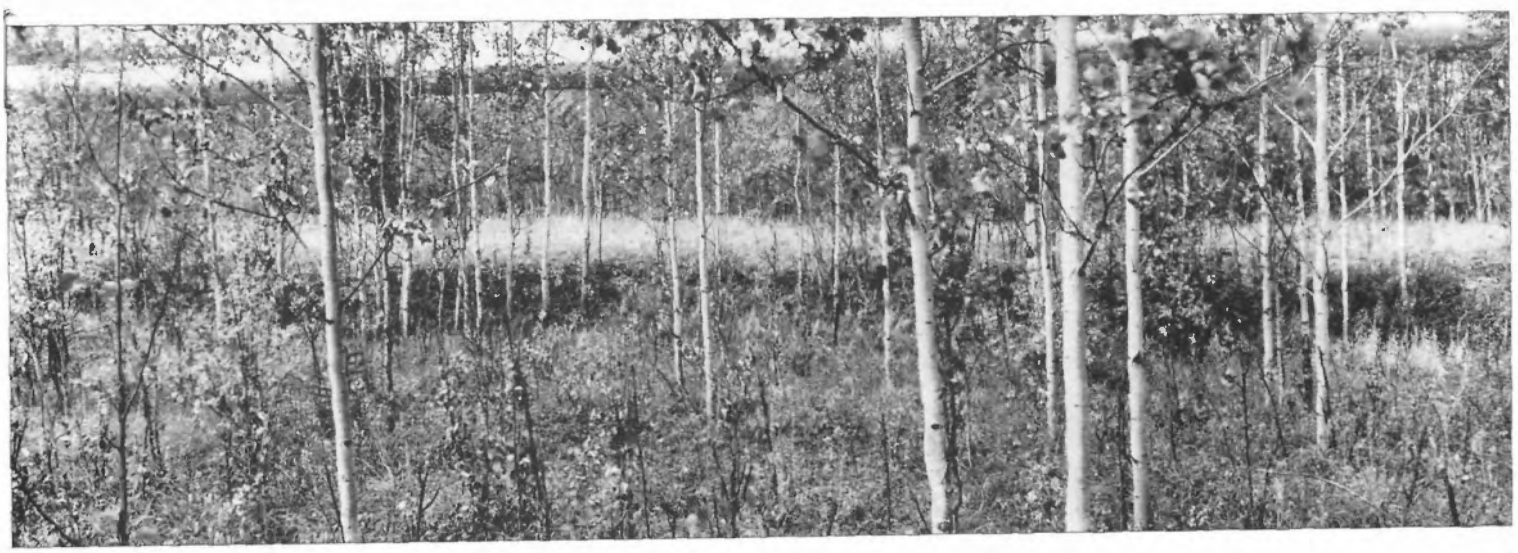
Fisher's Landing: Martinez Lake, Arizona *by Jim Stone (1988).*

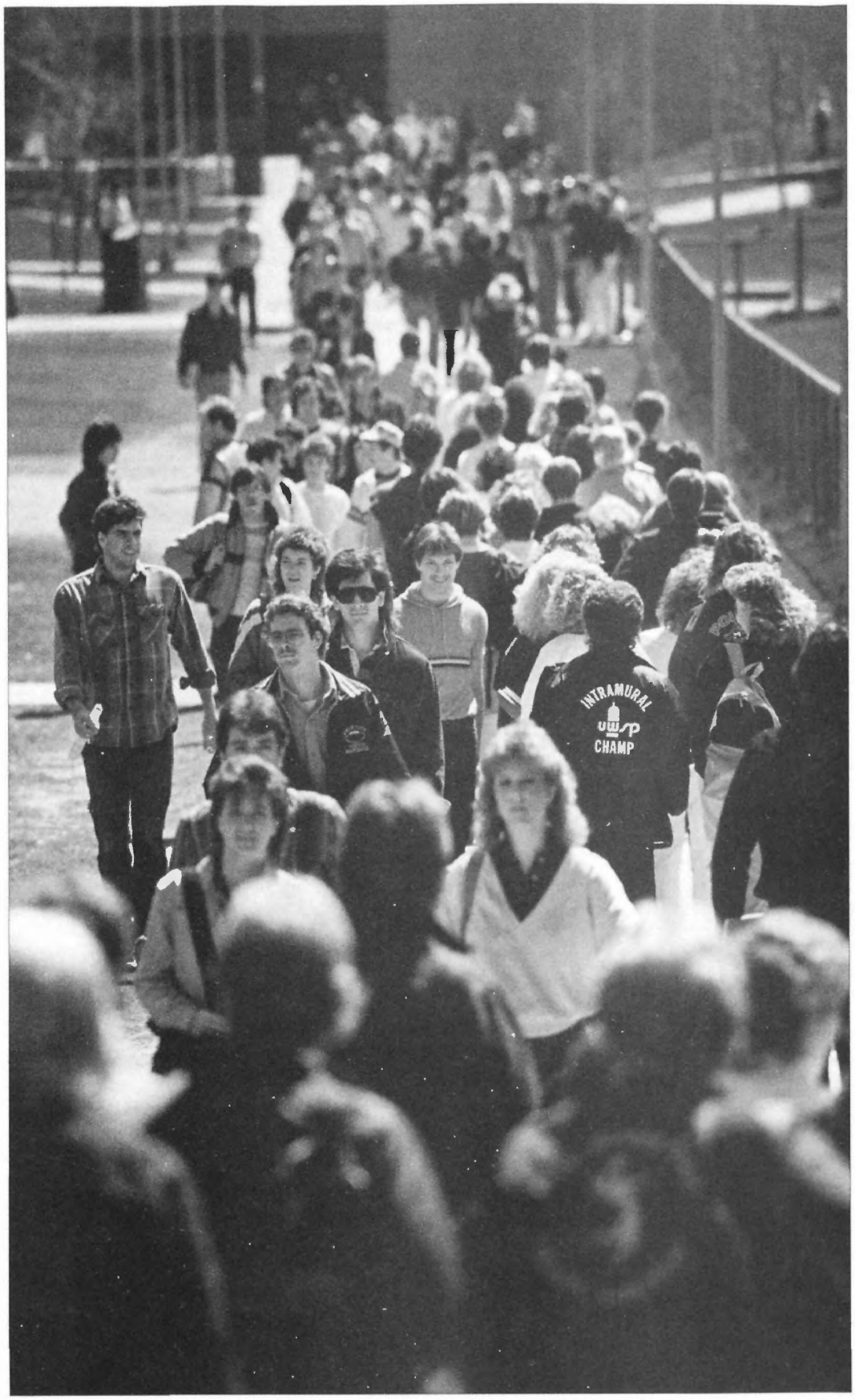
The "Earth Summit" of last June—the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil—brought worldwide attention to the fundamental interconnections between economic activity and the environment. In the wake of the Rio conference, it makes sense, as a beginning, to take a closer look at the economic and ecological connections that surround us, starting here at home in the United States.

It has been said that the 20th century ended and the 21st century began at the Earth Summit. If that is true, then a current exhibition entitled *Between Home and Heaven: Contemporary American Landscape Photography,* organized by the National Museum of American Art, documents the American landscape of the era now ending. *Between Home and Heaven* (a few images are pictured here) depicts urban grit in Manhattan, the textures of a Kansas prairie, scarring left from a strip mine in Montana, and a plethora of other images from across the continent. Amidst the patterns of abuse, the uneasy coexistence of nature and culture, and scenes of raw natural grandeur is an invitation for Americans to form a more benign compact with their land. By recognizing limits to sustainability, such a compact could ensure that the land continues to provide both inspiration—a heaven—and a source of resources and wealth—a home.

Between Home and Heaven has been displayed at the National Museum of American Art in Washington and the Carnegie Museum of Art in Pittsburgh. It will open this winter at the New Orleans Museum of Art and also will travel to the New York State Museum in Albany, the Cleveland Museum of Art, and the Virginia Beach Center for the Arts. ◊

Photos from top to bottom: Smoky Hill Bombing Range Target, Tires *by Terry Evans (1990);* Three Mile Island Nuclear Plant, Susquehanna River, Pennsylvania *by John Pfahl (1982);* Alaska Pipeline *by Skeet McAuley (1990). All four photos are from the National Museum of American Art and are gifts from the Consolidated Natural Gas Company Foundation.*





Today's young people will inherit the planet. Can it sustain their needs and those of future generations?

Mike Brisson photo.

A Call for Sustainability

To ensure our future survival, major changes are needed now

by Russell E. Train

The coming together of more than 170 nations under the auspices of the Earth Summit was, if nothing else, the first *global* acknowledgement that environmental quality and economic health are inextricably linked—that the economic well-being of the Earth's peoples depends directly on the continued health of its natural resources.

This synthesis of environment and economics—and put forward in *Agenda 21*, the lengthy charter for the future adopted by the conference plenery—known as sustainable development, was only advanced, not discovered, by the diplomats in Rio. I suspect that if one were to search the literature, one would find references to the basic relationship hundreds, if not thousands, of years ago. I do know that 85 years ago, in the annual message to Congress which has since become known as the State of the Union address, President Theodore Roosevelt said, "To waste our natural resources, to skin and exhaust the land instead of using it as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them amplified and developed."

The choice between crisis and sustainable development is one our nation shares with the rest of the world, and the only way to address it is through international cooperation and through U.S. commitment to leadership at home and abroad.

As the world's single largest economy, the largest user of natural resources, the largest producer and consumer of energy, and the largest producer of carbon dioxide pollution, the United States has not just a special responsibility to exercise world leadership but a particularly high stake in meeting the environmental challenges of the future.

I am convinced that the natural processes that support life on Earth are in serious jeopardy and that by acting now—or not acting—our country is choosing between two radically different futures. If the United States continues down its current path, merely reacting to and trying to repair environmental injuries, then the nation's natural resources, economy, and way of life will deteriorate. However, if our country pioneers new technologies, realigns government policies, makes bold economic changes, and embraces a new ethic of environmentally responsible behavior, we can expect the coming years to bring a higher quality of life, a healthier environment, and a vibrant economy.

The time is now for new strategies to address the environmental challenges of the future. The National Commission on the Environment (see box on page 9) spent more than 18 months deliberating and debating ways to address the overwhelming environmental problems we face. Let me share some thoughts of mine that arose from the commission's work.

The Picture Today

Over the past 20 years, an impressive array of federal, state, and local pollution control and resource management programs, both public and private, have been instituted in the United States. Total U.S. expenditures on environmental protection now average more than 2 percent of gross national product per year.

The United States had the foresight to begin adopting stringent environmental laws and regulations more than two decades ago and to make sizable economic investments in pollution control and energy efficiency. As a result, this country does not have to contend with landscapes as blighted, air and water as polluted, soils as poisoned, or public health as ravaged as those of Central and Eastern Europe. The measurable environmental progress made by the United States should be a source of national pride.

Still, our country's environmental achievements allow no room for complacency. Despite numerous

(Train, a former EPA Administrator, is Chairman of World Wildlife Fund.)

victories, the United States is losing the battle:

- Global environmental problems to which we make no small contribution—climate change, loss of biodiversity, stratospheric ozone depletion, for instance—are placing both human and natural systems at grave risk.
- The air in U.S. cities threatens to deteriorate further as improvements in auto emissions controls are overwhelmed by the sheer numbers of cars and miles driven and by congestion. Meanwhile, indoor air pollution is largely ignored.
- Disposal and cleanup of the vast amounts of waste generated each year pose ever greater difficulties and consume an increasing proportion of the limited funds available for environmental protection. Indirect sources of pollution, such as urban and agricultural runoff, continue nearly unabated.
- Encroaching land development is displacing and undermining critical ecosystems, such as wetlands, and threatens rural landscapes, natural areas, and biological diversity (see article on page 42).
- Large areas of national forest and other public lands and resources are not managed sustainably (see article on page 36).
- Farmlands are suffering from the loss of soil and excessive use of chemicals (see article on page 33).
- Aquifers, a major source of water supply, are being consumed and contaminated at an alarming rate in many areas of the nation.
- Overfishing is seriously depleting our most important commercial fisheries.
- In many U.S. inner cities, the physical environment has the look of a wasteland.

While this litany of environmental ills, familiar-sounding and by no means complete, is a product of *today's* level of economic activity and human population, consider tomorrow. Over the next 50 years—within the lifetimes of many of us and of all of our children—economic activity in the United States is projected to *quadruple* and global population to at least *double.* If growth of this magnitude occurs with today's industrial processes, agricultural methods, and consumer practices, the result could be both environmentally and economically disastrous.

Forecasts based on linear projections are often wrong. In the case of environmental conditions, such projections may be too optimistic. Ample evidence suggests that, unless we act decisively, the price will be serious—in some cases, irreversible—environmental damage. Clearly, it would be the height of folly for the nation to sit back and simply hope that the future will be greened by an invisible hand. Excuses for inaction, such as budget deficits and opposition to taxes, abound. Yet the continuing pursuit of politics as usual will almost certainly guarantee failure.

There must be an end to ambivalence about both the importance of environmental policy and our environmental policy priorities. The United States must have a long-term strategy for pursuing the goal of sustainable development. Such a balanced strategy may anticipate or avoid severe local and regional economic dislocations or stimulate adjustment assistance and job retraining.

"And may we continue to be worthy of consuming a disproportionate share of this planet's resources."

Drawing by Lorenz. Copyright 1992 The New Yorker Magazine, Inc.

Economic Growth

Economic and environmental well-being are mutually reinforcing goals that must be pursued simultaneously if either one is to be reached. Economic growth will create its own ruin if it continues to undermine the healthy functioning of Earth's natural systems or to exhaust natural resources. By the same token, healthy economies are most likely to provide the necessary wherewithal for investments in environmental protection. For this reason, one of the principal objectives of environmental policy must be to ensure a decent standard of living for all.

Sustainable development innovations will themselves bring major economic benefits. The economic advantage of efficiently using materials and energy is obvious, and the domestic production and use of environmentally sound technologies will reap profits both for the U.S. firms that sell them and for those who use them.

Agenda 21

"Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health, and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future …."

—Chapter 1 (Preamble)

The most efficient way to achieve environmental progress is to harness market forces. Here, the role of public policy is to send the right signals to the economy—"getting the prices right" and making the marketplace work *for*, instead of *against*, environmental protection. Available tools include social-cost pricing, taxes, and removing or instituting subsidies.

The National Commission on the Environment harbored no illusions that market economics alone will put the United States or the world on the path to sustainable development. Government, private, and personal initiatives are also required. Regrettably, the U.S. statutory and regulatory system is woefully inadequate, cumbersome, and sometimes even perverse. A regime that now emphasizes "end of the pipe" cleanup must be radically reformed into one that encourages pollution prevention. Changing product design or manufacturing processes to minimize or prevent pollution is obviously superior to mandating expensive cleanup after the fact. An environmentally literate public will encourage such efforts by demanding environmentally acceptable products.

If environmental prevention is to prevail over environmental cure, and if the United States is to remain an industrial leader, our country must rapidly develop and deploy a wide array of more efficient and environmentally safe technologies. This need for new technology is particularly acute in transportation and energy generation.

National Commission on the Environment

The National Commission on the Environment is a private sector, bipartisan panel of former EPA administrators and business, academic, and conservation leaders convened in 1991 by World Wildlife Fund and chaired by Train.

The goals of the commission are to "undertake an independent bipartisan review of U.S. environmental policies, to articulate a vision of the future—a future that both preserves human choices and protects natural systems—and to recommend specific strategies to achieve that vision."

The substance of the commission's deliberations will be summarized in a report to be released in January 1993.

Energy

There must be a fundamental change in how our country produces and uses energy. No single area of activity is so closely interwoven with the environment. Were it not for the world's predominant reliance on fossil fuels for both energy production and transportation, the problems of global warming, acid rain, and urban smog would be relatively minor. A progressive shift away from fossil fuels as quickly as possible in both the energy and transportation sectors is therefore crucial. Because the United States uses in excess of one-fourth of the world's energy—most of it generated by fossil fuels—it must accord this matter the highest priority.

We need dramatically different economic incentives in the energy sector. Coal, oil, and gas prices, for instance, must reflect the environmental costs associated with their combustion. Over the long term, the United States must develop alternative nonpolluting sources of energy, principally from renewable sources. Meanwhile, the country must develop technologies that use energy more efficiently, thereby consuming less fuel (see article on page 15).

In transportation, the long-range need is a shift in auto technology to a nonpolluting source of energy. Electricity—and in the long run, hydrogen—holds promise as a nonpolluting energy carrier. More research on nonpolluting sources is needed. The immediate need is for incentives for more fuel-efficient autos and for fewer miles driven (see article on page 21).

In agriculture, in manufacturing processes, in consumer products, and in almost every other sector of the economy, new technologies will give the United States a competitive edge as well as a healthier environment. The worldwide market for such technologies can only continue to grow as the connections between environmental and economic well-being become more apparent. The economic potential of trade in such technologies is no secret: Japan and Germany, among others, have already moved aggressively into this field. If the United States moves up in this technology race, it will be because we have at last understood that we need a technological revolution, not just another technical fix (see article on page 29).

Land Use Planning

A key failure in the U.S. effort to address environmental needs has been widespread resistance to land use planning. I am not suggesting that the federal government should impinge on state and local governments in this area, though certainly it should manage its own property and facilities better. State and local governments and other regional groups should undertake land use planning for a variety of reasons: to protect environmentally sensitive areas,

including watersheds, aquifers, and wetlands; to maintain biological diversity; to continue productivity of agricultural land; and to protect sites of natural beauty and of historic and cultural value.

The Global Environment

While the United States must put its own environmental house in order, there is no denying it has a huge stake in addressing global environmental problems. As environmentalists Barbara Ward and René Dubos have said, all of us have two countries—"our own and Planet Earth." The threat of global climate change, for example, certainly requires national initiatives in the United States, but the problem really can be addressed only through a common worldwide effort.

Similarly, the destruction of forests will exacerbate global warming and accelerate the loss of species and ecosystems, foreclosing medical, recreational, and trade opportunities for the United States, as well as diminishing the world's shared biological heritage. Economically, the large and growing trade with developing countries will ultimately collapse unless these nations achieve sustainable development. Politically, U.S. national security interests depend increasingly upon achieving a level of international stability that can come only from sustainable development.

The most critical need facing the world is the control of human numbers. Continued global population growth of the current magnitude—1 billion more people every decade—will swamp economic and social progress, as well as efforts to protect the environment. Our country and every other country stands to gain by efforts to stabilize world population and improve living standards in developing countries, where 90 percent of projected population growth will occur. The burden placed on the environment is a product of population and consumption. The priorities for the developed countries must focus on switching to sustainable technologies to reduce wasteful consumption; the priorities for the developing countries are to develop sustainably and curb population growth.

The United States must make a major commitment to cooperate with the world community to stabilize global population, recognizing the linkages between birth rates, child survival, economic development, education, and the economic and social status of women. Universal access to effective family planning information, contraceptives, and health care is essential.

Panelec photo.

The United States uses more than a quarter of the world's energy, most of it from fossil fuels such as coal.

Environmental Literacy

An informed citizenry with an ethical commitment to care for the environment is essential to the future (see article on page 52). Success with the necessary technological, economic, and governmental changes is predicated on the understanding and support of the American people—individuals and families, government at all levels, and business.

The U.S. society and its schools must pledge themselves to the goal of ecological literacy. U.S. citizens must have the knowledge, practical competence, and moral understanding to cooperate in building a sustainable civilization. The pursuit of environmental literacy will require curricular innovations from kindergarten through college, changes in teacher education programs, and expanded graduate programs.

All of us must develop a greater sense of ethical responsibility for the environment. Environmental ethics are founded on an awareness that humanity is part of nature and that nature's myriad parts are interdependent. In any natural community, the well-being of the individual and of each species is tied to the well-being of the whole. In a world increasingly without environmental borders, nations, like individuals, have a fundamental ethical responsibility to respect nature and to care for the Earth, protecting its life-support systems, biodiversity, and beauty, caring for the needs of other countries and future generations.

It is only within such a framework that sustainable development will be achieved. Religious institutions, schools, businesses, governments, the news media, and, perhaps, above all, families must share in the tasks of achieving it.

Humanity *can* live and prosper in harmonious and sustainable balance with the natural systems of the Earth. Americans have an opportunity to rise to the challenge of environmental leadership as they have to the causes of human liberty, of equality, and of free and open markets. The challenge starts at home. ◊

The Road from Rio

The success of the Earth Summit depends on how well we follow through on its principles and programs

by William K. Reilly

The United Nations Conference on Environment and Development (UNCED), the "Earth Summit," was a watershed event in environmental history. The conference, held in Rio de Janeiro last June, also represented a diplomatic breakthrough that opened up the possibility for a new era of global economic growth coupled seriously with environmental stewardship.

Now the world community is distracted by pressing political and economic problems: the turmoil of civil war and the threat of economic collapse in Eastern Europe; political scandals and an overextended budget in Japan; high unemployment and second thoughts about the extent of integration desirable in the European Community; and here in the United States, absorption with reinvigorating the economy and effecting a presidential transition. They will test the depth of commitments solemnly announced in Rio. These are not the best of times for making environmental history. Nevertheless, this year in Copenhagen the developed nations took further aggressive—and expensive—actions to phase out ozone-depleting chemicals and to create a permanent fund to help developing countries do the same. I think Planet Earth just passed the first post-Rio test!

More than 170 countries met in Rio for one of the most important multinational conferences in history. We did so in recognition of the potential dangers to human survival and the impediments to economic opportunity that come from the poisoning of our Earth, the disruption of our planet's natural systems, the degradation of human and ecological health, and the depletion of our productive natural resources.

The Rio conference was intended to promote better integration of nations' environmental goals with their economic aspirations. Ambitions for Rio ran high, and much was accomplished. While the hopes of some developing nations for vast commitments of new foreign assistance did not materialize, what was extraordinary to me was how many expectations *were* met—and how much the world *did* achieve.

• *Framework Convention on Climate Change*. More than 150 countries made commitments to decrease greenhouse gases, prepare national action plans, and undertake much needed scientific research and monitoring. The climate convention puts us on a course to address the critical issue of global warming. Its first test will be the timing and quality of national action plans. The U.S. action plan will be ready in January 1993.

• *Convention on Biological Diversity*. This treaty addresses the problem of species loss worldwide, with a commitment to national plans and conservation strategies. The United States' decision not to sign was the subject of intense controversy and criticism. All the other "G-7" nations—the economic superpowers—and nearly all developing countries did sign. I believe this convention ultimately will be adapted to meet U.S. concerns, which are centered on this convention's ambiguity regarding the protection of intellectual property rights, inadequate funding mechanisms, and selective, negative characterization and regulation of biotechnology. Meanwhile, the United States will continue to respect, even go well beyond, the principles of the treaty; U.S. commitments to protecting wildlife remain unsurpassed anywhere in the world. As the Director General of the United Nations Environment Program, Dr. Mustafa Tolba, recently reminded me, it was the United States which initiated the call for a treaty on biodiversity, a call he greeted skeptically and only later acceded to. I believe that all parties are uncomfortable with the existing exclusion of the United States and that America's voice will yet be heard in the councils of the Treaty Parties.

• *Forest Management*. The United States was a key participant in achieving agreement among *all* countries on principles of forest management. The principles are an advance, even if second best after a worldwide convention on forests. President Bush had proposed such a convention two years earlier, but developing countries are simply not yet ready for it, fearing a threat to their sovereignty in the global concern for better forest conservation and sustainable use. I was frankly startled by the depth of developing countries' anxiety about the industrialized world's concern for forests. Many poorer forest-owning nations genuinely fear an

(Reilly is Administrator of EPA.)

"internationalization" of their natural resources.

At Rio, the United States also proposed a Forests for the Future initiative, which aims to promote sustainable use and conservation through bilateral partnerships with developing countries. Working steadily with these nations on mutually selected projects, we may both quiet the fears and advance the cause.

• *Agenda 21.* This was perhaps the most remarkable achievement of the conference: an ambitious, 900-page action plan for protecting the atmosphere, oceans, and other global resources. Many of the ideas—community right-to-know, compiling information about toxic releases, environmental impact statements—originated in the United States. Agenda 21 represents an extraordinary new global consensus on standards against which to measure the environmental performance of governments. No doubt the press, non-governmental groups, and the business community will mine these documents for years to come. The human rights commitments of the 1970s and 1980s, the Helsinki Accords, and others, offer a model for how committed nongovernmental interests can confer authority on moral obligations and translate them into new policies.

From a global perspective, the Earth Summit marked the arrival of environmental concerns on the international stage as a major new consideration in foreign policy. The presence in Rio of foreign ministers, prime ministers, development ministers and presidents made the point that environmental questions must be accommodated in decisions and policies affecting trade, energy, agriculture, and economic development.

One of the most important lessons I took away from Rio was the conviction that the future of global environmental protection, especially in the developing countries, will not be achieved by financial aid; it will be assured by trade. If there is a single good example of that, it is Mexico. Significant amounts of capital, more than $25 billion, have flowed into Mexico in the last few years as a consequence of a climate of friendliness, of openness to trade. Protection for intellectual property, privatization of inefficient—often polluting—state industries, reduction of non-tariff trade barriers, agreements with creditors and the International Monetary Fund, and proposals to reduce tariffs have won confidence and attracted capital on a scale far beyond what aid might have brought. And not coincidentally, Mexico is now spending 1 percent of its GNP on the environment, which is more than most developed nations spend!

Now, in the aftermath of UNCED, the *real* work begins. The success of the Earth Summit will be determined by how well the nations of the world carry out the principles of sustainable development they agreed to at Rio. This is not a challenge only for the developing world. We in the United States—at the federal and state levels, in communities throughout our country—have a central role to play in the process. The Earth Summit counsels all of us to reach new heights of creativity and achievement. The responsibilities and challenges before us have never been greater.

One of our key tasks is to move ahead with the new approaches to environmental protection that we at EPA have begun to apply over the last few years—approaches that are more risk-oriented, more inclusive, more attuned to economic consequences.

A good example is our emphasis on addressing the ecological stresses affecting whole natural systems, such as the Great Lakes, on a geographic rather than piecemeal basis. The high priority now being given to the Great Lakes in all EPA programs greatly improves our chances of keeping this resource—the source of food, water, recreation, and renewal for millions of people—intact, healthy, and productive for our own and future generations.

In terms of budget resources and enforcement effort, the Great Lakes program is unprecedented. In 1991, fines and penalties in the Great Lakes region alone surpassed the national totals of only two years earlier. Greater coherence of pollution control and fish advisory policies among the Great Lakes states, closer coordination of Canadian and U.S. priorities, and aggressive pollution prevention programs by automobile companies, chemical plants, and pulp-and-paper mills add up to a new kind of environmentalism—a synergistic combination of highly diverse activities directed toward a common goal, improving and maintaining the health of a large productive ecosystem.

EPA is using the Great Lakes model to address other especially sensitive or threatened natural resources—Chesapeake Bay, the Gulf of Mexico, Puget Sound, San Francisco Bay, the Sacramento River estuary, Long Island Sound, and many more.

Another initiative given new impetus by the Earth Summit is pollution prevention. EPA already has developed a range of successful, voluntary efforts to reduce or eliminate waste at the outset of the manufacturing and service cycles. Our Green Lights program encourages the use of energy-efficient lighting wherever it is economically feasible. (See article on page 20.) EPA's recently unveiled Energy Star Computers program will save energy by producing computers that "sleep" when not in use.

All of our pollution prevention and waste minimization programs help reduce energy consumption while also reducing the release of harmful chemicals into the environment. These efforts will play a key role in enabling the United States to meet the goal of the Climate Change Convention: to cut greenhouse gas emissions using a benchmark of 1990 levels.

Still another initiative is EPA's voluntary 33/50 Program, in which 1,000 manufacturing companies have pledged to reduce their emissions of 17 high-priority toxic pollutants such as benzene, lead, mercury, and cyanide by at least one-third by the end of this year, and by at least 50 percent by the end of 1995. Commitments made to this program to date will result in a projected reduction of more than 350 million pounds a year of toxic pollutants by 1995. In signing on to these voluntary programs, companies like Monsanto, General Dynamics, Polaroid, AT&T, American Cyanamid, Honda of America, and others are

As part of the Izaak Walton League's Save Our Streams program, volunteers count and identify aquatic organisms in West Virginia's Little Bluestone River. Committed citizens who understand the principles of ecology are vital to a sustainable development strategy.

Chris Dorst photo. The Charleston Gazette.

recognizing, either explicitly or implicitly, that the only secure path to long-term economic growth is the "green" path.

The success of these pollution prevention programs suggests a new dynamic may be at work in U.S. companies: They're finding ways to reduce pollution by redesigning processes, improving efficiency, and cutting the costs of raw materials, disposal, and potential liability.

Much that went on in Rio, in fact, reflected the growing recognition by the private sector that companies must begin to incorporate environmental concerns into their decision making if they are to stay competitive in years to come. International business groups, such as the Business Council for Sustainable Development (BCSD), led by Swiss industrialist Stephan Schmidheiny, were instrumental at Rio in defining what environmental leadership in industry means. The book developed by Schmidheiny and the BCSD, *Changing Course: A Global Business Perspective on Development and the Environment*, has become required reading for enlightened business leaders in the 1990s; it lays out the path for the future of environmental entrepreneurship.

Another key to sustaining the momentum of the Earth Summit into the next century is an informed, educated citizenry. Environmental education programs need to nurture a more sophisticated understanding of risk and the principles of ecology. We must help students develop a critical perspective, one that is aware of the limitations and ambiguities of science and appreciates the rigor of scientific methods.

Above all, we must help our citizens grasp the environmental reality of the 1990s: The greatest threats in the developed world no longer come from the belching smokestacks and oozing sewer outfalls of the 1960s—most of which have been tamed or eliminated—but from the cumulative impact of millions of individual actions. It is our lifestyles, our habits, our daily choices, which must be informed by an environmental ethic: the choice to recycle used oil instead of pouring it down the drain; to buy an energy-efficient light bulb or refrigerator; to minimize the use of harmful chemicals on our lawns and flowers; to practice regular inspection and maintenance of our cars to help curb air pollution; to recognize that the character of our land can discipline our expectations for its use. Over the long term, our environmental education goal should be to instill a personal ethic of stewardship among our people.

To fulfill the promise of the Earth Summit, we will have to bend our minds and our money to the task, just as we did in cleaning up our own environment. I believe that environmental policy is the single most successful of all U.S. domestic policies of the past 20 years. What can you think of that compares with it in producing real results? The United States was the first country to enact national environmental laws, and environmental conditions today are far better than they were 20 years ago—in urban air and water quality, in nature protection, in park and wilderness protection, and the revival of endangered wildlife.

Most important, we made this environmental progress while our economy continued to grow. Our history shows us that economic growth and environmental protection *can* go hand-in-hand. Economic growth financed environmental progress, and in turn economic development became healthier, more humane, and congenial. The post-Rio world will demand a new sophistication and capacity to integrate economic priorities with new international environmental priorities on the part of governments and their leaders. The experience of the United States has a great deal to offer other countries.

For our part, we in the United States, as I noted earlier, have just won international agreement on a 1995 phaseout of ozone-depleting substances and we will continue to work with industry on developing safe substitutes. We will advance the Forests for the Future initiative President Bush announced at Rio; we will encourage the transfer of U.S.-developed "green" technologies to developing countries, so they can pursue their development in a way that is sustainable over the long term; we will continue to lead the world in promoting community right-to-know internationally, both to help the environment and to strengthen democracy.

The Earth Summit presented an unprecedented opportunity for governments of all nations, at all levels, to pursue strategies of sustainable development. The question we must ask ourselves today is: How do we expand our economies to meet the aspirations of our people, while still protecting human health and the natural resources on which lasting economic growth depends? How well we answer this question will define our quality of life in the 21st century. ◊

This 30-kilowatt photovoltaic installation supplies power to a highway maintenance facility in Caples Lake, California. Solar and other renewable energy sources may be important for a sustainable future.

Siemens Solar Industries photo.

Powering the Future

Efficient use and renewable supplies are key

by Robert H. Williams

Sustainable development requires that clean, secure, and safe energy be available for economic growth. As the 21st century approaches, the challenges implicit in "clean, secure, and safe" seem daunting for the United States.

- Urban air pollution is putting pressure on the internal combustion engine. California has mandated that 2 percent of new cars must be "zero-emission vehicles" by 1998; the percentage rises to 10 percent by 2003. Other states may follow California's lead.

- Domestic oil production has fallen to 9 million barrels per day (mmbd) from the 1970 peak of over 11 mmbd. The Department of Energy (DOE) projects that output will fall to 4 mmbd by 2030. It is generally expected that conventional oil production will decline after 2000 in all major regions outside the Middle East.

- If greenhouse warming is as serious as most scientists believe, the world may be required to reduce emissions of carbon dioxide (CO_2) substantially: by 60 percent or more to stabilize current atmospheric concentrations. Much of the burden would fall on the already industrialized countries, which today account for three-quarters of the emissions.

Despite such challenges, the prospects are good that energy can be provided consistent with sustainability goals. This will be illustrated by describing an energy future for the United States that emphasizes efficient use and renewable supplies of energy. The scenario was developed in an assessment of renewable energy carried out by an international team of experts as an input to the United Nations Conference on Environment and Development (UNCED).

Improvements in efficiency can reduce environmental and energy security risks substantially. While it has long been assumed that energy consumption must grow in lock-step with economic growth, U.S. energy consumption remained constant after the energy crisis of 1973 while the country's economic output increased by more than one-third. Although energy use since 1986 has once again followed economic output, the opportunities for decoupling energy and economic growth through investments in more efficient energy use are substantial. In the UNCED study scenario, during the period 1985 to 2050, energy use decreases by one-fourth (see figure) while economic output increases nearly five-fold.

Electricity (excluding losses during generation) has accounted for a growing share of energy use in the United States, increasing from 6 percent in 1960 to 12 percent in 1991. While driven primarily by desirable attributes—high quality, ease and flexibility of use—the trend would be reinforced if environmental concerns become a major determinant of energy carrier choice: It is generally easier to bring environmental problems under control with electricity than with alternative carriers. In the UNCED study scenario, electricity's share of U.S. energy rises to 20 percent by 2050. However, electricity demand grows at only one-fourth the rate of the last decade because of the emphasis given to more efficient use.

Coal, which is the source for 55 percent of U.S. electricity production, poses the greatest environmental challenges in the power sector: It is responsible for 85 percent of the sector's CO_2 emissions and for most of its air pollution. Air pollution problems are likely to be solved by the coal gasification technologies being developed for use with advanced power-generating cycles.

(Continued next page)

(Williams is a Senior Research Scientist at Princeton University's Center for Energy and Environmental Studies. The UNCED study scenario is detailed in the book Renewable Energy: Sources For Fuels and Electricity, *edited by T.B. Johansson, H. Kelly, A.K.N. Reddy, and R.H. Williams, 1142 pp., Island Press, Washington, DC, 1992. It is available from the publisher.)*

In the near term, these advanced cycles will use gas turbines; sometime during the next 10 to 20 years, they will use molten-carbonate fuel cells as well. These systems will produce only a tiny fraction of the air pollution released from current steam-turbine plants equipped with scrubbers, and they will be more energy efficient. Compared to an average efficiency of 33 percent for existing coal plants, these gas turbine systems are expected to be 40 to 45 percent efficient, while fuel-cell technologies could achieve efficiencies of 55 to 60 percent. Nonetheless, the concomitant reductions in CO_2 emissions are not likely to be adequate if the atmospheric concentration must be stabilized.

Nuclear power produces no air pollution or greenhouse gases, and its use in generating electricity could reduce dependence on insecure oil supplies. Nuclear safety and radioactive waste disposal, the issues of greatest public concern at present, are, in principle at least, resolvable with technical fixes.

However, at high levels of nuclear power development worldwide, another issue—the nuclear weapons connection to nuclear power—would come into sharp focus: Millions of kilograms of plutonium would be produced annually in reactors; less than 10 kilograms are needed to make a nuclear weapon. New reactor designs that minimize plutonium production and unprecedented levels of international control over sensitive nuclear facilities would be needed to prevent diversions. To resurrect nuclear power, the industry must convince the public and investors that safe, diversion-resistant nuclear power can be provided at competitive costs.

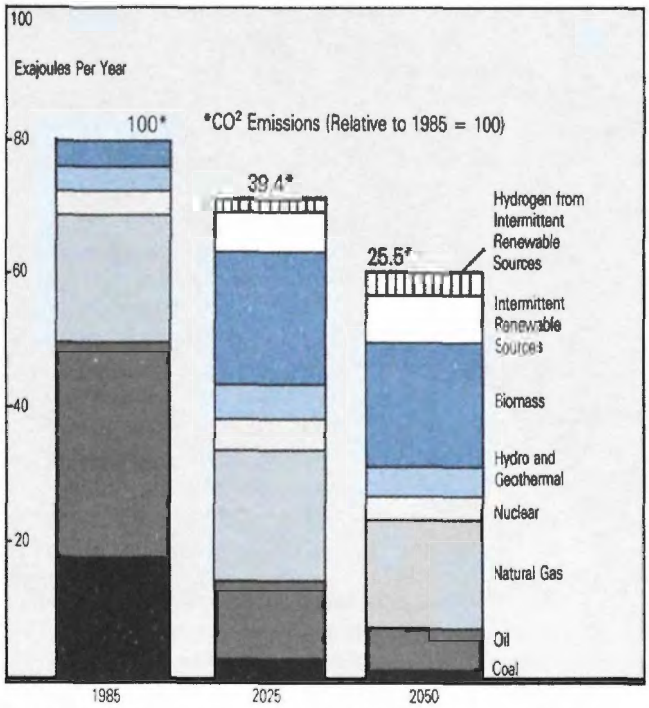
Producing electricity from biomass (plant matter) is a promising renewable option. If the biomass is grown sustainably, there would be no net buildup of CO_2 in the atmosphere. The United States already has biomass power-generating capacity equivalent to the output of nine large nuclear power plants; the fuel is mainly low-cost biomass wastes. The steam-turbine technology used could not produce electricity at competitive costs with more abundant but more costly biomass feedstocks, such as biomass grown on dedicated plantations. However, electricity from more costly biomass sources could be competitive if produced with technology adapted from coal, involving gasification and gas turbine power cycles. Especially promising are turbines derived from aircraft engines that offer high efficiency and low cost at the modest scales needed for biomass power plants. Biomass is inherently easier to gasify than coal, and it contains negligible sulfur, which is costly to remove from coal. Several demonstration projects are being planned for this technology, which could be available for commercial applications in the late 1990s. Likewise, molten carbonate fuel-cell technologies being developed for coal could also be adapted to biomass.

Crops grown on excess agricultural lands represent a large potential source of biomass for energy. To prop up food prices and control erosion, the United States holds out of agricultural production some 80 million acres, an amount that is expected to increase substantially as a result of continuing improvements in crop productivities. Planting fast-growing trees or perennial grasses is a proven strategy for erosion control. Growing such energy crops on erodible and other excess croplands would conserve the agricultural base while providing new income for farmers.

Most renewable energy technologies are characterized by modest scale and modular construction, making them good candidates for cutting costs through organizational learning—in other words, from getting better organized. Modern mass production techniques can be applied to most renewable energy technologies. Moreover, the short lead times from product design to operation make it possible to identify needed improvements by field testing and to incorporate these improvements in modified designs quickly, so that many generations of technology can be introduced in short periods.

The history of wind power in California illustrates the phenomenon. Wind power costs have fallen ten-fold since the first farms were established in the Altamont Pass in the early 1980s. Electricity produced with wind turbine

Scenario for a Renewable Energy-Intensive Future in the United States



The chart shows U.S. primary energy requirements, in exajoules (EJ) per year, in a renewables-intensive global energy scenario developed as part of an assessment of future prospects for renewable energy worldwide (*Renewable Energy, 1992*). (One EJ equals 0.45 million barrels/day of oil.) This scenario reflects projections of the Response Strategies Working Group of the Intergovernmental Panel on Climate Change concerning demands for solid, liquid, and gaseous fuels and electricity. A mix of renewable and conventional energy supplies was constructed to match these projected demand levels, taking into account relative energy prices, endowments of conventional and renewable energy sources, and environmental constraints.

Note: Hydrogen intermittent renewable sources include the proton-exchange-membrane (PEM) fuel cell. Intermittent renewable sources include wind and solar power.

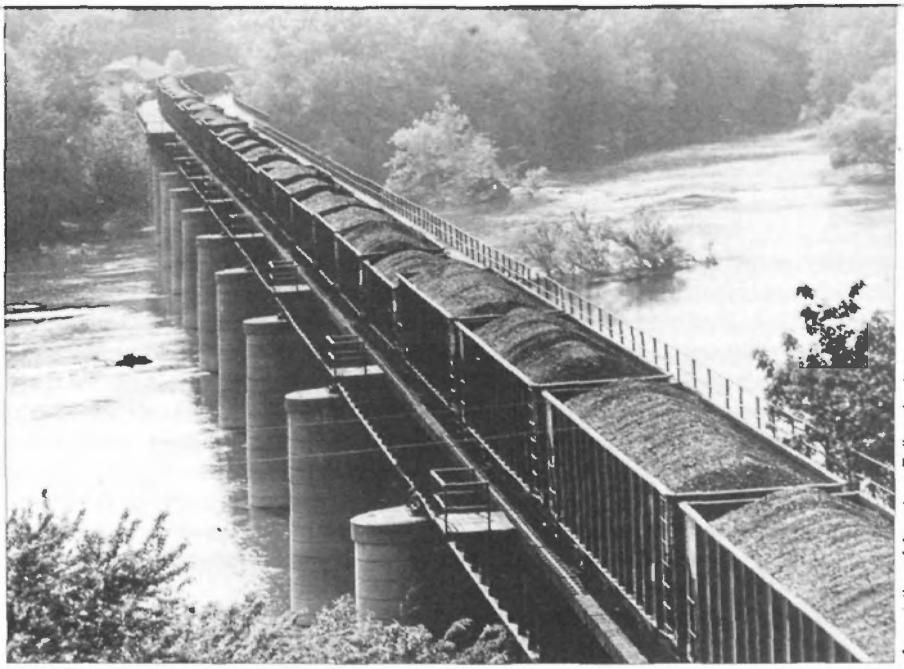
Source: *Renewable Energy: Sources for Fuels and Electricity*, T.B. Johansson, H. Kelly, A.K.N. Reddy, and R.H. Williams, eds. (Island Press, 1992)

technologies now coming onto the market is cheaper than electricity from new fossil-fuel power plants. Although some of the more recent cost reductions are due to technological improvement, most of the progress has been made through organizational learning. These reductions are expected to lead to rapid growth in the industry, which could potentially provide electricity on a large scale. In the 12 states of the Great Plains and Midwest that account for 90 percent of the U.S. wind energy potential, electricity generation from wind could be up to four times the amount of energy currently consumed in the entire United States.

Although photovoltaic (pv) power costs are about five times that of wind power, these costs are expected to fall sharply in this decade. The prospects are good that some pv technologies will enter electric utility markets before the turn of the century. The absence of scale economies and low operational and maintenance requirements for most pv technologies means that they can be deployed on rooftops and windows as well as in centralized power stations. Because power from pv units installed close to consumers is especially valuable to utilities, we will probably see such applications of pv first, before costs fall to the levels required for centralized configurations to meet competition.

A problem posed by these intermittent renewable sources is that electricity is also needed when the wind doesn't blow and the sun doesn't shine. While the problem seems especially formidable in light of the fact that progress for electrical storage technologies has been slow, it is not as serious as one might think. Both pv and solar thermal-electric technologies produce the most electricity when sunlight is the most intense; where there are air conditioning loads, this also tends to be the time of peak electrical demand.

In the case of wind power, the wind is usually blowing somewhere, so a system of widely distributed wind farms will provide electricity most of the time. A significant penetration of intermittent renewable sources can be accommodated on an electric power system if there are enough low-cost,



Association of American Railroads photo

In addition to "conventional" air pollutants, coal results in 85 percent of the power sector's emissions of carbon dioxide, a greenhouse gas.

fuel-burning plants with the flexibility to change their output quickly. Advanced gas turbine power cycles fueled with natural gas would provide such flexibility. Natural gas is the cleanest of the fossil fuels, and U.S. resources are probably 40 to 50 percent more plentiful than U.S. oil resources.

Meeting sustainability goals for transportation will be more challenging than for electricity production. Yet even here the prospects are auspicious.

As described in a later article (see page 24), the quest for zero-emission vehicles has catalyzed a substantial effort to develop the battery-powered electric car. The potential for replacing internal combustion engine cars with this technology is limited, however, because several hours are required to recharge the battery and the range between charges is limited.

A promising alternative is the fuel cell electric car. As in a battery-powered car, the fuel cell provides electricity to power motors that drive the wheels. The proton-exchange-membrane (PEM) fuel cell, developed originally for space and military applications, is a compact power resource well suited for cars. In operation, hydrogen fuel combines with oxygen from the air to form water vapor, the only byproduct. Refueling takes only minutes for compressed hydrogen gas. A hydrogen fuel-cell car would be about three times as energy efficient as a gasoline-powered internal combustion engine car of comparable performance. Prototype PEM fuel-cell cars will be built in the mid-1990s, and commercial vehicles could become available less than a decade later.

Experience shows that hydrogen can be used safely, although it is often perceived as a particularly dangerous fuel. The perception is probably largely due to the Hindenburg disaster, one of the rare accidents involving an energy source that was caught on film. Certainly, the public must be convinced that hydrogen can be used safely before it is introduced on a wide scale.

Initially, hydrogen could be produced with existing technology from natural gas; subsequently, a shift to renewables could take place. The cheapest way of producing hydrogen from renewable sources is through the thermochemical gasification of biomass, a technology that could be commercialized by 2000. Hydrogen could also be produced electrolytically from water, using electricity derived from wind or pv sources. With expected reductions in the costs of these sources, fuel-cell cars operated on wind or pv hydrogen could well be competitive with battery-powered cars during the first decade of the next century. While this hydrogen would probably be twice as costly as that derived from biomass, the amount that could be produced is vast. For

example, photovoltaic modules on 0.1 percent of the U.S. land area could provide enough hydrogen to serve all light-duty vehicles powered with fuel cells in 2020.

An alternative approach that requires no hydrogen fuel infrastructure is to use energy carriers that are converted into hydrogen at the point of use. One such carrier is methanol, which can be derived from natural gas with current commercial technology and from biomass with technology that could be commercialized within the decade. For fuel-cell cars, methanol would be reacted with steam under the hood to produce hydrogen. The main advantage of methanol is that, as a liquid, it is easier to store than hydrogen and can be distributed with much the same infrastructure as is now used for gasoline. A more exotic carrier proposed recently is powdered iron; steam generated by the fuel cell onboard the car would oxidize the iron, producing hydrogen plus rust. At the refueling station, the tank of rust would be exchanged for fresh iron, and the rust would be recycled.

The U.S. energy scenario developed in the UNCED study indicates what might be achievable in meeting sustainability goals through emphasis on efficient use of energy and renewables. By 2050, overall dependence on oil and coal would be sharply reduced, dependence on natural gas reduced slightly, and renewables would account for more than half of primary energy, with biomass accounting for more than half of renewables. The net effect of both the emphasis on energy efficiency and energy supply shifts is a 75-percent reduction in CO_2 emissions relative to 1985 levels (see figure on page 16).

Such a future could probably be realized at energy prices close to

States Fight Global Warming

by Pamela Wexler and Susan Conbere

Except for the United States, every major industrialized nation in the world has agreed either to stabilize or reduce emissions of carbon dioxide (CO_2), the most prevalent greenhouse gas. Interestingly enough, given the limits of U.S. national policy, concern over climate has stimulated numerous state and local environmental and energy policy initiatives.

In May 1990, with support from EPA, the Center for Global Change initiated a project to collect and analyze state and local legislative bills, laws, and policy proposals having either direct or incidental effects on greenhouse gas emissions. The material presented here derives from the resulting report, entitled *Cool Tools*.

Groundwork to collect important baseline data and set policy goals is underway in a number of jurisdictions. California leads in this area, with 1988 legislation calling for the state's energy commission to conduct a comprehensive study and provide policy recommendations to the governor and legislature. A comprehensive plan in Vermont includes a schedule of goals to reduce both greenhouse gas emissions and per capita nonrenewable energy consumption. Connecticut's 1992 legislature strengthened its 1991 omnibus global legislation, adding annual CO_2 emissions reporting requirements and calling for reduction goals in the state's 1993 energy plan. Minnesota launched a program to inventory the state's CO_2 emissions and develop incentives to reduce them.

But should states respond to climate change, a global problem? Implementing policies at the state level is essential to slowing the buildup of atmospheric greenhouse gases. State and local governments hold or share the authority to regulate some of the most important activities affecting emissions: utility regulation, building codes, and land use planning. Also, as large users and taxers of energy, states make policies that directly increase or reduce greenhouse emissions. Ultimately, whatever federal program is developed, there will need to be a complementary set of state actions.

Consider electricity generation, which represents approximately 35 percent of U.S. CO_2 emissions. Established state authority over rate making and plant siting now extends to choices regarding fuels, as well as conservation initiatives to defer the need for new sources of supply. Initiatives to capture the economic benefits of least-cost planning for electric and gas utilities are some of the most significant actions states are taking to reduce greenhouse gas emissions. Several states now require that utilities give preference to conservation and demand-side management measures before considering new power plant construction. Numerous other states have developed or are developing least-cost planning processes through regulatory proceedings.

Meaningful opportunities for efficiency also lie in strengthening state and municipal building codes. At least three states and several communities in California require buyers to make conservation investments when they purchase a house.

In the absence of federal policy, state and municipal initiatives provide an ideal testing ground for environmental strategies and leadership for the nation. Small-scale

(Wexler, formerly a Policy Analyst at the University of Maryland's Center for Global Change, is a Public Utility Analyst at the Public Service Commission of the District of Columbia. Conbere is a Research Associate at the Center for Global Change.)

present levels. The technologies involved require advances but no major breakthroughs. However, a new energy policy dedicated to increasing the energy productivity of the U.S. economy and encouraging the development and commercialization of new energy sources that are both economically and environmentally attractive would be required.

The first priority should be to eliminate the subsidies for fossil fuels and nuclear energy totaling $10 billion per year, or more, that distort markets. Second, the Federal Energy Regulatory Commission should require all states to develop programs that require electric utilities to pursue the least costly mix of investments in energy efficiency and new supplies, taking into account environmental costs. Third, the federal government should launch a clean car initiative in cooperation with U.S. auto producers, with the objective that before the end of the first decade of the 21st century the U.S. industry will be profitably producing a new generation of personal vehicles with zero or very low emissions. Fourth, the Department of Agriculture should encourage the production of wind energy on croplands having good wind resources and biomass energy crops on excess agricultural lands. Energy production from these sources would generate alternative income for farmers and eventually make it possible to phase out most federal support for farm income.

And, finally, the federal government should encourage the demonstration and commercialization of a wide range of promising renewable energy options. Taxes on gasoline or carbon would also provide powerful support for the kinds of innovation needed, but a strong program could be built even without such measures. ◊

experiments allow for greater innovation than federal ones. Moreover, this "laboratory of the states" allows a mix of strategies—suitable to different parts of the country having different climates, tastes, industrial bases, power sources, and commuting patterns—to emerge. Modest trials also facilitate evaluation, important when one state's proposals are adopted by other jurisdictions or adapted for federal application.

Connecticut is among the leaders in pursuing small-scale demonstration programs, particularly with respect to energy use by state agencies. Recent legislation establishes energy performance standards for new and existing state buildings, complemented by a technical advisory group to recommend standards for commercial buildings. Connecticut has also set fuel efficiency requirements for state fleet purchases and has plans to increase public transit ridership and occupancy levels for passenger vehicles.

A 1991 National Academy of Sciences study estimated that the United States could reduce its greenhouse gas emissions by up to 40 percent of 1990 levels at "very low cost." Prominent on the list of low cost options are areas appropriate for state and local treatment: transportation, efficiency investment in new buildings, electric utility supply decisions, and forestry.

As a practical matter, local government is often more successful than federal government at initiating and implementing policy. Citizens are more likely to respond positively to statutes that address their community's needs than to the often broad or ambiguous guidelines coming from national or international bodies.

There are economic considerations, too. States already tax gasoline, electricity, and other forms of energy; however, such taxes currently do not reflect varying environmental impacts, and thus fail to communicate the true costs of energy. Incorporating environmental costs into prices will require complementing, replacing, or augmenting direct regulation with innovative fiscal tools to promote environmentally beneficial results, such as the sale of energy-efficient equipment. Legislation enacted in California in 1990, for instance, imposes gradual gasoline tax increases and earmarks portions of the revenue for environmental damage mitigation.

Many state and local governments participate in EPA's Green Lights program, in which participants survey existing lighting facilities and install energy efficient equipment when it is profitable and does not compromise lighting quality. In Maryland, participation in Green Lights is expected to cut the state's lighting bill by 25 percent, for a savings of $10.5 million per year.

It makes sense for states to make energy efficiency investments that retain dollars in the local economy, rather than spending them on interstate or international energy supplies. Particularly in the building and utility sectors, states can realize substantial opportunities for savings that only come up every 40 years or so as buildings stocks and electricity generating plants are replaced. Solar and renewable investments typically provide several times as many jobs per dollar as more capital intensive fossil investments. Washington, for instance, estimates that CO_2 savings from tightening residential energy codes will reach 3.3 million tons annually—with energy efficiency savings worth approximately $16.5 million, at $5.00 per ton, by 2005. That's a savings worth noting.

(Editor's note: The Commonwealth of Kentucky and the Kentucky Chapter of the United Nations Association are sponsoring a conference, "From Rio to the Capitols—State Strategies for Sustainable Development," on May 25 to 28, 1993, in Louisville, Kentucky. The conference will bring together concerned citizens, government officials, business and industry, educators, and nongovernmental organizations to discuss how Agenda 21 *can be interpreted and implemented at state and local levels.)*

EPA's Green Programs

by Eileen B. Claussen

Let's face it. If a healthy body can serve as a metaphor for a strong market economy, America's economy is pretty "sickly" in terms of energy use. The symptoms are rampant. We use twice the energy per dollar of gross national product that Germany and Japan use. Businesses and consumers often make wasteful decisions that are neither in their own best interest nor the environment's.

Here's where EPA's energy-saving "green programs," such as its flagship "Green Lights" program, come in. They are designed to apply just the right regimen to help markets to function better *and* improve the environment. EPA's green programs are revolutionary in a number of ways: They are *voluntary*, not mandated by law; participants *enhance their profits* when they join (no compliance costs involved); the programs harness the power of the *free market*; and everyone wins—environmentalists, businesses, and government. Sound too good to be true? Not so. Proof can already be found in EPA's first generation of green programs.

The premise is simple: When energy is wasted, so is money. A company paying $1 million annually in lighting bills has to sell a lot of widgets just to cover that expense. If Company X could save $500,000 a year by cutting its lighting consumption in half (with an investment that amounts to much less than the resulting savings), this would reduce the number of widgets it had to sell just to balance the books.

Take the real-world example of the Boeing Company, a participant in the Green Lights program, which encourages major U.S. corporations, state and local governments, and other organizations to install energy-efficient lighting. Extrapolating from its experience to date, once Boeing fully implements its Green Lights agreement around 1995, it will have netted enough savings to finance production of a Boeing 757. That's a $100 million aircraft, essentially for free.

If energy efficiency makes such bottomline sense, why doesn't it just happen? The principal reason is so-called "first-cost disease." A new green technology tends to have a higher price up front. Often that's due to the sophistication of its design and materials. In many cases, however, a larger factor is low sales volume for products just introduced to the market. Remember how much VCRs cost when they first came out?

Although green technologies might carry a higher price tag, they recoup the extra money spent on them—and then some—by reducing energy bills. Such products make obvious sense. Unfortunately, the market often doesn't inform corporate purchasers that such choices even exist. Or, if the choice is raised by a salesperson promoting his or her product, it might be dismissed as so much snake oil.

EPA's green programs cut through these complications. For example, the Green Lights program goes straight to the top: EPA seeks out key corporate managers, educates them on the economic and environmental benefits of high efficiency lighting, and gets them to commit voluntarily to a corporate-wide program to improve lighting efficiency wherever profitable. The commitment—a "Just Do It" agreement—is a simple, easy-to-understand prescription that emphasizes flexibility and performance rather than technical requirements. (EPA also provides other tools to help technical staff verify product reliability and iron out the details of implementation.)

By mid-October 1992, 658 organizations, including 12 state governments, had joined this quickly expanding program, committing 2.9 billion square feet—more than seven times all the commercial space in Los Angeles—to efficient lighting. They are achieving average reductions in lighting consumption of over 50 percent.

EPA is now designing other green programs to spur large corporate purchases that move highly efficient technologies out of niche markets and into the mass market. These include heating, ventilating, and air conditioning technologies and water-heating technologies.

It isn't always enough to spur sales of existing products. Some green programs use market forces to bring promising technologies off the drawing board and into the showrooms. The EPA Energy Star Computer Program, initiated in June 1992, is one such flagship program following a product identification and manufacturer mobilization strategy. With existing technology, manufacturers participating in this program will make "catnapping computers" that power down to drastically reduce their electricity demands if no one is at the keyboard. The "Golden Carrot®" Super Efficient Refrigerator Program is another (see article on page 27).

Some EPA green programs expand opportunities for American ingenuity in international markets. For example, U.S. coal and gas companies lead the world in recovering methane—a greenhouse gas, but also a valuable fuel—from coal seams and gas pipelines. EPA is identifying opportunities for these U.S. companies to operate overseas, particularly in Eastern Europe, Russia, and Asia.

EPA's market-oriented green programs know only the limits of human creativity and ingenuity. Their revolutionary implications are far-reaching. Green programs are helping to reshape the way the United States does business by building on the strong link between economy and the environment. This is an important step toward true sustainability.

(Claussen is Director of EPA's Office of Atmospheric Programs.)

Driving Home a New Transportation Policy

Recent legislation, leadership, and commitment can get us there

by Senator John H. Chafee

Governments from all over the world gathered in Rio de Janeiro this past June to discuss strategies for sustainable development. Because transportation affects every aspect of human life, the way this country manages transportation services in the future will determine, to a great extent, whether our own national strategies will result in sustainable development.

The United States is about to complete one of the largest public works projects ever undertaken, the Dwight D. Eisenhower System of Interstate and Defense Highways.

In 1950, before the decision to build the Interstate Highway System, we had 49 million motor vehicles in this country and 62 million licensed drivers. That's considerably fewer vehicles than drivers.

By 1990, the situation was reversed. Along with the interstate highway system came a nearly 400-percent increase in the number of motor vehicles in this country (190 million by 1990) and a 270-percent increase in the number of licensed drivers (167 million in 1990). In other words, we now have 23 million more vehicles in this country than drivers. More vehicles mean more vehicle miles traveled—three times as many miles in 1990 as in 1950.

There is a connection between the construction of the interstate system and the increase in numbers of vehicles and miles traveled. In 1956, the United States adopted a policy to make its biggest transportation investment in a facility most suited for cars and trucks—highways.

The interstate highway system achieved the important objectives of improving interstate transportation and highway safety. These 42,000 miles, which represent only 3 percent of our highways, carry 20 percent of all traffic. This is a laudable achievement, but it came with a price. It came at the environmental and aesthetic expense of both cities and rural areas. In order to focus attention and money on completing the interstate system, many community needs were neglected.

Other countries made different

Wide World photo.

Some community needs suffered as the United States built its vast system of interstates and highways. This 1960 photo shows how the Cross-Bronx Expressway cut through an old, established neighborhood.

(Chafee (R-Rhode Island) is ranking member on the Senate Committee on Environment and Public Works and was an author of ISTEA.)

choices. European countries decided to make major investments in transit and rail facilities. Land use planning, infrastructure investment, and pricing policies promoted alternatives to using a car. The result: 50 percent of urban person-trips in Europe are conducted by public transit, on bicycle, or on foot. In the United States we manage only 15 percent.

Our highway system is one of the best in the world—a system that provides mobility for its citizens and is paid for by its users. Once the user fee has been paid, generally in the form of a gas tax, highway users believe they have thereby paid for these roads. But this is a myth.

Highway users' gas tax payments are not paying for a lot of things:

- The loss from the tax base of more than 60,000 square miles (an area about the size of Georgia) dedicated to automobile infrastructure—for example, roads, interchanges, parking facilities, and gas stations
- The disposal of 200 million tires, 8 million junked vehicles, and 138,000 tons of lead from batteries each year
- Maintenance costs of existing roads
- Law enforcement costs
- Parking subsidies for the 90 percent of all commuters who park free at work
- Environmental degradation of our air, wetlands, parklands, and historic and cultural areas
- Energy security costs to maintain our oil supply—half of all oil consumed in the United States is used by motor vehicles.
- Congestion costs—i.e., lost time and productivity
- Costs associated with motor vehicle crashes.

In a recent World Resources Institute report, *The Going Rate: What It Really Costs to Drive*, Jim MacKenzie estimates these costs at over $300 billion per year. Others say this is a conservative estimate; that the true costs may be as high as $600 billion per year. These unpaid costs are subsidies.

Because of these subsidies, many urban areas are experiencing growing congestion. In Florida, for example, to accommodate traffic projections for the next 20 years, a 44-lane highway would be needed to move traffic from Orlando to Miami. The cost of constructing and maintaining such a highway facility would be prohibitive. It would have a devastating effect on our landscape and on our quality of life.

As Congress prepared to extend the highway program in 1991, we were confronted with the likelihood of leaving a legacy of gridlock, polluted air, and a scarred landscape for our children and grandchildren unless we made fundamental changes in our transportation policy. As we developed a new direction for our transportation policy, we were influenced by several guiding principles.

First, the one-sided emphasis on building highways has to end. There must be a level playing field for all modes of transportation, so that decisions about how to solve transportation problems are not unduly influenced by the availability of greater or lesser amounts of federal money. The best solution may be a highway, or

Steve Delaney photo.

Gasoline taxes do not reflect the costs of disposing of 200 million tires a year in the United States.

it may be an improved transit system, better land use planning, or an intermodal facility. *Performance*, not total lane-miles of *pavement*, must be the measure of success.

Second, transportation decisions have to be part of a larger planning process that recognizes how transportation touches every corner of our lives. The way our neighborhoods are zoned, for example, dictates whether we get in our car for every errand or whether we can walk to the grocery store or the day care center.

Finally, people must be given options. Policies have to be put in place to encourage habits that will sustain our environment—policies which will provide mobility for everyone, including those who do not have access to a car.

If people are given the choice of commuting to and from work either alone in their cars, at 55 miles per hour, using cheap fuel, or making three bus connections, they will most likely choose their cars. If the choice is to pay $150 a month for parking, or walk or bike a short distance to public transit for the work commute, more people may leave the car at home.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) makes fundamental changes to our transportation policy. This new law is based on the premise that we must permanently change our habits if we are going to maintain our mobility and preserve the environment that sustains us.

The 1991 transportation law gives the U.S. Department of Transportation a new mission: improving the performance of the transportation system rather than just building additional capacity. The department no longer has the single objective of building new highways. Its objectives now include clean air, energy conservation, productivity, and international competitiveness.

For the first time in the history of this program, the transportation law recognizes the connection between transportation policy and clean air. The law provides $1 billion per year which can be spent only in locations that are formally designated as "nonattainment areas" under the Clean Air Act and can be spent only on transportation projects that will improve air quality. It requires each state to conform its State Implementation Plan for air quality with its Transportation Improvement Program. This means each state must actually do the transportation projects it promises to do to clean up the air.

The new transportation law renews and expands on previously established planning requirements. State and local officials must now consider the effect of their transportation policy on land use, energy conservation, the environment, and the efficient use of existing facilities. The law also expands the number of constituencies who will participate in the planning process and make project selection decisions.

ISTEA substantially increased the federal research program for new technologies that hold promise for transportation systems that are more efficient and more environmentally responsible. These include high speed rail, magnetic levitation, electric vehicle research, and Intelligent Vehicle Highway Systems (IVHS). Again, the relevant standard is performance, not pavement.

Performance, not total lane-miles of pavement, must be the measure of success.

The new law includes a pilot program to put in place congestion pricing, such as tolls on heavily used roads, especially during peak use times. It is no longer enough to manage demand. We must reduce demand. Pricing incentives that charge true costs for using a facility at peak times are one way to reduce demand.

ISTEA recognizes that problems are created as well as solved by our transportation facilities, and that transportation policy must address these problems. The new law, for example, requires that each state use a minimum amount of rubber-modified asphalt pavement. This requirement will help dispose of at least a portion of the thousands of scrap tires that are discarded each year and are currently being placed in environmentally unsound waste piles.

The 1991 transportation law directs states and communities to use a portion of their highway funds for transportation enhancements such as bicycle and pedestrian facilities, historic preservation, and scenic beautification. The purpose of these projects is to improve the community as transportation investments are made.

ISTEA will not solve all our transportation problems, nor will it cure all other ills. It is less a mandate for change than a compelling invitation to change. It provides a blueprint for the necessary first steps toward change in our transportation policy.

States, faced with congestion, limited resources, and clean air compliance deadlines, also realize that we must change our driving habits. They are trying to provide these choices. Unfortunately, if a recent example in Virginia is an indication, changing old habits will not be easy. Virginia established High Occupancy Vehicle (HOV) lanes in a very congested corridor near Washington, DC. Commuters in the remaining, congested lanes cried out for relief. They did not like the idea of carpooling. Within one month of the new HOV restrictions, before people had a chance to get used to the idea of change, Congress responded to the outcry and directed Virginia to take the easy way out—by getting rid of the HOV lanes.

We have already taken the easy steps. If we are going to have a transportation policy in the future that we can sustain, and that will sustain us, we are going to have to put up with some temporary pain to achieve the long term goals of environmental protection, energy security, and economic stability. Achieving these goals will take laws like ISTEA, strong leadership at all levels of government, and the commitment of the traveling public to leaving a car at home sometimes because doing so is good economic, energy, environmental, and transportation policy. ◊

The Environmentally Friendly Vehicle

What makes a green car?

by John M. DeCicco
and Deborah Gordon

What would the "green car" be like? An oxymoron to some and an environmentally safe, personal mobility machine to others. Think of the green car as an ideal toward which the nation must strive if it is to achieve an ecologically sustainable transportation system. Production, use, and disposal of such a car would consume no fossil fuels and generate no pollution.

The greenness of a car depends not only on the machine, but also on how and when it is used. A car is greener with two people in it than it is with one, and it's greener still with three. A car is greenest if it's not used at all when there's a cleaner way to go: by foot, by bike, by transit, or by wire ("telecommuting"). The supporting infrastructure—roadways and fuel supply—would be built and maintained without habitat degradation or greenhouse gas emissions. Finally, although the carbon dioxide (CO_2) emissions from a vehicle's use are now about 10 times those associated with its manufacture, there must be parallel progress toward a greener industrial system focusing on reduced fossil fuel use and pollution, minimal waste, and the design of products for recycling or refurbishment.

While we cannot expect to quickly realize this vision, the industry does know how to make "greenish machines," vehicles which will greatly reduce the environmental impacts of each mile driven. Today's cars and light trucks average 20 miles per gallon (mpg) on the road, resulting in average CO_2 emissions of about 540 grams per mile. With technologies now available and in development, light vehicle energy efficiency could be doubled, thereby halving CO_2 emissions.

What would be the nuts and bolts of a greenish machine? An electric drivetrain is a good bet. Electric motors have negligible direct emissions, operate at high efficiency over a range of loads, and draw no power at idle. When electric motors are used to brake the car during deceleration, they can act as generators to recover much of the energy that today's cars dissipate through friction. The significance of this *regenerative braking* must not be underestimated, since more and more driving is done under congested, stop-and-go conditions, in which most of the energy supplied by the engine is lost to braking. Electric motors are also quiet and durable and could be easily recycled or refurbished.

To power an electric vehicle, we now have to rely on batteries, which are heavy, inefficient, and made with hazardous materials like lead and acid. The materials problems can be dealt with through careful packaging and through systems for recycling by the battery supplier. The weight and performance limitations are, however, a challenge. If batteries are ever to see widespread use as the sole source of on-board power, major engineering breakthroughs are needed.

Zero tailpipe emissions would certainly be a major boon in urban areas; this is why Los Angeles is leading the way to get electric vehicles on the road. However, the greenness of an electric vehicle also depends on how clean and renewable the electricity generation system is.

More promising in the long run are fuel cells—devices that electrochemically convert fuel into power. Hydrogen, supplied from a renewable resource such as biomass, is an ideal input for fuel cells. Although hydrogen storage is presently problematic, there are some promising options: metal hydrides, carbon, and an iron/water system. Hydrogen can also be carried in natural gas or methanol by using an on-board "reformer," a device to break the fuels into hydrogen and CO_2. Analysis by researchers at Princeton University suggests that such fuel cell systems look very promising as a long-run option for vehicles that must be environmentally sustainable and have low lifecycle cost. A fuel cell electric vehicle would have

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high end-use efficiency, which is crucial for keeping any renewable fuel production to a scale that avoids conflict with food production and habitat protection.

The first generation greenish machine could be a hybrid. The drivetrain would combine a small, efficient combustion engine with an electric motor and a medium-size battery. The engine could be constrained to operate only under narrow conditions, maintaining optimum efficiency and minimal emissions. Battery range limitations would be eliminated, and the regenerative braking and efficiency benefits of an electric drivetrain would be realized. Use of hybrid vehicle technology could more than double the efficiency of light vehicles, pushing the on-road average of cars and light trucks to 50 mpg without reducing size or compromising performance. Petroleum supplies would be stretched, and they would be used much more cleanly and efficiently. Hybrid vehicles could also operate on a diversity of fuels, with the choice dictated by regional energy resources and environmental constraints.

Best of all, many of the technologies needed to make an efficient hybrid vehicle are already on the shelf.

Powered by proton-exchange-membrane fuel cells, the Green Car™ has a range of 120 miles and can achieve a speed of 100 miles per hour. *Energy Partners photo.*

Improved aerodynamics, low rolling-resistance tires, high-efficiency mobile air conditioners, and other improved accessories already appear in new cars. A variety of refinements allows today's best engines to produce a given amount of power at less than half the size of older designs. Electronic control of ignition and intake/exhaust systems yields simultaneous lowering of emissions and improved torque—the rotational force needed to move the car. Further efficiency enhancements can follow from "lean-burn" designs, including two-stroke engines and advanced diesels.

Nearly all automakers have prototypes of greener cars. No big breakthrough, just good engineering, is needed for practical hybrid vehicles. Steady research and development efforts could make fuel cell electric vehicles a reality for the next century. Ultimately, the challenge is much more a matter of political will than technical ability. With a national commitment to heading in the right direction, we could soon be driving progressively "greener machines" down the road to an environmentally sustainable transportation future. ◊

The Auto Industry Looks Ahead

by Dean A. Drake and Treva Formby

Before discussing "green cars," it is necessary to ask, "What is a green transportation system?" Fundamentally, a green transportation system is one that provides the greatest degree of personal mobility with minimal environmental impact. Such a system would be a mix of mass transportation and personal transportation devices, primarily automobiles, powered by a variety of fuels.

GM already produces and sells intermediate-sized Lumina sedans powered by methanol and ethanol and pick-up trucks powered by natural gas, and is readying a commuter-type electric car for sale by the mid-1990s. Each of these vehicle-fuel combinations could be an element in a green transportation system.

But even in a green transportation system, most of the personal transportation requirements will probably be met by highly modified versions of vehicles powered by internal combustion engines using the new, cleaner-burning, "reformulated" gasoline. Gasoline has the highest energy content per pound of any commonly available fuel. Internal combustion engines burn this fuel extremely efficiently and have the performance characteristics most people require.

All of our new technologies will be needed to produce green cars and efficient transportation systems. The end result will be a transportation system that preserves and even increases Americans' freedom of mobility, while ensuring that each citizen will live in a healthy environment.

(Drake is Manager of California and State Activities at General Motors' Environmental Activities Staff. Formby is an associate engineer with the Staff.)

Companies Change Course

Progressive companies will merge economics and environment

by Frank Popoff

It is obvious the Earth Summit did not—and could not—solve the world's environmental problems, but it did lay an important foundation for continued progress. It helped bring home the message that economic growth and environmental reform don't have to be mutually exclusive; on the contrary, they go hand in hand.

For industry, the message is clear. Progressive companies that further the cause of sustainable development will become more valuable and more highly regarded in the marketplace. Those that don't, place their future success at risk.

The challenge now is to build on the positive momentum that emerged from the summit. There are two distinct directions this nation can take to balance economic and environmental issues. First, the United States could continue the command-and-control approach—by enacting more legislation, writing more regulations, and raising taxes to pay for it all. Or the country could make the transition to a more voluntary, pro-active, and free market solution. The latter approach will be far more effective.

It has been proven time and again that voluntary change by business is less painful, more efficient, and more economical for consumers, for government, and for businesses themselves, than regulated change. Voluntary improvements offer increased flexibility, lower compliance costs, and market incentives. Regulation and legislation have resulted in a reluctant compliance orientation in industry rather than one of innovation and continuous improvement.

Moving toward sustainability requires building an economic advantage after finding the costs and benefits of environmental improvements. Already, there are positive results from this approach. Although industrial production is rising steadily, industrial pollution is declining. For example, while chemical industry production was up 10 percent from 1987 to 1990, emissions to air, land, and water during that time decreased 35 percent. More companies are realizing that the emissions they produce are a sign of inefficiency, and that waste reflects raw materials not sold in final products. This idea is discussed in *Changing Course: A Global Business Perspective on Development and the Environment*, a book prepared by the Business Council for Sustainable Development (BCSD). As part of BCSD, I was among 48 business leaders from throughout the world who helped provide industry's input during the Earth Summit process.

Changing Course explores the use of several economic instruments that would incorporate environmental considerations into how businesses are run. Used judiciously, instruments such as pollution taxes, deposit-refund systems, and tradeable permits can encourage environmental responsibility through pollution prevention.

Another concept that deserves further exploration is full cost pricing, which means pricing goods and services to reflect their true environmental costs through production, use, recycling, and disposal. Shifting to this new paradigm will be achieved gradually over the next few decades. Already economists are working to establish detailed costs of various pollution and environmental problems. Air, water, and earth should no longer be considered free goods. They are assets that should be efficiently and appropriately allocated. Achieving full cost pricing is a difficult task which must evolve slowly so that it will not shock the world's economic and trade balance.

Changing Course creatively and effectively articulates an industry blueprint for working toward sustainable development. The country will not reach sustainability, however, unless everyone involved lowers the level of rhetoric and shows a willingness to seek common ground. The response to increasingly complex environmental problems has been like a

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traffic jam with everyone honking their horns and nothing much being done. However, I do see signs that "environmental gridlock"—the adversarial relationship that too often exists among government, industry, and special interest groups—is loosening. Through partnerships and self-initiated programs, Americans can do more good for the environment and do it more quickly than they can working separately.

EPA's 33/50 Program to voluntarily reduce emissions is an excellent example of government and the private sector working together for everyone's benefit. Another voluntary effort that is reaping dividends is a program developed by the Chemical Manufacturers Association called Responsible Care®. Through Responsible Care, companies publicly commit to improve their environmental, health, and safety performance. Participants are obligated, as a condition of membership, to follow six "Codes of Management Practices": community awareness and emergency response, pollution prevention, process safety,

Building a Better Refrigerator

by Gary Fernstrom

America's appliance manufacturers have begun to grasp issues of sustainability. However, they face a significant "chicken and egg" dilemma that inhibits the development and commercialization of "green" products. Most consumers aren't willing to spend much money up front on green products, including more energy efficient ones, even though energy efficient appliances may pay for their higher cost several times over in reduced energy bills. Also, people are conservative on brand and model recognition. Because they don't tend to try new models, new green products often fill small market niches, with higher prices resulting in lower sales volume. These higher prices in turn prevent higher market penetration and economies of scale that could lead to price reductions.

Fortunately, a group of players has stepped into the marketplace to provide financial incentives that will encourage the development of energy efficient appliances. Twenty-five utilities—which service nearly a quarter of all households in the nation—have pooled almost $30 million for a contest among manufacturers that will result in a super-efficient refrigerator that is free of chlorofluorocarbons (CFCs). The initiative is called the Super Efficient Refrigerator Program (SERP), and EPA, the Natural Resources Defense Council, and other agencies and associations have worked with Pacific Gas and Electric and the other utilities to develop it.

To compete in the SERP contest, a manufacturer must commit to producing CFC-free refrigerators that beat the 1993 federal refrigerator-efficiency standard by at least 25 percent. Manufacturers may improve their score by proposing even greater efficiency goals. The manufacturer must plan to assemble the refrigerators in North America and deliver them to dealers in participating utility service territories from 1994 to 1997. The earlier the manufacturer plans to deliver units, the higher the bid score.

In their proposals, bidders are free to specify the amount of incentive to be paid by the utilities, as long as they don't ask more per refrigerator unit than the ceiling set by participating utilities. Manufacturers will use the utility payment to lower the price of the green refrigerators to the same general price level as more run-of-the-mill models. The lower the incentive the bidder requests, the more cost-effective to the utilities, and therefore, the higher the bid will score.

In addition to these competitive factors, the utilities will evaluate the bids for reliability factors, such as the marketing plan, corporate commitment to the project, and experience with the technologies proposed.

Bids were due from manufacturers by October 15, 1992. SERP will evaluate them, and on December 1, 1992, two finalists will be picked. They will then begin building prototypes. On July 1, 1993, SERP will pick the competition's winner. The winner will ship refrigerators into participating utility territories according to its proposed delivery schedule, and SERP will pay the manufacturer the incentives as these shipments are made.

The number of refrigerators that SERP subsidizes depends on the structure of the winning bid, and could range anywhere from 150,000 to 500,000 units. Any outcome in this range will be a significant step in the transformation of the refrigerator market to greener technologies. EPA estimates that the direct and spin-off effects of SERP could save 3 to 6 billion kilowatt-hours per year by the year 2000, saving customers $240 million to $480 million per year on electric bills and helping utilities save the high economic and environmental costs associated with building more power plants and distribution systems. By 2000, SERP will reduce annual U.S. carbon dioxide emissions by 600,000 to 1,200,000 metric tons.

SERP underscores the huge potential for forward-looking utilities, environmental groups, and public agencies to work together to improve energy efficiency, maintain jobs by promoting greener technologies, and reconcile environmental sustainability with a high standard of living.

(Fernstrom is Supervisor of Residential Program Development and Evaluation for the Pacific Gas and Electric Company. He is also Chief Financial Officer and a trustee of SERP.)

distribution, employee health and safety, and product stewardship. Ideally, Responsible Care will help the chemical industry achieve progress that would have been considered impossible even 10 years ago.

To make sustainable development a reality, every business and industry sector will have to ask: What does sustainable development mean for my business or industry? What do we need to do to become sustainable? By developing principles that integrate environmental considerations into all economic decisions, industry is taking an important first step.

Dow has developed a first set of principles we will apply in our pursuit toward sustainable development. Our principles include commitments to integrate environmental considerations into all business decisions and to design or modify our products and processes to reduce environmental impact. Our goal is to become a premier company in the practice of sustainable development.

Dow has proven that a responsible environmental attitude can be good for the bottom line. In 1986, the company formalized its waste reduction efforts in a program called Waste Reduction Always Pays (WRAP). Through WRAP, Dow seeks out cost effective projects that reduce waste to the environment, measure and track performance, and recognize employee excellence.

For example, a waste reduction team in our Pittsburg, California, plant received an award for identifying opportunities to recycle a solvent used in the production of an agricultural product. The solvent was being incinerated after a single use. Today, solvent use at the Pittsburg plant has been reduced 80 percent, and $8 million per year is saved at full plant capacity. The benefits are reduced costs and reduced waste.

Unfortunately, much of the capital spent on the environment today is in response to legislation and regulation, which offers no return on investment. Initiatives such as WRAP, which often show a cost savings, motivate companies to direct capital to pollution prevention rather than end-of-the-pipe treatment. For example, from 1988 through 1991, the plant at our Louisiana division implemented 207 WRAP projects at a cost of about $23 million. That investment, however, has thus far resulted in total cost savings of more than $36 million.

As part of Dow's Waste Reduction Always Pays (WRAP) program, a technician at the Polycarbonate Research Plant in Texas checks the quality of a recycled solvent, methylene chloride.

Dow photo.

By actively pursuing waste reduction opportunities, Dow will reduce waste management costs, improve productivity of operations, demonstrate to the public a commitment to environmental protection, and show that a voluntary program of waste reduction can work without government regulation.

With strong leadership and sustained commitment, industry has the ability to translate the challenge into opportunities. By investing in products that avoid or solve environmental problems, performing life cycle analyses on products, including environmental costs in prices, starting voluntary programs, and monitoring our own progress, business can take a strong leadership role in the quest for sustainable development. Business leaders look forward to improved conditions for implementing these solutions as governments begin to deregulate markets, privatize enterprises, and stabilize basic economic conditions.

As my generation was growing up, the images of progress were smokestacks and bulldozers making way for new developments. Let's hope that the next generation better balances economic progress and environmental preservation. ◊

Moving Beyond the "Tech Fix"

Research and development should stress resource efficiency

by John Gibbons

Our society has espoused a number of overarching goals, including economic strength, environmental quality, and national security. Some policy makers here and abroad have begun to consider a goal of sustainable development. Given the general fascination with the "tech-fix," inquiries about the role of science and technology in achieving sustainability naturally follow.

Ample evidence supports the notion that technology can contribute substantially to sustainability. Providing necessities and amenities—shelter, food, health care, mobility, recreation, communication—makes varying demands on the natural resource base depending upon the sophistication of the technology used. For example, technology already exists that can provide energy services, such as heating and cooling, transportation, illumination, and food preservation, at much lower levels of fuel consumption than commonly encountered.

Nevertheless, a fair amount of uncertainty inheres to the concept of sustainability. We have not yet come to grips with René Dubos's assertion that just as important as food and shelter are "the social amenities that make it possible to satisfy the longing for quiet empty spaces, for privacy, independence, and other conditions essential for preserving and enlarging the peculiarly human qualities of life." We also cannot project with accuracy the extent to which technology will expand or limit our own opportunities and those of future generations.

These uncertainties, however, need not deter us from measuring the impacts, good and bad, that we anticipate making on the natural resource base, impacts which certainly influence the ability of this generation (and future generations) to sustain itself. One important measure is the amount of environmental damage inflicted by human activities, especially resource consumption and population size.

Technology gives us hope of achieving sustainability, but no guarantees.

The magnitude of environmental damage is strongly influenced by technology. The task, then, is to link technology to achieving societal goals—including sustainable development—rather than to pursue new technologies in a policy vacuum. The challenges lie in three main areas: prudent resource use; birth control; and resource restoration.

Prudent Resource Use

The value of many resources, like electricity or oil, lies in the services they provide. We can limit impacts on the resource base by making no excess demands: in other words, by using resources efficiently. We can also help sustain the availability of the services using substitute resources.

For instance, ultimately, noncarbon fuel sources will be needed to meet energy demand and control pollution. To enable the multi-decade transition to supplies such as solar technologies or a new generation of nuclear power, a strong research, development, and demonstration (RD&D) effort is needed—starting today. On the demand side, enormous opportunities exist to cut the amount of energy needed to provide a given quantity of necessities or amenities. Over the past couple of decades, technology has enabled major increases in services that can be gotten from a given quantity of energy, while simultaneously enabling major cuts in pollution produced. Scenarios for oil supply and demand to 2020 show the promise of several aggressive approaches, such as improving the average new auto mileage to 40 to 50 miles per gallon

(Gibbons is Director of the Congressional Office of Technology Assessment (OTA). The views expressed are the author's and not necessarily those of OTA or the Technology Assessment Board.)

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(mpg) and shifting to new fuels. Forceful efforts could result in energy savings of about 50 percent in residential and commercial sectors and about 33 percent in industrial and utility sectors.

Government can speed the process of researching and testing many energy supply and end-use technologies. However, recent federal energy RD&D budgets are about half of what they were in 1980, funding for renewable energy and conservation RD&D has dropped by about 80 percent over the last decade, and only about 5 percent of the $3.7 billion federal budget for energy technology RD&D in 1991 was devoted to these two promising alternatives.

"Green" product design is another prudent resource-use strategy that provides an opportunity to improve U.S. industrial competitiveness while addressing environmental problems. Design is the stage where decisions are made regarding the types of resources and manufacturing processes to be used in production; these decisions ultimately determine the characteristics of waste streams, including the ultimate fate of the manufactured product. Recent analysis suggests that simply providing information to designers and consumers about the environmental impacts of products and waste streams may help, but is not enough. Rather, the environmental costs of production, consumption, and disposal should be accounted for at each stage of the product life cycle.

The challenge to public policy makers is to choose a mix of regulatory and economic instruments that targets the right problems and gives designers the incentives and flexibility to find innovative, environmentally beneficial solutions (see figure).

Birth Control

Modern health care practices created the population explosion by enabling deep and rapid inroads into death rates without corresponding cuts in birth rates. In societies that industrialized before the 20th century, typically over many decades, social adaptation to slowly falling death rates was followed by slowly falling birth rates; the two were never very far apart. But when death rates fall rapidly, as happened in the developing countries over the last several decades, without corresponding decreases in birth rates, populations "explode."

The challenge to practitioners of science and technology is two-fold: to enable leaders to understand better the dynamics of population growth, the demographic changes that attend it, and its impacts on development and social stability; and to develop and make universally available increasingly effective and acceptable means of birth control.

In the United States, contraceptive research is virtually at a standstill. Restrictions on scientific investigations of human reproduction impede important new directions in research. Fear of litigation also appears to have a chilling effect on manufacturers' interest in developing and introducing new birth control measures. These types of barriers must be removed before technology can help fulfill the unmet desires for effective family planning services.

Different standards of living and technological sophistication alter the impact of population changes in different countries. For example, a small population growth rate in a very affluent society like the United States can increase pollution by as much as or more than a large population growth rate in a very poor society. All of us hope that people in developing countries will grow more wealthy and that per capita additions to pollution ultimately will stabilize or decrease around the planet. Under those conditions, technology and population

size become the sole drivers of changes in pollution and associated risks. Thus, population stabilization—at home and abroad—is an essential ingredient in any long-term, comprehensive pursuit of sustainable development.

Resource Restoration

Development practices have often left natural areas unproductive and seriously depleted resource stocks in their wake. Of immediate concern to the United States are those areas of the country contaminated by toxic wastes. It is clear that the federal government's operations rank high among the contributors to environmental contamination, which is a serious and complicated problem. Decades will be required for cleanup of certain sites, while others will never be returned to pristine condition.

Of equal or greater concern are the loss of old growth forest ecosystems and the reduction in the Earth's biological diversity. Both problems have grown during the last decade from development assistance concerns to themes of global debate. As the value of biological resources to humankind has become more fully appreciated, the connections between these resources and global environmental stability and economic development potential have become more compelling.

Little scientific effort has been directed to increasing the direct financial benefits from sustainable management of natural forests to local communities. In the United States, for example, the major underlying cause of old growth deforestation and species extinctions—lack of local alternative employment opportunities for forest workers—remains. Hence the forests and their biodiversity are in jeopardy, both at home and abroad, despite momentum at the international and national policy and planning levels. Technology—to create new job opportunities and to reestablish the forests—is badly needed to make the task of resource restoration less expensive and more effective.

Technology gives us hope of achieving sustainability, but no guarantees. The United States is ideally positioned to lead a global effort to achieve sustainable development. We are technically sophisticated, open, and innovative, and we presently use a major portion of the world's resources. For technology to work to our benefit, however, change must occur in other spheres as well. Many traditional public policies bias actions toward higher resource consumption, rather than toward greater resource efficiency. These policies need fixing.

I believe we also need to devise some better measures of progress than the Gross Domestic Product (GDP). We continue to measure economic health in terms of the rate of flow of materials and energy through the economy—the faster, the better. On that basis, human and environmental disasters such as the Oakland fire, the Los Angeles riots, and Hurricane Andrew have one thing in common: They increase the GDP.

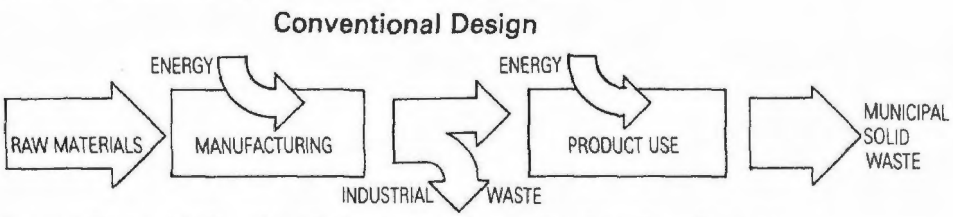
Kierkegaard suggested an alternative: "Progress should be measured by the increase in man's individuality." It is something to consider, as we grapple with sustainable development. ◊

Agenda 21

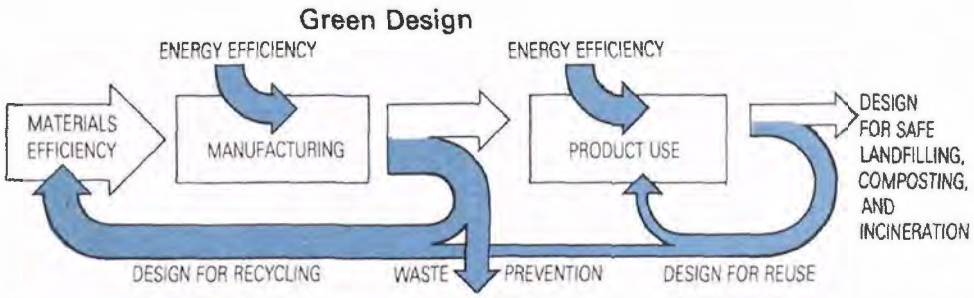
"Decision makers should create more favorable conditions for improving training and independent research in sustainable development. Existing multidisciplinary approaches will have to be strengthened and more interdisciplinary studies developed between the scientific and technological community and policy makers and with the general public to provide leadership and practical know-how to the concept of sustainable development ...."

—Chapter 31

How Product Design Affects Materials Flows

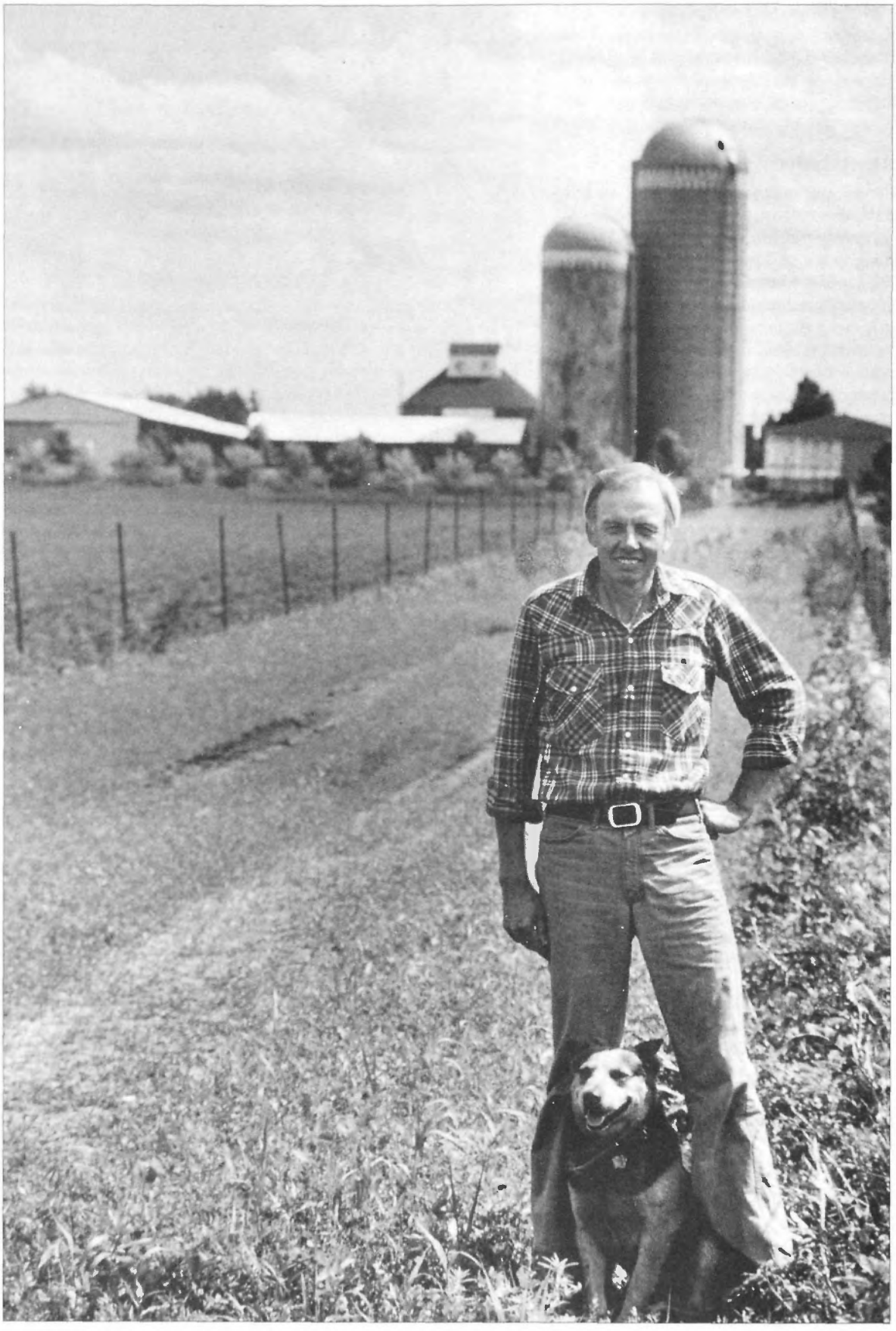


In general, materials flow through the economy in one direction only — from raw materials toward eventual disposal as industrial or municipal waste.



By making changes in a product's design, overall environmental impact can be reduced. Green design emphasizes efficient use of materials and energy, reduction of waste toxicity, and reuse and recycling of materials.

Source: U.S. Congress, Office of Technology Assessment, *Green Products by Design: Choices for a Cleaner Environment* (U.S. Government Printing Office 1992)



Richard Thompson farms without chemicals near Boone, Iowa, by using ridge-tilling and crop rotation methods.

Mitch Mandel photo.
The New Farm.

Agriculture: Two Views

Farmers must do more than take green subsidies

by Ken Cook

For the past 30 years, ever since Rachel Carson revealed the ecological costs of agricultural pesticide misuse in *Silent Spring*, the louder voices in agriculture have howled in protest whenever evidence surfaced that modern farming contributes to a serious environmental problem, be it wetlands loss, surface water pollution, or ground water contamination. Chances are, however, that we'll hear many of those very same voices say just the opposite, and say it just as loudly, over the next few years. Agriculture's environmental problems, far from being exaggerated, will be discovered to be so severe that society will be asked to pay farmers billions of dollars each year to deal with them.

What will account for the reversal? Will it be a response to the Earth Summit's call for "sustainable agriculture?" Alas, dear taxpayer, the voices will be motivated by green of another kind. Farm interests throughout the industrialized world have resigned themselves to the fact that the only feasible, politically correct, post-Rio defense against the growing assault on their massive agricultural subsidies is to put an ecological coating on the flow of cash. It's quite a sight, really: farm policy, big and embarrassed, arriving at the new world order all done up in the most delicate shades of green.

Will the new color have a slimming effect? A fellow in the business of defending farm subsidies these days really must keep an eye on his figures: Agricultural protectionism costs taxpayers and consumers tens of billions of dollars each year here and in Japan, and gobbles up most of the European Community's revenues. And quite apart from their cost, agricultural subsidies in Europe, the United States, and Japan have been targeted during the current Uruguay round of the General Agreement on Tariffs and Trade (GATT) as the principal roadblock to freer trade worldwide. That has put commodity export subsidies, price supports, cash payments, and myriad other forms of agricultural protectionism on the chopping block of the post cold-war world.

GATTocrats emphasize, however, that national subsidies made for environmental purposes would remain unaffected by proposed reforms—they're "GATT-proof," as they say in the trade. And therein lies the inspiration for environmentally friendly farm policies that are *de rigueur* in Europe, and catching on here.

As Britain's Agriculture Minister John Gummer declared at a recent international meeting in The Netherlands, "Farmers who benefit from direct payments under the reformed Common Agricultural Policy should be expected to protect and safeguard the countryside and its wildlife."

The United States may be said to be a season or two ahead of the fashion, at least on paper. Since 1985, U.S. farm policy has stipulated a conservation *quid pro quo* for some two dozen forms of farm benefits. Under those policies, farmers who drain wetlands or farm erodible lands outside the rules lose their eligibility for most farm programs. In fact, the supposed conservation benefits were used to defend farm programs from attack during the 1990 Farm Bill debate. U.S. Department of Agriculture (USDA) officials claim great conservation gains under these policies, but investigations by the USDA's Office of Inspector General, among others, show that USDA's enforcement of the rules has been exceedingly lax. Center for Resource Economics research indicates that thousands of farmers should have lost program benefits for failing to protect wetlands and fragile soils in recent years, but all but a handful got off scot-free. That means taxpayers still are subsidizing soil erosion and wetlands destruction on an extensive scale.

At the same time, U.S. policy has conclusively demonstrated that farmers will line up in droves for environmental subsidies. Under the Conservation Reserve Program, also established in 1985, farmers are being paid to plant

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grass and trees on more than 36 million acres of erodible land for a period of 10 years, with substantial soil and wildlife conservation benefits. Current USDA outlays for conservation reserve contracts, at $1.6 billion per year, exceed EPA outlays for Superfund.

If farm policies are to evolve another turn in the environmental direction in this country, as seems likely, some fundamental questions arise. For starters, what are the goals of such policies? To begin with, they should result in the use of pollution prevention techniques that have proven efficacious and cost-effective. Reasonable yield goals and soil testing to reduce the chances of fertilizer overuse; biological or integrated pest control; "banding" of herbicides along crop rows instead of "broadcast" application over entire fields; greater diversity in crop rotations; and contour farming are among the many simple tools available. Modest though they might seem, widespread use of such practices would dramatically reduce environmental and health risks associated with agriculture while helping farmers' bottom lines. At the same time, much more effective measures need to be taken to conserve ecologically valuable habitats, such as wetlands, and the wildlife they contain.

Can anyone seriously believe that such policies will succeed if they are purely voluntary on the part of farmers? Or that we can afford to pay farmers for each and every step they need to take to protect the environment? We have never followed such a course with a serious environmental problem in any other industry, and we cannot afford to do so in the case of soil erosion, wetland loss, water quality, or other problems associated with agriculture.

If agricultural policy is to "green" in the 1990s, so that taxpayers truly receive environmental returns on agricultural assistance, the environmental performance expected of farmers must be clear and workable, and enforcement must be fair but firm. Among other things, EPA and state environmental agencies will need to play a major role in framing environmental goals for agriculture and in determining when farmers are meeting those goals. A green agricultural policy presided over exclusively by agricultural interests may look new, but in fact will mean business as usual both for taxpayers and the environment, something neither can afford. And without reform, writer P. J. O'Rourke's advice on farm policy will become more and more persuasive: Take the whole thing out behind the barn and kill it with an axe.

Look to the market to provide incentives

by Stephen B. Lovejoy and Kathleen A. Heaphy

In recent years, agriculture has made tremendous changes in response to widely vocalized public concerns for environmental quality. Farmers have greatly cut their per-acre use of agricultural chemicals, and millions of acres now are better protected because tillage has been reduced. Our research at Purdue University suggests that these changes have reduced the flow of certain pollutants into surface waters by 20 to 40 percent. New programs that assist producers in farmstead assessment and environmental risk should reduce environmental damage even further.

However, the public is demanding even greater improvements. Farmers are ready to supply whatever outputs the public wants, and most will be good environmental stewards, if the environmental goals are specific and quantifiable. Some suggest that state and national regulation is the best or only way to achieve these environmental goals. In essence, they suggest that we treat the agricultural sector just as we have treated other industrial sectors and force producers to adopt a specified set of management practices. While regulation has often been viewed as a fair and efficient method for achieving environmental goals, there are characteristics of the agricultural sector and the agricultural production process that make it very different from other industries.

Systems for producing agricultural commodities vary from region to region because of differences in rainfall, temperature, soil productivity, and other characteristics of the terrain. These same factors, plus proximity to water and seasonality, influence the quantity of pollutants produced by a given production system. These characteristics will make a regulatory approach to environmental quality in agriculture much more expensive (per unit of environmental improvement) than it is for other sectors of the economy. Instead of a few thousand industries to control, there are a billion acres of farmland and a few million farmers and landowners. Enforcement of command-and-control regulations would be extremely difficult. In fact, it might be impossible.

We need drastic change and not just business as usual. We need new, innovative ideas that help achieve environmental goals in an efficient manner without sacrificing other important objectives such as property rights and liberty. We need to take an intensive look at property rights systems and find innovative ways to achieve our goals at the least cost. For example, the following analysis of

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Rows of corn alternate with alfalfa on an Illinois farm—a practice that curbs erosion while maintaining high yields.

Tim McCabe photo. USDA, Soil Conservation Service.

wetlands is an example of how we could use the marketplace to achieve environmental goals.

Environmentalists want to save the remaining wetlands. Many farmers and developers see the wetlands or drainage restrictions imposed on owners of property through the Clean Water Act and the 1985 and 1990 farm bills as the government "taking" their rights to productively use these lands. In between are most Americans, who want to see valuable wetlands protected but also want land available for food production and for development of housing.

One solution to this dilemma is to hold a wetlands auction and sell the rights to protect or use wetlands to the highest bidder. There is a great deal of diversity in the wetlands values associated with those rights that society now possesses as a result of the Clean Water Act and farm bill restrictions. These rights—drainage rights—are analogous to development rights or mineral rights that are severed from land surface ownership or direct control of the property.

If the government held a wetlands auction, we would begin to see differences in the quantifiable value of those rights for different purposes; for example, farming versus habitat or housing versus water quality. In geographic areas where the value of wetlands is high, organized groups, such as conservation and environmental groups, will bid for those rights. However, where the ability of wetland acres to supply the desired environmental amenities is low, farmers or the present owners will outbid others in order to have the *option to drain those acres to increase planted* acres or to reduce management problems. To compensate present owners, the auction could be set up to return one-half the bid price with the remainder of the bid going to an environmental improvement program.

Besides protecting those wetlands that are most valuable while reducing the loss associated with protecting less valuable wetlands, the wetland auction also provides us with great flexibility for future decisions. As society's knowledge about the environmental benefits of wetlands increases, owners of those wetland rights can sell those they presently own or buy others. In other words, these rights would be transferrable on the basis of market processes, where voluntary buyers and sellers come together.

The wetlands auction is a specific example of more general efforts to introduce market functions into environmental protection. Other market-based environmental protection measures, outside the agricultural sector, include tradeable air emissions permits and tradeable development permits. A significant benefit associated with these market procedures, often called free-market environmentalism, is that they would allow members of society—rather than public bureaucrats or university scientists—to place values on environmental quality. ◊

Public Lands: Two Views

Traditional management policies threaten both economic and environmental health

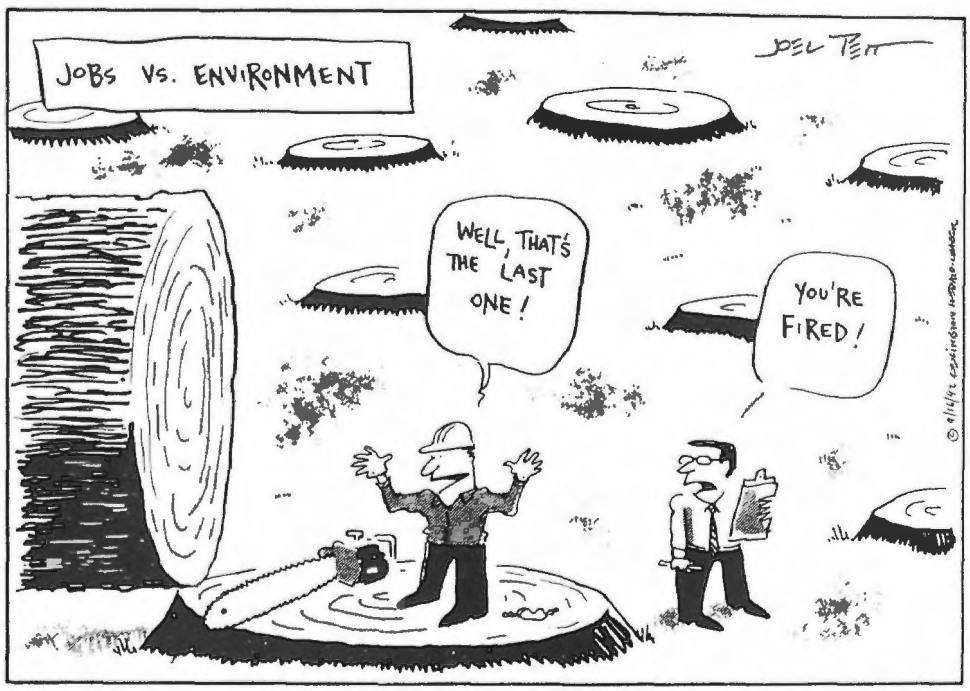
by George T. Frampton, Jr.

Over the last several decades, it has become increasingly obvious that our future well-being depends on more than just a larger gross national product. An increased understanding of our environment has resulted in urgent demands for preventing further degradation and cleaning the pollution that has occurred already.

To many, sustainable development should be the goal for the future management of the nation's public lands. Unfortunately, sustainable development stands directly contrary to the status quo. Traditional federal land management policies threaten both the environment and the economic health of local communities by emphasizing commodity extraction over ecosystem protection. Regions such as the Pacific Northwest, the Greater Yellowstone region of the northern Rockies, and the Four Corners area of the Southwest are particularly ill-served by the current federal policies.

Take logging of the ancient forests, for example. Decades of excessive logging on public lands throughout the region have severely degraded the habitat for several species, such as salmon. Most of the spawning and rearing habitat for wild salmon in the Pacific Northwest is located on or directly downstream from national forests and other federal lands. Logging and road building may increase the amount of fine sediment in streams by as much as 1,000 times. The excess sediment adversely affects the viability of salmon eggs and the salmon's ability to feed. Salmon are visual feeders and the higher levels of sedimentation, in effect, hide food. The American Fisheries Society estimates that some 106 populations of West Coast salmon are extinct and another 214 salmon stocks in the Pacific Northwest are at risk of extinction.

Mining on public lands is an equally egregious assault on the environment. Across the public lands, tens of thousands of abandoned mining sites still are leaking acid, heavy metals, and other hazardous wastes into streams



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(Frampton is President of The Wilderness Society.)

and rivers, while abandoned tailings—mining waste—piles spew poison-laden dust.

EPA has put 47 abandoned mine sites on the National Priorities List for Superfund clean-up action. Economists estimate that toxic waste cleanup at mine sites could cost $50 billion. The National Park Service estimates that it will take $45 million to clean up and make physically safe more than 2,000 abandoned mine sites within Olympic, Glacier, Death Valley, and many other national parks and monuments.

The record on grazing on public lands is just as dismal as that of logging and mining. Overgrazing on public lands, spurred by cheap fees, has resulted in extensive soil erosion, watershed destruction, and the enormous loss of vegetation.

The damage from overgrazing is so great that the Bureau of Land Management (BLM) estimates that over the next five years a minimum of $60 million of ecological restoration work is needed. In its 1990 report on rangeland conditions, BLM says that only 33 percent of grazing lands are in good to excellent condition. The U.S. Forest Service says that only 46 percent of its lands used for grazing are in good condition.

The economic damage from these federally sponsored commodity programs parallels the environmental problems. Altogether, taxpayers subsidize the private profit from public resources to the tune of more than $1 billion every year. This subsidy does little to benefit the economic well-being of the region.

Much of the West has changed dramatically over the past 20 years. The once predictable boom-and-bust economic cycle has become a bust, with ranching, mining, logging, and other commodity-production industries experiencing long-term declines. Other enterprises such as high technology, service industries, entrepreneurship, government, and recreation and tourism are becoming more important. This trend can be turned to advantage, and the West can be rebuilt and diversified with an economy that protects and restores the region's outstanding environmental features.

To a great extent, sustainable development is the foundation for making a successful link between the environment and the economy. Communities seeking to diversify their economies and wean themselves from dependency on extractive industries see this link plainly. The federal government should recognize that a reversal of its subsidized commodity programs is an essential first step toward providing genuine, long-term community stability to rural areas. Subsidized timber sales must be phased out, grazing fees should match market rates, and minerals taken from public lands should be subject to the same royalties as oil and gas.

Environmental and economic health for rural communities today depends more than anything else on maintaining biological diversity, clean air and water, wildlife habitat, and other natural attributes.

The demands now placed on the public lands bear little resemblance to those faced 100, 50, or even 25 years ago. Wildlife, recreation, scenic beauty, clean air and water, and perhaps most importantly, biological diversity, have taken on new prominence in public lands management. So has public accountability for the federal land stewards. The era when the environmental and economic integrity of our public lands is sacrificed for private gain is over and is being replaced by a new era of sustainability. We have little choice but to make this transition. We can no longer afford, economically or environmentally, a business-as-usual approach to public lands management. ◊

Agenda 21

"Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in suboptimal use of both land and land resources. If, in the future, human requirements are to be met in a sustainable manner, it is now essential to resolve these conflicts and move toward more effective and efficient use of land and its natural resources …."

—Chapter 10

No so-called "sustainable" fixes are required

by William Perry Pendley

Americans fear any ruse that permits bureaucrats more control over their lives, knowing intuitively the truth of Ronald Reagan's definition of Washington, DC: the land on the banks of the Potomac surrounded by reality.

The unreality of Washington is nowhere more evident than in its embrace of "sustainable development" as a wise or even achievable public policy. Federal bureaucrats may breathe the rarefied air of Washington's Mount Olympus-like atmosphere, but their crystal balls are no better than yours or mine.

Even if the bureaucracy were capable of deciding what is "sustainable development," the economic distress accompanying such decision making would be enormous. In Washington, where everyone can say "no" yet no one can give an authoritative "yes," decision making is measured in years, not months.

More importantly, the call for "sustainable development" makes no sense because it is based, in part, upon the notion that technology has increased America's standard of living at the expense of the environment.

(Pendley is President and Chief Legal Officer of the Mountain States Legal Foundation in Denver, Colorado.)

America leads the world in protecting the quality of the human environment because the creativity of our technology and the strength of our economy permit us to do so. Since only a country with a strong economy can spend money on environmental protection, it is hardly surprising to have found environmental disasters in the economically hard pressed, government managed economies of Eastern Europe.

Another delusion underlying "sustainable development" is that we are running out of natural resources. Yet every generation has left the next generation with more, not fewer, usable resources. The prices of coal, oil, gas, and metallic ores are at or near all time lows, denoting abundance, not scarcity. Current predictions of gloom are as erroneous as the forecast of the "expert" who once intoned: "When whale oil is gone, the world will be plunged into darkness."

We in the western United States have long recognized the need for good stewardship and conservation. Conservation, in Theodore Roosevelt's sense of the term, means the wise use of natural resources—mankind and nature living together in productive harmony for the benefit of mankind.

Some in the highly urbanized East see the West as a land mass to be managed, not for multiple use and the economic well-being of those who live here, but as a playground to be enjoyed by urbanites. Of course, vast reaches of the West are set aside for single purpose recreational pursuits, including millions of acres of parks and wilderness areas. However, the federal lands that remain are key to our region's economy. As to those lands, only the most disingenuous would assert that the needs of future generations are not being protected by the economic activities now taking place—activities like ranching, timbering, mining, and oil and gas development.

Grazing lands in the West are in the best shape in decades. Wildlife in the West—elk, deer, antelope, bear, mountain lion— are at their highest population levels since record keeping began in the early 1900s. These lands, which have supported economic activity for generations, are being managed for sustained development far into the future, since it is the fervent prayer of every ranching family that its sons and daughters remain on the land. The battle over grazing in the West ("Cattle-Free by '93," cry some zealots) does not involve environmental considerations but matters of culture. As one federal judge concluded, some find unique beauty in the droppings of elk but are offended by the leavings of cattle.

Timber is a story of untold success and tragedy. The success is the fact that there are more trees today than 40 years ago, the result of thoughtful reforestation programs and the management of private and public forest lands for sustained yield. The tragedy is the manner in which—as a result of endless, mindless appeals by so-called environmental groups—forested lands, devastated by insect infestation and the victims of "fuel" (decaying, dead, and downed trees) buildup, are being permitted to rot. In time, much of these once beautiful forests will erupt into fire, much like Yellowstone National Park did, thereby releasing carbon dioxide into the atmosphere, destroying wildlife habitat, killing fish and game, and wiping out vast, rich, renewable resources.

Federal bureaucrats may breathe the rarefied air of Washington's Mount Olympus-like atmosphere, but their crystal balls are no better than yours or mine.

As for mining, only mineral deposits that represent the highest, most efficient use for the least amount of disturbance will be mined. Companies that mine in America compete in a world market in which cheap foreign labor provides a tremendous advantage (American miners are among the nation's best paid workers). Thus, mineral deposits in the United States are only being developed—yielding millions of dollars in revenues, salaries, and tax payments to federal, state, and local governments, not to mention valuable natural resources—if the deposits are world class, that is, if they can compete with the rich ores found in South Africa, Russia, or Brazil.

President Jimmy Carter once predicted that the world would run out of oil by 1990. Obviously, it did not. What we have run out of is much of our domestic production (exploration is at a 50-year low) not because the oil isn't there, but because of "environmental" regulations. While there are vast regions of this country that contain enormous hydrocarbon potential, we appear to prefer to go to war in the Persian Gulf and to permit the export of some 400,000 energy-related jobs to foreign countries. The irony is that the United States is not thinking globally when we look to the former Soviet Union—with its dismal environmental record—to produce energy resources for us.

Calls for "sustainable development" are based upon three fatally flawed assumptions: that technology increases standards of living at the expense of the environment; that we are running out of resources and must limit development to ensure future availability; and that government is any better at telling us what type of development is "sustainable" than it is at telling us if it will rain tomorrow.

"Sustainable development" is simply a code word. It is a code word for federal land use planning, for more government control, and for centralizing enormous power in the hands of bureaucrats who are thousands of miles away from the people whose lives they seek to control and light years away from the real world in which most of us live. ◊

The Rising Tide

Rapid development threatens U.S. coastal areas

by Marya Morris

> "As powerful as Hurricane Hugo was, it will be surpassed by bigger storms in the future; population growth and increased development along the coasts suggest that these future storms may cause even more damage and loss of life."
> —From *Coasts in Crisis*, U.S. Geological Survey, 1990.

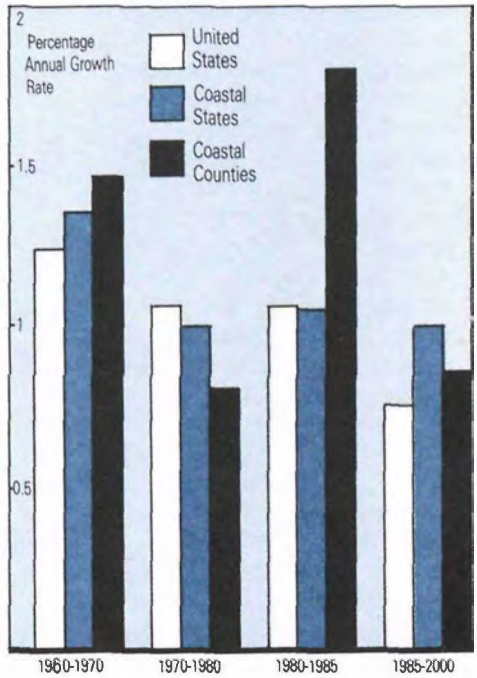
In October 1992, two months after Hurricane Andrew ripped through South Florida, this remark from 1990 has proven prophetic. Hurricanes, storm surges, flooding, and erosion are recurring realities in coastal communities. Major natural disasters, such as Hurricane Hugo in 1989 and Hurricane Andrew this past August, force us to refocus our attention on the human, environmental, and financial ramifications of intense land development in and near coastal wetlands, estuaries, and on coastlines. The rights of property owners are expanding, carrying with that expansion the assumption that environmental protection comes at the expense of job creation and economic development. Preserving the natural functions and values of coastal areas is paramount to enhancing the economic value of the coasts, ensuring the stability of the coastal communities, and sparing all taxpayers the cost of misguided land-development practices.

The most rapid land development and population growth in the United States is occurring near the coasts. According to the 1990 census, 50 percent of Americans currently live within 50 miles of a coast; this number likely will increase to 75 percent by 2010. Moreover, the National Coastal Research Institute (NCRI) estimated in 1991 that coastal recreation and tourism generates $8 to 12 billion annually. In 1985, NCRI estimated that 31.7 percent of the U.S. gross national product (GNP), almost $3 trillion, originated in the 413 coastal counties (including Great Lakes coastal counties).

Much of the land development spurred by the population boom has caused extensive damage on beaches and dunes, and in estuaries and coastal wetlands. This problem, combined with existing threats of sea-level rise, periodic storm damage, shoreline erosion, and declining water quality, poses continuing challenges to coastal resource management.

In many cases, land development in sensitive coastal areas has hampered the ability of beaches, estuaries, and wetlands to perform their natural functions of erosion protection, stormwater management, and pollution control. Development that results in harm to the environment, or that ignores other negative external effects, does not translate into an improved standard of living or better quality of life in the long run. When wetlands are

Annual Population Growth Rates, 1960 - 2000
United States, Coastal States, and Coastal Counties



Source: National Coastal Resources, Research, and Development Institute (1990)

(Morris is a Senior Research Associate at the American Planning Association (APA) in Chicago. She is the author of Wetlands Protection: A Local Government Handbook, *published by EPA and APA in September 1991.)*

Projected population and development growth for U.S. coastal areas means that future natural disasters may cause even more damage than did Hurricane Andrew.

Kathy Willens photo. Wide World.

filled, millions of dollars must be spent to build and improve storm-water retention systems. When estuaries are disturbed, wildlife habitats are lost permanently and pollutants proceed directly into bays and the ocean, where they threaten human safety and the fishing and shellfish industries. When beach-front property is developed, fragile sand dunes and coastal vegetation are destroyed, thus endangering marine life with pollution and sediments from eroded beaches and increasing the likelihood and magnitude of damage to private property from hurricanes and tropical storms. When coasts are developed, expensive devices like seawalls, groins, riprap, and imported sand must be used to protect private property from the inevitable encroachment of erosion and waves.

In other words, current land development patterns in coastal areas are threatening the sustainability of the entire coastal environment. Significant changes in the nature and extent of land development are required if we want future generations to be able to use and enjoy these resources.

While it would be difficult to argue that these areas are underregulated, the question is, Are the regulations working? In the current economic climate, any action that somehow limits land development or business activity will be perceived as "bad" or even anti-American. This makes it incumbent on environmentalists and those who value these areas to make it crystal clear to property owners in coastal areas that ignoring regulations, or fighting their passage, will, in the end, entirely destroy the resource that gave their property value in the first place. Some of the current laws and ordinances—described below—that regulate development in coastal areas offer glimmers of hope that these areas can be saved.

Development in coastal and inland wetlands is regulated by the Clean Water Act's Section 404 permitting procedure. The law establishes a permit program that regulates the discharge of dredged and fill material into wetlands. Most individuals who follow environmental news are aware of the current, long-running debate over the definition of wetlands. The controversy stems from the 1989 federal wetlands delineation manual, which defined wetlands in such a way that even some lands that rarely are wet are wetlands. Because coastal wetlands are usually fully immersed in water or subject to tides, there is not as much debate about their status as wetlands. The wetlands permitting process, however, allows far too many acres of coastal wetlands to be drained and filled for development.

There are other government programs that have greater, albeit limited, success than the Section 404 process in balancing environmental protection and economic vitality in these fragile areas. The goal of many of them is to encourage land development patterns that reduce negative externalities, such as increased storm-water runoff; contamination of ground water, rivers, and bays from nonpoint-source pollution; and erosion of coastlines.

The federal Coastal Zone Management Act (CZMA) of 1972 provides funding to the 32 coastal states (including Great Lakes states) to develop and implement programs for the proper conservation and environmentally sound development of coastal areas. States spend the bulk of CZMA funds on "improving government decision making." The specific activities undertaken by states in this regard have been coordination of permit review and procedures, elimination of duplicative federal

reviews in wetlands projects, and preparation of handbooks to assist property owners. The 1990 CZMA amendments authorized new enhancement grants that are to be based on each state's assessment of its priority needs and the development of multi-year strategies to attain state goals.

A 1990 analysis of the CZMA program by NCRI indicated that each dollar of CZMA funds spent by states was associated with an increase of $25 to $37 in coastal GNP due to coast-dependent activities (e.g., fisheries, off-beach recreation, and shipping), an increase of $1.50 in coastal GNP due to coast-linked activities (e.g., fish processing and marine equipment sales), and an increase of $482 to $650 in coastal GNP due to coastal-service activities (e.g., real estate, retail, and hotels).

Section 320 of the Clean Water Act, established by the 1987 Water Quality Act Amendments, created the National Estuaries Program. The purposes of the program are to identify nationally significant estuaries, protect and improve their water quality, and enhance their living resources. When Congress reconvenes in January 1993, the National Estuary Program is up for reauthorization under H.R. 5070, the Water Pollution Control and Estuary Restoration Financing Act, and its companion bill in the Senate, S. 2831. The program requires that a Comprehensive Conservation and Management Plan be developed by a local or state planning or management agency for each estuary that is participating in the program.

The program can be very effective in implementing a regional solution to protecting estuaries from pollution and preserving wildlife habitat as the following example from Buzzards Bay, Massachusetts, illustrates. However, the effort is limited to only 18 estuaries in the whole country, which means the majority of estuarine areas are still at extreme risk.

A plan for Buzzards Bay estuary off Cape Cod was completed in 1990. A long history of industrial discharge at Buzzards Bay had resulted in highly contaminated sediment. The sediment was so bad that one part of the bay had been designated as a Superfund site and had been closed to fishing and the public since 1979. The plan, now being implemented by the Buzzards Bay Project, serves as a guidance document for local governments on how to implement strategies to protect water quality in the bay.

Specifically, the plan outlines several action plans designed to tackle the causes of nonpoint-source pollution. One goal is to prevent or minimize any new, direct storm-water discharges into the bay from new subdivisions. In the case of one local government, this meant reducing allowable density of single-family homes in a yet-to-be developed area to lots of 70,000 square feet, or a little more than 1.5 acres. The Buzzards Bay project is working with other local governments to implement strategies that limit the number of septic systems and to adopt bylaws that strengthen their wetlands regulatory authority. The plan for Buzzards Bay serves as a model for other organizations participating in the National Estuary Program.

Sustainability in coastal areas requires a modification of our patterns of living, consumption, and land development. The regulations put in place must continue to balance the economic needs of the community and respect the rights of property owners. But policies must also reflect the fact that destruction of wetlands, beaches, and estuaries will—in the long run—cost taxpayers billions of dollars in pollution cleanup, storm damage, and other negative consequences. These billions would not have to be spent if only good planning could minimize the effects of development and allow natural processes to occur. ◊

EPA Environmental Photographic Interpretation Center photo.

Intense development in Miami, Florida. Too often, coastal development brings shoreline erosion and declining water quality.

Linkages and Lifelines

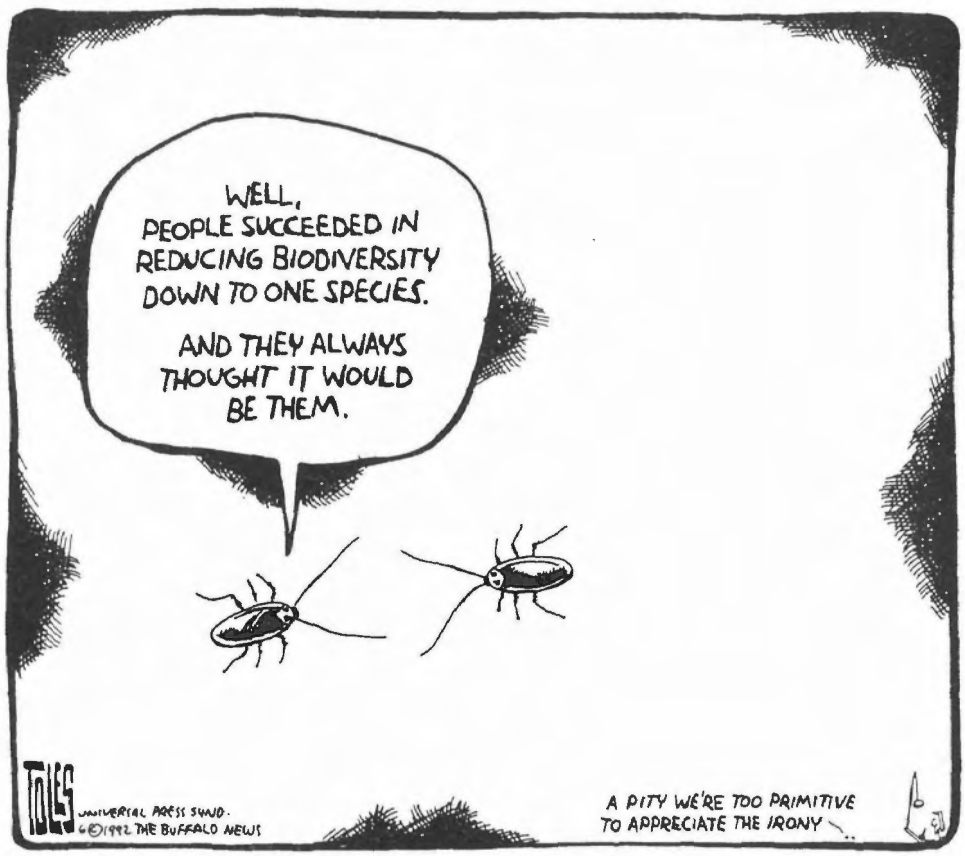
Biodiversity protection requires more than the Endangered Species Act

by Douglass Lea

"There's a whole lot of death out there," remarks an English conservationist as he watches millions of frogs being annihilated by speeding vehicles. An eight-lane motorway had recently been built across a migration route connecting seasonal poles of the frog's traditional habitat, and the consequences were clear: a massive carnage that left the ancient "frog-way" slippery with a shiny soup of crushed amphibians.

On American roads alone, some 100 million wild animals are killed annually. Less dramatic are the steady extinctions of a multitude of obscure flora and fauna, including, at the veiled end of the spectrum, bacteria, fungi, plankton, insects, and mollusks. On a global scale, about 30 million species are thought to exist, and nearly a quarter of them will disappear during the lifetimes of middle-aged human beings.

As the human species spreads into every available niche, wildlife populations become stranded in fragmented islands of habitat, separated from migration routes and normal ranges by roads, fences, dikes, reservoirs, clearcuts, fields of single-crop agriculture, residential developments, and other products of human culture. Often capriciously imposed on the landscape, these overlays of geometry—straight lines, hard edges, acute angles—seldom mirror the natural borders and demands of plant and animal communities. Fragmented habitat



(Lea, a writer and editor, also teaches in American University's Washington Semester Program.)

Agenda 21

"Despite mounting efforts over the past 20 years, the loss of the world's biological diversity, mainly from habitat destruction, over-harvesting, pollution, and the inappropriate introduction of foreign plants and animals, has continued .... Urgent and decisive action is needed to conserve and maintain genes, species and ecosystems, with a view to the sustainable management and use of biological resources ...."

—Chapter 15

isolates these communities, diminishes genetic integrity and viability within species, imperils species that have highly specialized requirements, and encourages exotic and opportunistic species to immigrate and compete for scarce resources.

In the midst of this teeming fertility, pervasive slaughter, and encroaching fragmentation, debate on preserving nature's store of biological diversity, or biodiversity, remains fixed on individual species. Those species with symbolic stature or political utility attract the spotlight. As a result, the stale air of impasse has settled around the re-authorization of the Endangered Species Act, the nation's flagship for guarding biological treasures. Arguments tend to revolve around the costs and benefits of saving illuminated species like the spotted owl, condor, and snail darter.

True biodiversity occupies a more generous realm. It refers to the full sweep of intricate processes within ecological systems, or ecosystems, and habitats. It provides sufficient redundancy for organisms to adapt to the evolution and shocks in their environment and sufficient variety to resist inbreeding within isolated populations. In *The Diversity of Life*, Harvard professor and prize-winning author E.O. Wilson defines biodiversity as "the variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels."

Managing vast arrays of life forms with only the blunt instrument of the Endangered Species Act violates Ashby's Law of Requisite Variety. Derived from cybernetic theory, this law says the repertoire of responses an entity can make to its complexity reflects the complexity of that environment. The Law of Requisite Variety implies that a system of strategic controls within the universe of biodiversity-promoting instrumentalities succeeds insofar as it develops a level of complexity similar to that posed by the universe of threats to biodiversity. In these terms, the federal Endangered Species Act, however important in limited applications, constitutes a clumsy response to the complex dilemmas found in the real world of biodiversity.

Fortunately, the variety of responses to those dilemmas evolves more rapidly than the pace and sophistication of legislative process. On a number of fronts—publications, scientific investigations, community projects, school curricula, litigation, state initiatives—the campaign to save the world's biodiversity is beginning to use a wider assortment of techniques and tactics.

Scientific interest has recently focused on mitigating techniques, especially the wildlife corridor, a variation on "greenways," which have appeared in hundreds of local communities and states. Most greenways are designed for human use and enjoyment—typically, an abandoned railroad right-of-way converted to a recreational trail. Wildlife corridors are reserved for plant and animal communities—either to expand ranges and facilitate migrations or encompass shifting habitats under conditions of rapid environmental change, such as global warming. Wildlife corridors serve as "geneways."

For example, birds that are unable to survive in a shrunken forest reserve are, nevertheless, able to participate fully in the isolated ecosystem by migrating along forest corridors between reserves. When two or more fragments are linked, the whole is greater than the sum of its parts. In a depleted and simplified exosphere, the mandates of sustainable development, raised to an ethical imperative by the Earth Summit in Rio de Janeiro, validate the use of coherent networks of ecological corridors to save what is still pristine, restore what is still retrievable, and connect what is still green. To bind remaining wetlands and wildlife reserves, new restorations and nature development areas, and mediating corridors and buffer zones into an extensive system of linear greenways is to create a biological infrastructure for an entire region or country.

Railroad and highway corridors often have biological as well as recreational values. David Burwell, president of the American Rails-to-Trails Conservancy, learned about the potential of wildlife corridors 15 years ago when he received urgent appeals from an official of the South Dakota Wildlife Federation. "He told me the Milwaukee Road Railroad's proposed abandonment of 600 miles of right-of-way would seriously endanger South Dakota pheasants," Burwell recalls. "More than 90 percent of these birds are hatched in the state's railroad and highway corridors. The rest of their habitat has long since been plowed under."

Similar benefits are provided by natural corridors that have suffered relatively little from human occupation or manipulation. In the Southeast, the private purchase of the Pinhook Swamp puts migrating bears out of harm's way and ensures that other plants and wildlife can move freely along a 15-mile corridor between Osceola National Forest in Florida and Okefenookee National Wildlife Refuge in Georgia.

Biodiversity has recently achieved standing on its own merits. In *Marble Mountain Audubon v. Rice*, the Ninth U.S. Circuit Court of Appeals held in September 1990, that a U.S. Forest Service Proposal to log the 3,325-acre Grider Creek watershed had failed to consider its impact on animals using a five-mile-wide corridor between two wilderness areas situated 16 miles apart

in northern California's Klamath National Forest. Nathaniel Lawrence, a lawyer for the Natural Resources Defense Council, emphasizes that he argued the case "strictly on the grounds of using corridors to maintain biological diversity and intentionally ignored the menace to threatened and endangered species." This case, in short, transports biodiversity beyond the policy gridlocks forming around the Endangered Species Act.

Meanwhile, bioregionalism, a concept long marginalized at the fringe of the environmental movement, has recently moved to the very center of the biodiversity debate. A California program called Natural Communities Conservation Planning (NCCP) aims to protect critical habitat "before it becomes so fragmented or degraded by development and other use" that its species require listing under an endangered-species program. The program is designed to save critical habitat and, at the same time, allow "reasonable" economic activity and development on affected land, much of which is privately owned. The first NCCP pilot program targets the Coastal Sage Scrub ecosystem, which extends from the Mexican border up the Pacific Coast to Ventura County. Harboring the California gnatcatcher and some 50 other threatened species, this ecosystem demonstrates the advantages of multi-species protection. NCCP's innovations lie in the program's holistic approach to biodiversity and its anticipatory bias—that is, its attempt to stop incipient problems before they become acute and require institutionalized responses.

Jimmy Walker photo.

Wildlife can migrate freely through the Pinhook Swamp natural corridor, which runs between Osceola National Forest in Florida and Okefenokee National Wildlife Refuge in Georgia.

Experiments in protecting biodiversity find sturdy underpinnings in a growing library of scholarship on the subject and in an expanding number of students learning the principles of conservation biology and landscape ecology. In addition to E.O. Wilson's volumes, the library now includes significant contributions from a wide range of experts, many of whom can be sampled in *Landscape Linkages and Biodiversity*, published in 1991 by Defenders of Wildlife. A comprehensive textbook, *Landscape Ecology* by Richard T.T. Forman and Michel Godron, has been available since 1986. Biodiversity experts have also formed the International Association for Landscape Ecology. Followers of this discipline perform "gap analyses" to generate digital maps that identify both species-rich areas and other ecosystems inadequately protected by existing reserves.

As the frog massacre on the British motorway demonstrates, many species—not just those officially inscribed as endangered species—are now extremely vulnerable. They are at risk from depletion of stratospheric ozone, enormous growth in human populations and economic activity, global warming, droughts, fires, pollution, disease, and other environmental shocks. British authorities, realizing that biological systems require margins of safety, finally tunneled under the motorway to reconstitute the ancient "frogway." Thanks to enlightened management, the frogs are safe again, and their critical role in the maintenance of biological diversity continues. ◊

Great Water Bodies at a Watershed

Pollution prevention and a regional approach are needed

by Wesley Marx

You might not think that two Pennsylvania farmers could help watermen in the Chesapeake Bay harvest more shellfish. But Joe and David Garber, by carefully applying fertilizer to their Spring Lawn Farm, are helping to demonstrate how we can achieve sustainable use of our great water bodies.

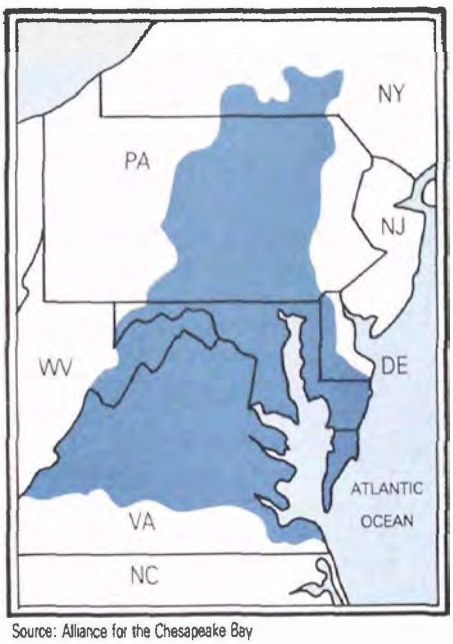
The goal of sustainable use is critical. From generation to generation, our bays and coastal waters have provided an economy and a way of life for millions of people. They have helped to enrich our lives and to define the communities in which we live. Who can imagine a Baltimore without Chesapeake Bay, a Seattle without Puget Sound, a Chicago without Lake Michigan?

However, when we use our great water bodies as cheap all-purpose dumps, we can wind up with shellfish quarantines, seafood health advisories, and closed summer beaches. Nationwide, there are 2,100 health advisories for fish contaminated by toxic chemicals, according to a 1991 National Academy of Sciences report, *Seafood Safety*. Overfishing, development, and pollution threaten "to destroy the harvest of wild shellfish ... throughout the nation's coastal areas," according to a 1990 report by the National Oceanic and Atmospheric Administration. Salmon runs in California and the Pacific Northwest are in serious decline as upstream dams and canals divert river flows. Our great water bodies can become, in the words of the accountants, "non-performing assets."

To keep our great water bodies fit to perform, we have invested funds in the last two decades to clean up discharges from our sewage treatment plants. However, as the Chesapeake Bay region has learned, controlling pollution at the "end of the pipe" is not enough to ensure the goal of sustainable use. Progress in cleaning up sewage discharges has been offset by the occurrence of slimy algal blooms in the bay. These dense, greenish blooms cut off light to critical seagrass beds or submerged aquatic vegetation. The blooms, as they decay, deplete life-giving dissolved oxygen for finfish. Nutrient-rich loads of nitrogen and phosphorous feed these destructive blooms. Phosphate detergent bans and nutrient removal in sewage plants will not suffice to roll back these destructive blooms, which are nurtured by livestock wastes and farm fertilizers from the vast bay watershed. More than a decade ago, scientists warned that the bay would continue to deteriorate without controls on nonpoint sources of pollution in the watershed.

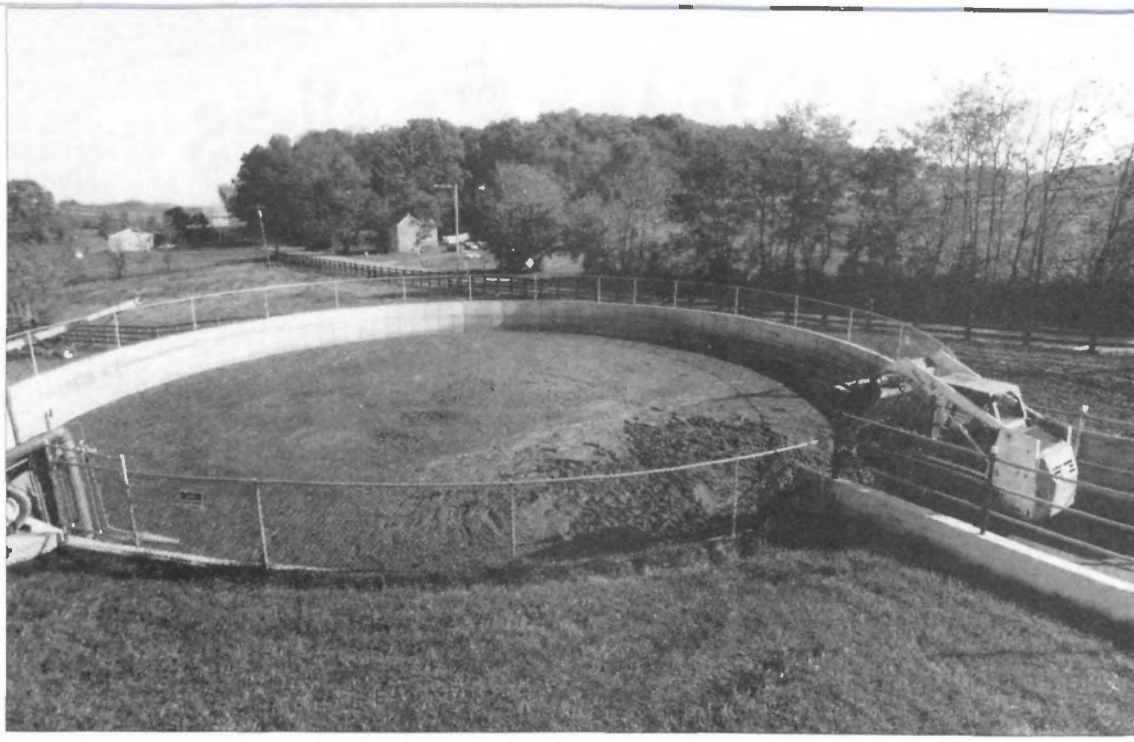
Today, the Chesapeake Bay region is undertaking the critical transition from "end of the pipe" controls to a watershed approach that embraces all the impacts that converge on a water body. Prompted by pressure from the Chesapeake Bay Foundation and other citizen groups, the governments of Pennsylvania, Maryland, Virginia, and

Chesapeake Bay Drainage Area



Source: Alliance for the Chesapeake Bay

(Marx is the author of The Frail Ocean: A Blueprint for Change in the 1990s and Beyond *(The Globe Pequot Press, 1991). He served on National Research Council panels on marine monitoring and on coastal science and policy.)*



Manure is held in a waste management facility on a demonstration farm in the Chesapeake Bay watershed. By enabling farmers to apply manure only as needed at optimum times, the facility helps prevent excess runoff.

Tim McCabe photo. USDA, Soil Conservation Service

the District of Columbia, in partnership with EPA, signed an agreement in 1987 to cut nutrient loads to the bay by 40 percent by the year 2000. Pennsylvania provides technical and financial aid to farmers like the Garbers who develop nutrient management plans to minimize runoff of manure and artificial fertilizers.

Maryland is working to enlist virtually every citizen in the bay cleanup. To help reduce soil erosion to the bay, thousands of Marylanders planted 1.4 million trees during Earth Month in 1991. To help companies reduce toxic discharges to the bay, the state sponsors special workshops on how to change to environmentally compatible manufacturing processes. To help fund such efforts, more than 300,000 citizens bought special "Treasure the Chesapeake" vehicle license plates.

Is the bay saved? Hardly. Its world-famous oyster population is seriously depleted. Nitrogen levels remain too high. Phosphorous levels are dropping and some seagrass beds are recovering, but even this progress may be offset if another impact converging on our coastal regions is not controlled. The bay watershed population will grow 20 percent by 2020, and a recent report notes "unmanaged new growth has the potential to erase any progress made in bay improvements, overwhelming past and current efforts." Environmental groups are closely scrutinizing new development proposals. Maryland and Virginia have both established commissions to recommend growth management strategies. Clearly, achieving the goal of sustainable use for the bay is not going to be an easy victory. But by shifting to a watershed approach, the bay region has given itself the *opportunity* to achieve this goal.

To be effective, the watershed approach also must take into account what is happening in the air above. Up to 30 percent of the nitrogen loads in the Chesapeake Bay is aerial fallout from regional smokestack and auto exhaust emissions. Nearly 90 percent of the toxic PCBs that enter Lake Superior and make large lake trout unsafe to eat comes from aerial fallout. International agreements may be needed to control this aerial assault. While DDT cannot be used in the United States, this persistent toxin continues to enter the Great Lakes system because of airborne sources as far away as Mexico.

Coupling the watershed approach with the concept of pollution prevention can yield economic as well as environmental benefits. By shifting to reducing pollution at the front end, we can reduce the need to build bigger sewage plants, larger landfills, and taller smokestacks. Pollution prevention can make economic sense to farmers and manufacturers as well. In Wisconsin, Green Bay Packaging, Inc., finds it is more cost effective to recycle its wastewater than to meet increasingly strict discharge standards to the Lower Fox River. In learning to reduce fertilizer runoff, farmers in Pennsylvania have discovered that they have been applying more fertilizer than their fields can absorb. "By applying less, the farmers can save both money and our waterways," notes Victor Funk of Pennsylvania's Bureau of Soil and Water Conservation. By shifting to water conservation, drip irrigation, and wastewater recycling, cities and farming communities in California can reduce the need to divert river flows from salmon rivers.

A watershed approach must be able to bridge traditional political boundaries and foster interagency coordination. To do this, Congress directed EPA to form the National Estuary Program (NEP). An estuarine region can use an NEP grant to fund a broad-based management conference and develop a Comprehensive Conservation and Management Program (CCMP). So far, EPA has designated 18 estuaries for the NEP. In 1991, Puget Sound was the first region to have its CCMP approved by EPA. One priority goal: stepped up control

of nonpoint pollution sources responsible for closing some 40 percent of the sound's commercial shellfish beds. By treating storm runoff and expanding its chemical source control program, one paper mill in Tacoma, Washington, is eliminating more than one million pounds of potential chemical pollutants each year.

The CCMP for the San Francisco Bay and Delta system envisions a major recovery of salmon runs and freshwater wetlands—but only if standards are adopted to ensure adequate freshwater inflows to the estuary ecosystem. EPA has stated its intent to set such standards if California does not act by 1993. In 1992, Congress passed a bill supported by the Bay Institute and other environmental groups that requires the federal Bureau of Reclamation to help restore salmon runs damaged by its dam projects in California.

Rimmed by wetlands, seagrass beds, and mangrove forests, the Gulf of Mexico sustains 40 percent of the nation's commercial fish catch by volume. However, severe pollution and habitat loss are now overtaking this magnificent water body. Nearly 60 percent of the shellfish beds are subject to repeated health closures. Under the Gulf of Mexico Program, the five Gulf of Mexico states are cooperating with EPA to develop regional action agendas for nutrient loads, habitat loss, toxics, marine debris, and public health threats. The Soil Conservation Service has established a plant center at Golden Meadows, Louisiana, to supply wetlands plants to community groups working to restore coastal wetlands.

Eventually, much of the continental United States will have to cooperate if these initiatives are to succeed. The Mississippi River, which empties into the gulf, drains two-thirds of the continental United States. Nutrients in the massive river discharge trigger oxygen-depressing blooms in the gulf and contribute to a 3,000-square-mile "dead zone" off the coast of Louisiana and Texas. To help mobilize the broad public support that will be needed to protect the gulf from such piecemeal destruction, Congress designated 1992 as the "Year of the Gulf of Mexico."

Given the current budget crunch at all levels of government, there will be a temptation to stint on protection of our great water bodies. However, such "savings" will be illusory. The marine fishing industries, both seafood and recreation, contribute more than $24 billion annually to the U.S. economy, according to the National Marine Fisheries Service. The more fishing grounds we lose to pollution, habitat loss, and uncontrolled growth, the more jobs and businesses we jeopardize.

By managing our water bodies for sustainable use, we can restore jobs and business opportunities while reducing the current need to import half of our seafood supply. Native Americans learned how to use salmon and other living marine resources without depriving their children of the same opportunity. We must provide the same opportunity to our children. Says Bill Frank, Jr., chairman of the Northwest Indian Fisheries Commission in Washington: "Care for nature, for without her your children will not survive." ◊

A birdwatcher looks out over Tennison Bay at Fish Creek, Wisconsin. Our major water bodies enrich the lives of millions.

An Urgent Agenda

Nongovernmental organizations must reexamine programs and priorities

by John Adams

The United Nations Conference on Environment and Development in Rio last June changed history. For those of us in public interest groups who work for environmental protection in the United States, it changed the entire context of our work and it changed fundamental ground rules.

Sustainable development is an ideal that many of us have cherished for a very long time. Now that the largest gathering of heads of state in history has confirmed a need that we saw all along, it would be easy for us simply to congratulate ourselves. But Rio is far from being merely a cause for celebration. It also conferred responsibility—the responsibility to live up to ideals that we ourselves promoted, and the responsibility to make sure this new international agreement becomes a real commitment instead of only words on paper.

Rio set a new standard by which the work of U.S. environmental organizations should be measured. We must all reexamine our programs and priorities in light of the ideals of Rio and ask whether we are in fact doing our utmost to achieve a sustainable society in this country.

(Adams is Executive Director of the Natural Resources Defense Council, a national environmental advocacy organization headquartered in New York City.)

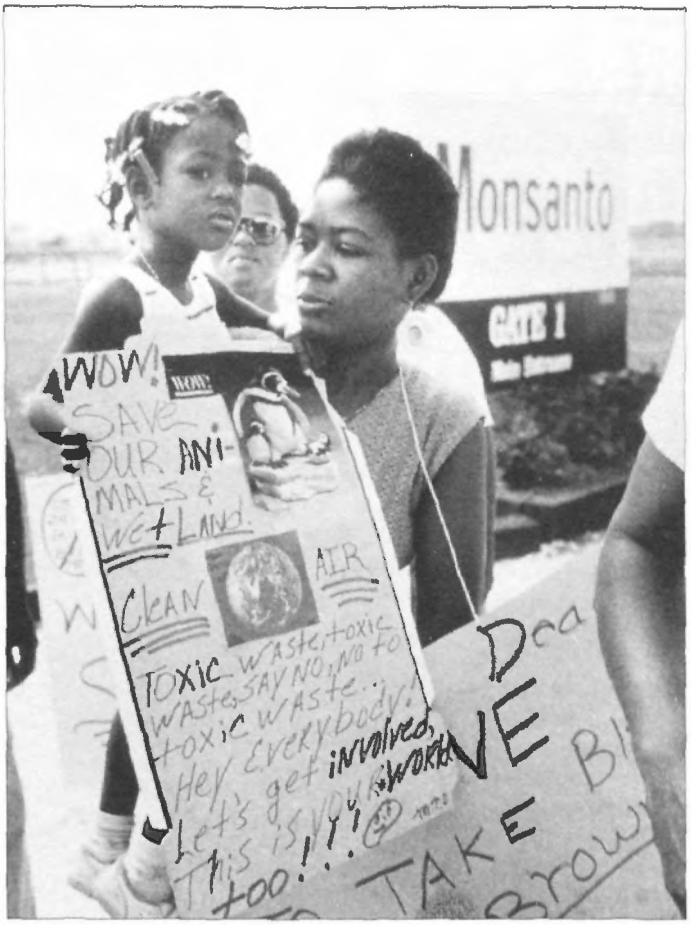
First, there is choice of priorities. Rio forces us to ask hard questions. Are we in fact devoting our resources to the primary problems obstructing sustainability in the United States? Are we setting goals that we could defend before the assembled delegates of Rio and the nongovernmental organizations that participated? Could we defend them not just as important local concerns or as issues that we have traditionally addressed, but as priorities of global significance?

The cardinal global problems are the greenhouse effect, loss of species and habitat, and imbalance of population and resource consumption. The United States bears special responsibility in each of these areas. We are the primary emitter of greenhouse gases, with an average per capita energy consumption many times that of the nations of the Southern Hemisphere. We criticize the destruction of tropical forests and loss of tropical species, but we have destroyed all but 5 percent of the original forest cover of the 48 coterminous states, and we continue to drive countless ecosystems towards extinction. And we cannot in good faith ask the nations of the South to engage in family planning if we remain unwilling to address the other side of the coin, our own grossly outsized rate of resource consumption.

Unless the U.S. environmental community devotes substantial resources to these problems, in a deliberate program focused on creating a sustainable society, we cannot claim to be meeting the standard we ourselves helped set at Rio. It is our task to push the envelope by creating far-reaching solutions. We need to continue our work on energy-efficiency incentives, but we also need to secure a carbon dioxide tax. We need to preserve the Endangered Species Act, but also to move beyond it with large-scale ecological planning. We need to keep promoting recycling, but also to change the most basic attitudes towards resources of all kinds in this country, so that cleaner and cleaner technologies are developed and waste becomes taboo.

To reach goals like these, we must do more than work on issues one by one. The U.S. government has formally committed itself to sustainable development. It is up to us in the environmental public interest community to make sure that this phrase, which is so poorly defined, is made specific and applied to every area of governmental activity and government-regulated activity.

We must work for the creation of a federal mechanism with broad authority to review U.S. obligations under Agenda 21. The United States is the leading international proponent of a free market system, yet we have never faced up to the fact that at home we provide heavy subsidies for massively destructive practices.



For some participants, the cultural diversity of the Rio conference highlighted environmental equity concerns back home.
Copyright, Sam Kittner photo.

At a minimum, sustainable development implies an end to government subsidies for overgrazing livestock on public lands, for cutting ancient forests, for supplying water far below cost so that agribusiness can grow monsoon crops in the desert, and for many other federal practices that are degrading our natural resources past the point of no return. It implies a different way of figuring the gross national product of this country, one that takes account of the state of the natural resources that fuel growth. Environmental groups must move this country—both its government and its people—to come to grips with these issues, or the U.S. commitment to sustainable development will never be realized in any degree.

Second, Rio demands that those of us in the established U.S. environmental groups examine our relations with communities of color in this country. If any single lesson emerged clearly from the range and the strength of the groups that participated at Rio, it was that nongovernmental organizations of the North and South must work hand in hand, communicating with each other as equals and following an agenda that both determine together. Until we can do this, we will not have a world environmental movement, and we will not be able to craft genuine solutions to world environmental problems.

The same lesson applies inside this country. We in the mainstream environmental movement are still overwhelmingly European-American in our staffs and boards, and our work suffers from our lack of diversity. We need to seek out organizations of people of color as partners, draw on their expertise and their ideas to help shape our agendas, and stay in constant communication with them. "Sustainability" in this country must mean sustainability for everyone—so that the toxic burdens of industrial waste are not concentrated disproportionately in communities of color and the poor—or it will be only a facade.

Finally, there is the Sustainable Development Commission, the new United Nations body approved at Rio. If the resolutions of Rio are to have any force at all, it will be because of this commission. Such a commission provides a tremendous opportunity and challenge for all of us to help realign the world's powers, so that they come to recognize the need to work for sustainable development and to resolve contentious global resource issues through peaceful negotiation. We need a commission with a sweeping mandate, empowered to monitor the implementation of Agenda 21 by international organizations and national governments, including the United States. We need a commission that can oversee the treaties signed at Rio and watch over trends in global environmental health. Such a commission will require an independent professional staff, expert advisory bodies that include nongovernmental and governmental experts, and the staff and funding for on-the-ground fact-finding capability.

We in the U.S. public interest community have an overriding responsibility to follow every step as the Sustainable Development Commission is created and to pressure the federal government with every means of persuasion at our disposal. We must convince U.S. policy makers to back a strong mandate and substantial resources for the commission. Moreover, it will be important to make the United States' first report to the commission a model for other countries; not simply a reworking of the annual Council on Environmental Quality report, but a serious, cross-sector review of U.S. laws and policies with substantial input from the public. One delegate to Rio, initially skeptical about the potential of the commission, later commented that it would be the nongovernmental organizations of the world that would "breathe life into it." That responsibility begins now.

There were many disappointments at Rio: the weakness of the global warming treaty, the failure of the United States to sign the biodiversity treaty, and the failure to take strong action to address population pressures, Third World debt, and resource consumption in the developed world. But the most disappointing prospect, the greatest fear of all, is that the potential to build on the true achievements of the Earth Summit may be lost—that the follow-up will be all talk and no action. We in the public interest community must strive to show the world how to live by the commitments made at Rio. ◊

Sustainability and People of Color

Will America's underdeveloped places benefit in the post-Rio world?

by Mencer Donahue Edwards

There have been few times when the United States has engaged in imagining "a better future" that Americans of color have not participated, often as leaders. Therefore, it should surprise no one to know that a handful of Americans of color were at the Earth Summit talking about sustainable development—abroad and back home.

However, it may surprise some people to know that a key reason why people of color may enthusiastically embrace sustainable development is because they hope it is a new road that will lead to an old objective—a United States of America transformed by the guiding principles of freedom, justice, and equality.

Cora Tucker, chair of Grassroots Leadership in Halifax, Virginia, articulated the meaning of this hope when she was in Rio. Speaking to the press, Ms. Tucker opined, "People talk about what's going on around the world. The same exact thing [goes on in America]. There are so many underdeveloped places in America, a so-called developed country."

(Edwards is the Executive Director of The Panos Institute, a development information organization providing information resources on issues of sustainable development throughout the Americas.)

It is their clear recognition of the need for "a better future" at home that makes it likely that African, Latino, Asian, and Native American voices will continue to be lifted whenever movement toward sustainable development takes place.

There is much that these voices contribute to the public discourse slowly evolving on this subject. At a minimum, "sustainability" will need to reflect axioms which are common to the experiences and aspirations of communities of color across the United States, such as the following.

Sustainable development in the United States must occur uniformly. The challenge will need to be met in Des Moines and East Los Angeles ....

First, there can be no sustainable development in the United States without a sustained commitment to social justice. The historical processes that culminated most recently in the destruction of south central Los Angeles powerfully and simultaneously communicated the absence of—and the need for—justice and sustainable development in this country.

For people of color, the potential benefits of sustainable development to their communities, such as new industry, improved infrastructure, and increased educational opportunity, is sufficient reason to once again engage in diverse political, ethical, spiritual, economic, and social discourse with white Americans. Such discourse could help diminish the racial, gender, and economic polarization which now deeply divides our nation.

Second, ecologically sound and socially equitable development at home requires a transformation of the current operating paradigm, which juxtaposes economic development against environmental protection. Delegates to the First National People of Color Environmental Leadership Summit adopted a preamble pledging to

> re-establish our spiritual interdependence to the sacredness of our Mother Earth; to respect and celebrate each of our cultures, languages, and beliefs about the natural world and our roles in healing ourselves; to insure environmental justice; to promote economic alternatives which would contribute to the development of environmentally

safe livelihoods; and to secure our social, political, and cultural liberation ....

In doing so, they replaced traditional, narrowly defined environment and development issues with a comprehensive social agenda rendered as community development, self-determination, and economic, social, and political rights issues.

Third, sustainable development in the United States must occur uniformly. The challenge will need to be met in Des Moines and East Los Angeles, in Indianapolis and East St. Louis, in Seattle and Philadelphia. People of color know well that the benefits of grand ideas have too often skipped over their neighborhoods and barrios.

Agenda 21

"One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound and sustainable development is the need to activate a sense of common purpose on behalf of all sectors of society ...."

—*Chapter 27*

Even the ashes of south central Los Angeles were unable to launch strong policies and programs to support the spread and advance of sustainable urban and rural communities in the United States.

Finally, it will not be credible to promote sustainable development in the United States and block it in the developing world. Nonsustainable development in the rest of the world is felt throughout our country, but it is felt most powerfully in communities of color. People who flee nonsustainability in the developing world usually are incorporated into U.S. communities of color, thereby increasing the high level of vulnerability that already exists in those communities. The impact of the development struggles of countries like Haiti, Guatemala, Somalia, South Africa, Iraq, and Vietnam inside the United States is representative of America's global interdependence.

It is said that the 21st century began in Rio in June 1992. If it did, will it be a better century for all U.S. citizens than the 20th? If there is going to be sustainable development in the United States, is it going to be for everybody, or for just one race, one gender, and one class?

This is the future-focused challenge people of color continue to offer the United States. America may be able to avoid sustainable development and still enter the 21st century. The question is how will America enter the 21st century but avoid more meltdowns like Los Angeles? ◊

Will social justice be part of the drive for sustainable development? If so, the future might bring less of the frustration that caused the destruction of south central Los Angeles.

Douglas Pizac photo. Wide World.

Greening at the Grassroots

What polls say about Americans' environmental commitment

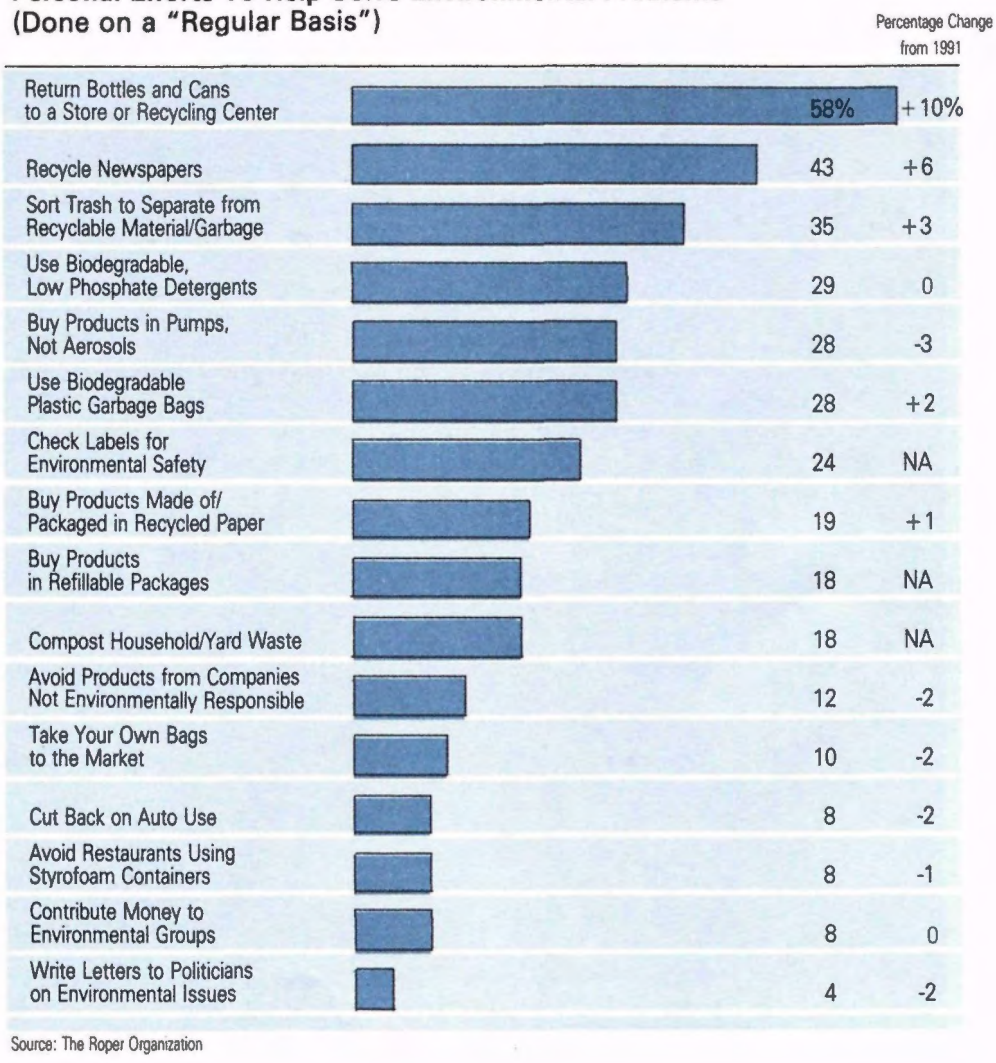
by Frederick Allen
and Gregg Sekscienski

Are Americans really becoming "green" or are they just talking "green"? What do they expect of business? Do they believe the country can strike a balance between environmentalism and economic development?

A look at some recent polling information from The Roper Organization, compiled from respondents' answers to multiple choice questions, reveals some trends.

Individuals and the environment. Americans are more concerned about the environment than many other "traditional" issues. When asked recently what they believe to be a "good description of the American people," the leading description was "concerned about the environment," ahead of "loyal to country," "strong sense of family," "friendly," and "strong religious beliefs."

An increasing proportion of individuals are trying to carry this attribute over into their personal lives. Another 1992 poll shows that 58 percent of Americans say they return beer or soda bottles or cans to stores or recycling centers on a regular basis. Just three years ago, only 41 percent claimed they did it on a regular basis. Forty-three percent recycle newspapers regularly (up from 20 percent three



Source: The Roper Organization

(Allen is Senior Policy Advisor to the Assistant Administrator for Policy, Planning and Evaluation at EPA. Sekscienski is an Assistant Editor for EPA Journal.)

years ago), and 35 percent sort their garbage (up from 14 percent). Twelve percent avoid products from companies they feel aren't environmentally responsible, a proportion that has held steady since 1989.

Business and the environment. The surveys also indicate that Americans want companies to show more environmental concern. Seventy percent say businesses have a definite responsibility toward environmental protection, yet only 35 percent of Americans feel businesses are fulfilling that responsibility fully or fairly well.

In fact, Americans feel that business' environmental performance is dropping. Fifty-seven percent of those polled in 1991 said business activities have worsened pollution problems compared to 50 percent in 1983 and 47 percent in 1974. In contrast, 19 percent of those polled in 1991 felt business activities have helped reduce pollution problems, compared to 26 percent in 1983 and 28 percent in 1974.

Many Americans also seem to question the environmental claims that many businesses make. Forty-two percent of the public thinks manufacturers make misleading or exaggerated claims about environmental benefits "fairly often" and another 24 percent thinks they do it "very often"—only 5 percent say almost never, and 22 percent "not very often."

The economy and the environment. Are the economy and the environment necessarily at odds? Nearly two-thirds (63 percent) say that the environment and economic development "can go hand in hand," while only a quarter (25 percent) say we must choose between them.

Moreover, 92 percent of those polled agree with the statement, "We can find a good balance between economic progress and the environment." When a choice is necessary, 64 percent say environmental protection is more important, while 17 percent say economic development is more important; 13 percent say, "It depends." At the same time, nearly equal numbers agreed and disagreed with the statement that, "The 1990s is the last decade when environmental catastrophe can be prevented."

Americans are concerned about the environment. They are taking more personal responsibility for the environment and doing more on a personal basis than they have before. No longer is the environment simply a problem for others to solve. At the same time they are holding business to a higher standard than before. Fortunately, there is optimism that the concerns of the environment and the economy can be balanced. But for many Americans, this optimism is tempered by a sense of urgency. ◊

What's a Person to Do?

by Dana Duxbury

Sustainable development appears at first to be a complex national or international concept, a way of thinking that could result in nations managing resources so efficiently and sensitively that the resources are able to sustain both a strong economic and environmental base. Yet, we all, on an individual basis, can contribute to sustainable development. How? By conserving resources and reducing the toxicity of what we buy, use, and throw away. Our goal should be to leave no footprints on the Earth as a result of what we do in our own homes and workplaces.

Some question whether sustainable development is attainable. The more I think about the concept, the more I realize that we will not survive on this planet without respecting its limits. Today, greed propels choices, and short-term decisions are made that have dire long-term results. We should be guided by the African proverb: "Treat the Earth well. It was not given to you by your parents. It was loaned to you by your children."

As a start, each one of us can work toward sustainable development by taking the following steps:

•Set a reasonable temperature for home heating and cooling. Install more insulation, keep furnaces in good repair, and change furnace filters. Turn off lights when not in use and change to compact fluorescent light bulbs. Encourage the development of bike paths and car pool lanes, support mass transit, and help educate the public on the importance of well maintained and energy efficient vehicles.

•Use water conservation devices for toilets and showers, and buy native plants that require little water. Fix dripping faucets and restrict lawn watering and car washing. Also, support moves to price water at its true or replacement value and to set up ground-water and watershed protection programs. To protect the quality of ground and surface waters, carefully monitor what is poured down the drain.

•Purchase products that are repairable, reusable, durable, and made with a minimal amount of materials (including packaging). Participate in recycling programs, purchase products made of recycled content, and compost kitchen and yard waste.

•Look for alternatives to hazardous products such as oven and drain cleaners. If the hazardous products are needed, buy only what you need, use them according to label instructions, and use them up before taking them to a household hazardous waste collection program.

•Use non-hazardous products or alternative methods, such as beneficial insects or integrated pest management practices, on your land. If you do use pesticides, use as little as possible.

(Duxbury is an environmental consultant and founder of Dana Duxbury & Associates, which provides policy, educational, research, and facilitation consulting services on solid and hazardous waste management issues to government, industry, and public interest groups.)

A Skeptical Twist

Look to the marketplace for sustainable solutions

by Jane S. Shaw
and Richard L. Stroup

Achieving the goal of sustainable development does not require legislatively imposed changes in technology or lifestyles in the United States. Rather, the path to sustainable development lies in preserving the institutions that have led to economic growth, because economic growth improves human health and environmental quality.

In its broad definition, sustainable development is economic development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. This is a goal that all welcome.

But many people mistakenly believe that "meeting the needs of future generations" means providing future generations with exactly the same natural resource base we have today. Thus, their recommendations tend to focus on, for example, preventing resource use. While there is nothing inherently wrong with developing energy-efficient lights and energy-efficient refrigerators, forcing such innovations when they do not make economic sense will most often be wasteful and counterproductive.

(Shaw and Stroup are Senior Associates of the Political Economy Research Center in Bozeman, Montana. Stroup also is Professor of Economics at Montana State University.)

The Western World has a remarkably safe and attractive environment, especially compared with the Third World and socialist nations. Our system of property rights and decisions made mainly in a market setting, with the wealth that it has produced, is largely responsible for that success.

By most available measures, the air and water in the United States are cleaner than they were a few decades ago. Although we have cities that suffer from air pollution, most violate national standards only a few days a year, and they are far cleaner than cities, such as Mexico City, in the less developed world. We have more acres of forest in the United States than we did in 1920, according to Resources for the Future, a Washington, DC, research organization specializing in the study of natural resources. Life expectancy at birth here is 76 years, compared with 47 at the turn of the century. The World Bank's *World Development Report 1992* reveals significant environmental improvement in the industrialized nations since 1970. For example, particulate emissions in industrialized countries have declined by 60 percent and sulfur oxides by 38 percent.

The road to sustainable development is to let the forces that have worked well continue to work.

Environmental problems do exist, both in our nation and in the rest of the world. But in the United States, the environmental problems most people fear are such things as hazardous waste, global warming, ozone depletion, and toxic air pollutants. While these are legitimate concerns, they must be put into perspective. Not one of these threats has been shown to harm the general population. In contrast, the environmental problems in the Third World are often deadly. For example, there is widespread disease from lack of clean drinking water and refrigeration, and soil erosion and depletion are common.

A persistent fear is that development cannot be sustained because nonrenewable resources such as oil and precious metals will be used up. But history tells us otherwise. To our knowledge, the world has never run out of a nonrenewable resource, and there are no signs that it is doing so now. The World Bank's *World Development Report 1992* helps explain why. It points out that as metals prices rose in the 1970s, people began conserving metals and switching to other materials. Fiber optics replaced copper in telecommunications; coatings

of tin, nickel, and zinc were used more sparingly; aluminum and other materials were recycled. In sum, "many nonrenewables have become more, rather than less, abundant."

It has always been this way in market-based economies. At the end of the 19th century, the demand for cleared farmland and for wood led to fears of a "timber famine." But as the price of wood rose, people found substitutes. For example, the railroads, one of the biggest customers for timber, developed steel ties and bridges to replace wooden ones, and designed them to last longer. The "timber famine" went away.

The first recorded doomsday forecast was probably in the 15th century, when the heavy use of wood for charcoal in England led to predictions that the forests would disappear. Instead, people began using coal. In 1865, a prominent economist, William Jevons, feared coal depletion: "The conclusion is inevitable that our present happy progressive condition is a thing of limited duration." But he was wrong. Thanks partly to the discovery of oil, coal is plentiful today.

Market-based economies have a natural incentive to reduce the consumption of raw materials: the profit motive. Early beverage cans, for example, used a lot of metal. In 1965, the production of 1,000 beverage cans required 164 pounds of metal, most of it steel. But by 1990, the cans required only 35 pounds of metal, mostly aluminum—a 78 percent reduction. This reduction reflected both the switch to a lighter-weight metal, aluminum, and a reduction in the amount of aluminum used. Competition, not government edicts, spurred the companies to use less raw material.

Such competition and efficiency are not found in economies where markets are replaced by government decision making. In his book *The Wealth of Nations and the Environment*, Mikhail Bernstam reports that socialist economies use more than three times as much steel per unit of output as market economies do. And market economies use only 37 percent as much energy as do the socialist nations to produce $1,000 worth of product.

Pollution tends to fall in capitalistic economies. In fact, although the data are sparse, it appears that air pollution in the United States was declining faster before the Clean Air Act took

Earl Dotter photo.

Critics say the government's price support policies encourage farmers to use pesticides excessively.

effect than afterwards, according to a Brookings Institution report. Why? Most pollution is waste. Smoke is often unburnt fuel, and profit-making companies try to save fuel by reducing pollution. An early measure of particulate density in exhaust plumes, the Ringelmann number, was developed by engineers to save diesel fuel.

But demand for environmental quality also is critical. Economic growth itself spurs this demand. Until they have food on their tables, most people will not concern themselves with the view from their windows. Only after they have basic sanitation will they be concerned about keeping streams and lakes pristine. In the United States today, people are wealthy enough to willingly pay higher taxes and higher prices for goods, if necessary, to keep the environment clean. In other parts of the world, people are too poor to demand the same level of environmental amenities.

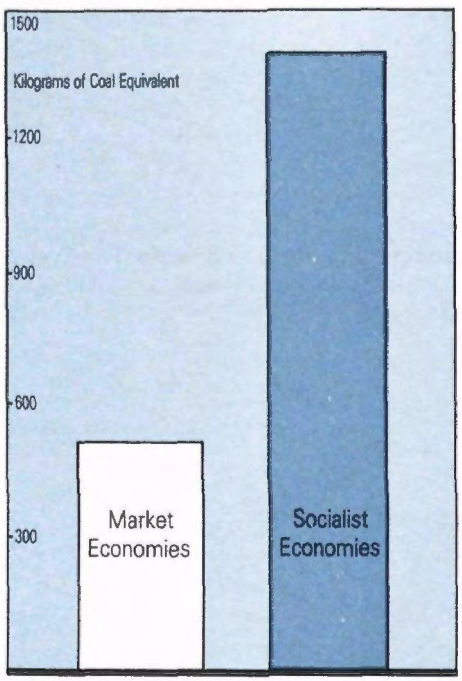
A study by Gene Grossman and Alan Krueger of Princeton University is consistent with other studies in suggesting that at low levels of income, economic growth puts initial stress on the environment, but after a certain level of wealth is reached the environment begins to improve. Using World Health Organization data, they compared levels of particulates and sulfur dioxide pollution with levels of income. They found that pollution began to decline when per capita income reached between $4,000 and $5,000 (in 1985 dollars).

Another reason for our improved environment is that our system of common law helps to stop pollution, which is an invasion of person or property just as a personal assault is. Historically, a person suffering demonstrable harm from pollution had the right (and the incentive) to demand that damages be paid or that the pollution be stopped.

While common law protection was not complete, new research conducted at Clemson University and the Political Economy Research Center by Roger Meiners and Bruce Yandle is revealing that it did put significant limits on environmental harm. Common law protection largely has been replaced by statutory laws such as the Clean Air Act and the Clean Water Act, which require the diversion of hundreds of billions of dollars' worth of resources each year to fight pollution. It is not clear whether or not this approach is more effective.

By and large, Western countries with market-based economies have been good stewards of their environments. They have not been perfect, of course. Today, environmentalists decry the 19th century logging of the forests around the Great Lakes, even though many of the forests have grown back. But people were poorer then. They wanted to use trees and clear land more than they wanted scenic beauty. As Americans' wealth grew (partly because they used the timber and cleared the land), their attitudes changed and the environment improved.

Energy Use Per $1,000 of Gross National Product (1986)



Note: Energy consumption was measured in kilograms of coal equivalent. Market economies were the United States, Canada, Japan, United Kingdom, West Germany, France, Belgium, Switzerland, Austria, Denmark, Sweden, and South Korea. Socialist economies were the USSR, Czechoslovakia, East Germany, Hungary, Poland, Romania, and North Korea.

Source: *The Wealth of Nations and the Environment* by Mikhail Bernstain (Institute of Economic Affairs, 1991)

In our view, then, the road to sustainable development is to let the forces that have worked well continue to work. We also should eliminate laws that stand in the way of sustainable development. Because government policies often subsidize wasteful activities, they can lead to environmental degradation. Economists Robert Stavins and Adam B. Jaffe estimate that flood control and drainage projects of the U.S. Army Corps of Engineers are responsible for nearly one-third of the wetlands drainage in the Mississippi alluvial plain region. According to Christopher Bosso, author of the book *Pesticides and Politics*, the government's price-support policies for many farm crops have encouraged overproduction and spurred farmers to use pesticides excessively. And current Forest Service policy requires that winning bidders for timber on Forest Service land must cut the timber. Environmentalists interested in saving the trees at their own expense cannot apply.

Yes, the United States can achieve sustainable development—by allowing the market to spur innovation, reward resource conservation, and hold decision makers generally accountable. In rare cases, government action might help keep development sustainable. Specifically, if and when scientists agree that global warming is a more serious threat than the economic dislocations that severe emissions controls will cause, government action might be appropriate. But since the environmental effects of such dislocations will be serious, even that is not certain.

Forcing changes in technology and in living patterns by politically directed central planning has been tried in other countries. It has failed, bringing waste and misery. It is seldom the way to go. ◊

Reading Gore

The Vice-President-elect and his *Earth in the Balance*

by Douglass Lea

Does Al Gore really mean it? Can he pull it off? What shape will the new environmental regime take. In search of answers, Washington policy wonks have spent much of the time since Election Day trying to decode the core of environmental meaning and purpose in the life of the Vice President-elect.

The clues appear compelling. Gore held the first hearings in the House of Representatives on Love Canal and other toxic dumps. He took unpublicized pilgrimages to the sites of environmental catastrophe around the world. Four years ago, he ran for president on a platform showcasing global warming and depletion of stratospheric ozone. Other evidence: Senate sponsorship of an international group of parliamentarians interested in global problems; a family tragedy that helped forge a spiritual transformation and a more demanding view of human responsibility; a dramatic appearance as leader of the Congressional delegation to the Earth Summit in Rio de Janeiro in June, 1992; and, finally, the book.

Earth in the Balance: Ecology and the Human Spirit is a runaway best-seller at $22.95. Its 368 pages are now undergoing the kind of textual analysis normally associated with Kremlinologists and Talmudic scholars. Its mere existence is a minor miracle. Politicians are usually too busy to embrace the solitude of the writer's life. Full of rituals and ceremonies, their lives are relentlessly public, and their minds, unsurprisingly, are drawn toward the serviceable banality.

The Gore book is an exception. It presents a view of the turbulence afflicting the global environment from the perspective of one who has suffered great turmoil in his own internal ecology. A common denominator runs from the personal to the global and back again: spiritual crisis. As one of Gore's heroes, Vaclav Havel, then-President of the devastated Czech and Slovak Republic, told the U.S. Congress in March, 1990, "The salvation of this human world lies nowhere else than in human responsibility."

Gore clearly wants us to take on that responsibility. He challenges Americans with a "State of the World" that reads like a litany of doom. It is familiar ground to those who regularly read *Scientific American*, *Science*, *Nature*, and the Tuesday Science Section of the *New York Times* or to those who have followed the periodic alarms from environmental advocacy groups or the Worldwatch Institute, the World Resources Institute, and various international agencies. Nevertheless, in telling this oft-told tale with great clarity, Gore makes good use of his experience as a newspaper reporter, for he retains an ear for the telling anecdote and an eye for local color. New recruits to the environmental movement are, moreover, likely to be amazed by his documentation of ecological catastrophe—the depletion of stratospheric ozone, overpopulation, unchecked economic expansion, global warming, loss of species and genetic diversity, droughts, plagues, and other shocks to our biological underpinnings.

In explaining these dilemmas, Gore wanders confidently through a thicket of concepts that have grown up around the domains of information, ecology, and personal development. He displays a casual fluency with Information Theory itself and with turbulence, Chaos Theory, equilibrium, resilience, feedback loops, redundancy, positive and negative feedback, authenticity, thresholds, stewardship, addictions, dysfunctions, and pattern recognition.

> ***[Gore] took unpublicized pilgrimages to the sites of environmental catastrophe around the world.***

During the recent Presidential campaign, Gore's ideas, particularly those collected in his book, were often characterized as extreme. Of particular interest was Gore's call for a "Global Marshall Plan," the functional equivalent of the U.S. program to rebuild Europe after World War II, this

time aimed at rescuing the global environment.

In this proposal, Gore isolates five large goals: stabilizing world population; developing and sharing appropriate technologies; developing a new global "eco-nomics;" negotiating a new generation of treaties and agreements; and building a new global consensus on the environment. "Each goal," he writes, "must be supported by a set of policies that will enable world civilization to reach it as quickly, efficiently, and justly as possible." Supporting policies are spelled out—some specifically, others generally—but this chapter also contains many exhortations, the fashionable "musts" and "shoulds" and "oughts" of public discourse.

Under the rubric of technology, Gore proposes a Strategic Environment Initiative (SEI), "a program that would discourage and phase out these older, inappropriate technologies and at the same time develop and disseminate a new generation of sophisticated and environmentally benign substitutes." Its name chosen to imply a parallel with the Strategic Defense Initiative (SDI), the Gore SEI includes tax incentives and disincentives, research and development funding, government purchasing programs, assessment procedures, a worldwide network of training centers, export controls on polluting technologies, and stronger safeguards for intellectual property rights. Most of these initiatives fit neatly within the incoming Clinton administration's emphasis on promoting technological innovations for economic growth, and the Vice President-elect has already been assigned "the responsibility and the authority to coordinate the administration's vision for technology."

Biotechnologies, particularly those promising to reduce pesticide and fertilizer loads, are likely to receive accelerated approvals. And Earth Summit conventions on reducing carbon dioxide emissions and protecting biodiversity are also likely to find strong support from the new Vice President. Gore will almost certainly push to convert federal vehicles to natural gas and to attain much higher automobile efficiency standards.

While the proposal for a Global Marshall Plan attracted much attention during the election campaign, an even more provocative concept—the "central organizing principle"—has generated little fanfare. "I have come to believe," writes Gore, "that we must take bold and unequivocal action: *we must make the rescue of the environment the central organizing principle for civilization.*" (Emphasis added.) To illustrate by analogy, Gore refers us to the West's recent victory in the Cold War, where he finds "a conscious and shared decision by men and women in the nations of the 'free world' to make the defeat of the communist system the central organizing principle of not only their governments' policies but of society itself."

In other words, rescuing the global environment will not be achieved on the cheap. Instead, it will entail the full mobilization of our people and institutions. Viewed as an organizing principle, the Cold War changed forever the shape of the military and intelligence communities. It reconfigured industry, banking, education, housing, communications, and transportation (particularly highways). It also affected the intangibles of mind and spirit—basic values and traditions, community life, family structure, career choices, morality. Similarly, the struggle to find a new equilibrium for life on Earth will require a total reorientation of our ways of being.

Although Gore's concept is imaginative, he has been silent so far on intermediate steps that would lead us toward a focus on the rescue of the environment as an organizing principle or on the ways that such a reorientation would resonate through our institutions, values, and relationships. In high office, Gore will be under enormous pressure to ease his quest. Here, in the matter of staying the course, lies the unfinished promise of the Vice President-elect's testament and of his leadership on the truly ultimate issues. ◊

Al Gore, right, speaks at a news conference during the Earth Summit. He is joined by, from left to right, Senators Bob Graham (D-Florida), John Kerry (D-Massachusetts), and Steve Symms (R-Idaho).

Joe Marquette photo. Wide World.

Living the Land Ethic

Aldo Leopold's vision

by Teresa Opheim

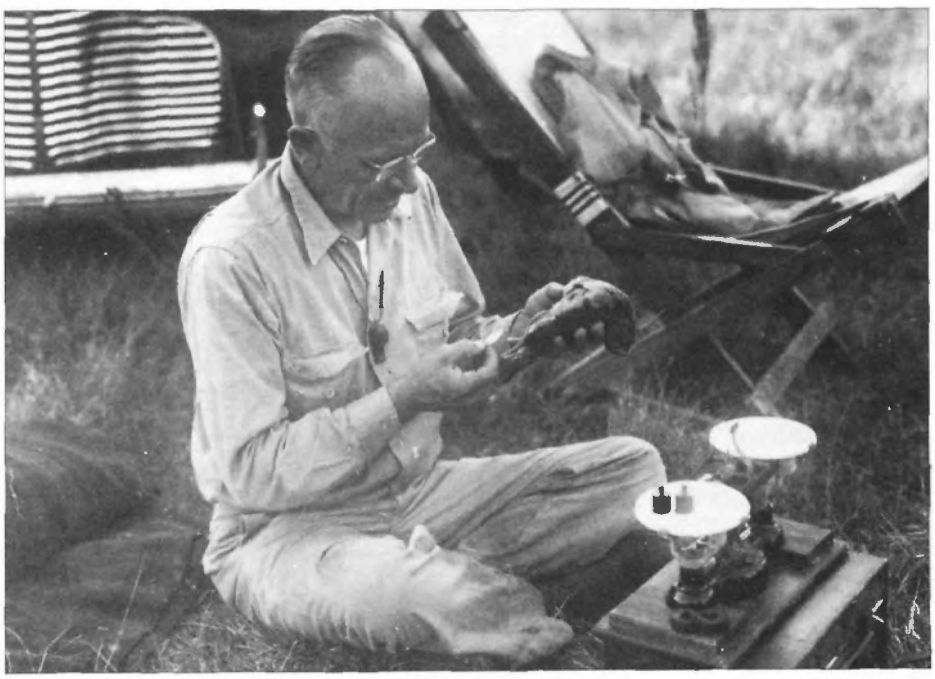
"Like winds and sunsets, wild things were taken for granted until progress began to do away with them," Aldo Leopold wrote in the foreword to his book *A Sand County Almanac*. "Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild, and free. For us of the minority, the opportunity to see geese is more important than television, and the chance to find a pasque-flower is a right as inalienable as free speech."

Aldo Leopold devoted his life to preserving his expansive version of "inalienable rights." In his time, Leopold made seminal contributions to ecology, wilderness preservation, and wildlife management, among other fields. Today, however, he is known chiefly for his authorship of *A Sand County Almanac*. In *Almanac*, Leopold wrote of a woodcock's dance, the corky bark of a burr oak, and other observations typical of the genre of nature writing. He also discussed conservation issues, including, in his words, "some of the episodes in my life that taught me, gradually and sometimes painfully, that the company is out of step." *A Sand County Almanac*'s most enduring passages, however, are Leopold's presentation of his now-famous "land ethic":

"All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in the community, but his ethics prompt him also to co-operate (perhaps in order that there may be a place to compete for).

"The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.

"This sounds simple: do we not already sing our love for and obligation to the land of the free and the home of the brave? Yes, but just what and whom do we love? Certainly not the soil, which we are sending helter-skelter downriver. Certainly not the waters, which we assume have no function except to turn turbines, float barges, and carry off sewage. Certainly not the plants, of which we exterminate whole communities without batting an eye. Certainly not the animals, of which we have already extirpated many of the largest and most beautiful species. A



Leopold kept detailed records of his natural history observations. A colleague said of him: "Few men loved the land so deeply as he loved America; few who have loved the land have examined it so carefully...."

University of Wisconsin-Madison archives.

(Opheim is an Assistant Editor for EPA Journal.*)*

land ethic of course cannot prevent the alteration, management, and use of these 'resources,' but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state.

"In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such."

"A Pinchot-like Intent"

A Sand County Almanac has been called a subversive book, one that questions the deepest values of our civilization. Leopold, however, did not live his life as a subversive man. Although he had the aesthetic and ethical sensitivity of a Romantic, he was pragmatic and spent his days working for change through committees, governmental reports, and articles directed toward garden club members, hunters, and farmers. He had, according to his biographer, Curt Meine, "both a Muir-like appreciation of nature and a Pinchot-like intent to use nature wisely."

Aldo Leopold was born in 1887 in the river town of Burlington, Iowa, to a German-American family of avid naturalists and hunters. The Leopolds lived in a home atop the bluffs of the Mississippi River. Although the location offered spectacular wildlife displays along the river's flyway, the wildlife was diminishing rapidly by the time of Aldo's birth. Leopold left the Midwest in 1904 to attend the college preparatory Lawrenceville School in New Jersey. He entered Yale University in 1905 and graduated with a Master of Forestry from the Yale Forest School in 1909.

After graduation, Leopold joined the U.S. Forest Service and headed to the Arizona and New Mexico territories for his first assignment. He quickly rose to become supervisor of the Carson National Forest in northern New Mexico, a position he coveted. After he was striken with acute nephritis a few years later, though, the physical rigors of a supervisor's job were no longer an option for Leopold, and he spent the rest of his life working at less physically demanding desk jobs and on consulting projects.

Leopold wasn't long in the Southwest before he began to notice a development pattern of waste and abandon. He lamented the serious erosion he routinely saw, and he came to challenge the Forest Service's assumption that heavy grazing by domestic stock was necessary to hold down grass that could carry fires. Leopold noted that, before white settlers arrived in the region, Southwestern watersheds had maintained their integrity despite centuries of periodic wildfire.

The young Leopold's thinking on watersheds was ahead of his time, but in other ways he reflected the conservation status quo. He was instrumental in a campaign to rid Southwestern public lands of "varmints" such as wolves, foxes, and bears, predatory animals that Leopold said "are continuing to eat the cream off the stock grower's profits."

Leopold grew to love the Southwest deeply and knew that, before Anglo-Americans pushed their way into every continental cranny, a governmental program would be needed to save any remaining areas of wilderness. Leopold wrote of the West and the nation's expansion: "For three centuries that environment has determined the character of our development; it may, in fact, be said that, coupled with the character of our racial stocks, it is the very stuff America is made of. Shall we now exterminate this thing that made us American?"

In 1922, Leopold drafted a wilderness area plan that became the basis for an administrative designation of the Gila National Forest as a wilderness area in 1924. His work set the pattern for what eventually became a nationwide system of wilderness areas. Leopold continued writing about the importance of wilderness areas his entire life, and later, in 1935, he helped found The Wilderness Society.

Ownership and Obligation

In 1924, Leopold accepted a transfer to the U.S. Forest Products Laboratory in Madison, Wisconsin, where he worked for four years before leaving to become a consultant on forestry and game management issues. A life-long hunter (for which he has been criticized by Rachel Carson and others), Leopold then surveyed wildlife habitat and game restoration policy in many Midwest states and helped inaugurate wildlife research projects at a variety of universities. He wrote *Game Management*, still a classic textbook for its field, and spent the last 15 years of his life as chairman of game and wildlife management studies at the University of Wisconsin. According to historian Susan Flader, "Today he is acknowledged by many in the field as the 'father' of the profession of wildlife management in America."

In Wisconsin, Leopold also focused on soil erosion and other issues of what he called "biotic farming." He wrote, "Soil is the fundamental resource, and its loss the most serious of all losses .... The day will come when the ownership of land will carry with it the obligation to so use and protect it with respect to erosion that it is not a menace to other landowners and the public."

Leopold's extensive fieldwork and his acute powers of observation on such a wide variety of issues—game depletion, soil erosion, wilderness preserves—reflected his understanding of the science of ecology at a time when that science was just coming of age. Leopold realized that, at its basic, the land was a complex organism that functioned through the interaction of its components. His keen understanding of the complexity of the natural system eventually led him to alter his thinking on predators. Decades after leading a campaign to eliminate predators,

In Leopold's Words

"We end, I think, at what might be called the standard paradox of the twentieth century: our tools are better than we are, and grow better faster than we do. They suffice to crack the atom, to command the tides. But they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it."

—"Engineering and Conservation" (1938)

Leopold then led the call for their restoration to American public lands. His reversal was eloquently described in his essay "Thinking Like a Mountain," which described his interaction with a wolf he and others had killed:

"We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes—something known only to her and to the mountain. I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view ...."

The Shack

Leopold's professional work provided the seeds for his theories about a human relationship with the land, but it was on his farm in Central Wisconsin that Leopold refined those theories and practiced his own personal compact with the land.

In 1935, Leopold bought some land in Wisconsin's Sand Counties Region. The only building on the abandoned Wisconsin River farm was a dilapidated chicken house-turned-cowshed with knee-deep manure on the floor. The farm had bare, blowing sands, it had been stripped of much of its timber, and its marsh had burned. For those who must go to towering mountains or crashing seas to find displays of nature they consider spectacular, the Sand Counties land had little to offer. For Leopold, however, the aesthetic appeal of country had nothing to do with its scenic qualities; he was interested in the land's evolutionary heritage and ecological processes. He sought to restore his land to ecological integrity, a goal he knew he would not live to fulfill completely.

Leopold's first recorded act as a landowner was to plant a food patch for wildlife. He, his wife, Estella, and their five children (all of the Leopold children became well-respected scientists) built birdhouses for martins, screech owls, and wood ducks and planted prairie grasses, wildflowers, and shrubs. Through the years, they planted thousands of pines—up to 5,000 to 6,000 a year—and Leopold devoted a good deal of effort trying to keep his trees healthy and free from the deer, drought, and fires that killed so many of them.

At The Shack, Leopold continued his life-long record keeping. His detailed journal includes entries such as the one for May 31, 1945, that only an insomniac such as Leopold could have observed:

Weather Warm, calm, hazy at daybreak, 58 degrees at 3 AM. Changed suddenly to cold NE wind at 7 AM, with a long streak of cloud marking the NE front. 54 degrees at 8 AM, cloudy. 41 degrees 6 PM.

Daybreak Song A favorable morning for early song:
2:45 song sparrow
3:00 " "
3:05 field sparrow
3:07 song sparrow
3:09 " ", field sparrow
3:11 field sparrow
3:15 Yellowthroat, field spar.
3:18 Crested Fly field spar.
Indigo (after which all cut loose) ....

Leopold planted thousands of pines on his central Wisconsin land.
University of Wisconsin-Madison archives.

On April 21, 1948, Aldo Leopold died of a heart attack while helping a neighbor fight a grass fire. Just a few days before, Oxford University Press had notified Leopold that *A Sand County Almanac* would be published. Albert Hochbaum, a former student and colleague of Leopold's, said in his eulogy for him: "Few men loved the land so deeply as he loved America; few who have loved the land have examined it so carefully; and few who have examined the land have been so articulate in detailing their discoveries."

Leopold once wrote that "No important change in human conduct is ever accomplished without an internal change in our intellectual emphases, our loyalties, our affections, and our convictions." Given the momentous way in which he was asking Americans to redefine their relationship with the land, the practical Leopold fully expected the necessary adjustments to take lifetimes. Said Leopold: "I have no illusions about the speed or accuracy with which an ecological conscience can become functional. It has required 19 centuries to define decent man-to-man conduct and the process is only half done; it may take as long to evolve a code of decency for man-to-land conduct." Given the urgency of today's environmental problems, Leopold's vision of a land ethic remains poignantly relevant; his patience for change is not. ◊

(Editor's Note: Quotations from A Sand County Almanac *(Oxford University Press, 1949) are reprinted with permission; quotations from the essay "Engineering and Conservation" are from* The Mother of the River of God and Other Essays by Aldo Leopold. *Edited by Susan L. Flader and J. Baird Callicott (Madison: The University of Wisconsin Press) Copyright 1991, the Aldo Leopold Shack Foundation; reprinted by permission of the publisher.)*

City Life, Country Living

From *Nature's Metropolis: Chicago and the Great West*
by William Cronon

If I am honest about the childhood emotions that have defined my adult passions and given a sense of direction to my life, I have to admit that I am still—like many if not most Americans who care about "the environment"—a captive of the pastoral myth. I still prefer the country to the city. But I have been certain for a long time now that there is a moral schizophrenia in that preference. Like most who prefer the country to the city, I live in the city, and am entirely dependent on the intricate systems with which it sustains my life. What now most strikes me about my urban home is how easily it obscures from me the very systems that enable me to survive. Much as I say I love "nature," that word usually remains an abstraction in my daily life—a non-urban quality of aesthetic or sacred beauty to be looked at and "appreciated," not the gritty web of material connections that feed, clothe, shelter, and cleanse me and my community. Living in the city means consuming goods and services in a marketplace with ties to people and places in every corner of the planet, people and places that remain invisible, unknown, and unimagined as we consume the products of their lives. The market fosters exchange relationships of almost unimaginable complexity, and then hides them from us at the very instant they are created, in that last moment when cash and commodity exchange hands and we finally consume the thing we have purchased.

Every city is nature's metropolis, and every piece of countryside its rural hinterland.

This ability of the market to construct and obscure relationships has been expanding for a long time now. The market existed long before there was a Chicago, and although it attained new complexity in that city, it has since gone on to become a fact of life in most places, no matter how urban or rural. We are consumers all, whether we live in the city or the country. This is to say that the urban and the rural landscapes I have been describing are not two places but one. They created each other, they transformed each other's environment and economies, and they now depend on each other for their very survival. To see them separately is to misunderstand where they came from and where they might go in the future. Worse, to ignore the nearly infinite ways they affect one another is to miss our moral responsibility for the ways they shape each other's landscapes and alter the lives of people and organisms within their bounds.... We all live in the city. We all live in the country. Both are second nature to us....

[M]y most vivid childhood memory of The City [is of] an orange column of vapor rising from a smokestack in Chicago's steel-milling suburb of Gary. It was and is an evil memory, a symbol of an urban world doing harm both to nature and to the people and other creatures who lived downwind of that cloud. As a child, I was always happy when we reached the end of our journey, the cottage on Green Lake that seemed about as far from that smokestack as I could imagine. Now I am not nearly so sure. It turns out that the green lake and the orange cloud had more in common than I thought. The things I experienced in each sprang from a common history, as did my very ability to make the

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journey between them. Even the ease with which I saw them as separate and disconnected, a pair of alternatives with an obvious choice between them—that too was part of their common past.

So when I now imagine a group of Chicagoans sitting on the veranda of David Greenway's Oakwood Hotel in the 1890s, on the far side of the lake that would be my first childhood experience of The Country, I also think about the cloud of dark smoke that so many nineteenth-century travelers saw hanging over the Chicago skyline. I imagine the coal from southern Illinois fueling locomotives bound for San Francisco, lifting Kansas wheat to the tops of grain elevators, sawing pine lumber from Wisconsin, butchering steers from Colorado, building reapers destined for the Dakotas, powering lights and elevators in skyscrapers, heating the homes of wealthy suburbanites and poor immigrants, carrying travelers north to the lake country. Like my orange smoke, that nineteenth-century cloud raised serious questions about the city's alienation from nature. But those questions were not to be answered by a flight to the country, for the country had helped make that cloud, and vice versa. Green Lake was and is no alternative to Chicago. To do right by nature and people in the country, one has to do right by them in the city as well, for the two seem always to find in each other their own image. In that sense, every city is nature's metropolis, and every piece of countryside its rural hinterland. We fool ourselves if we think we can choose between them, for the green lake and the orange cloud are creatures of the same landscape. Each is our responsibility. We can only take them together and, in making the journey between them, find a way of life that does justice to them both. ◊

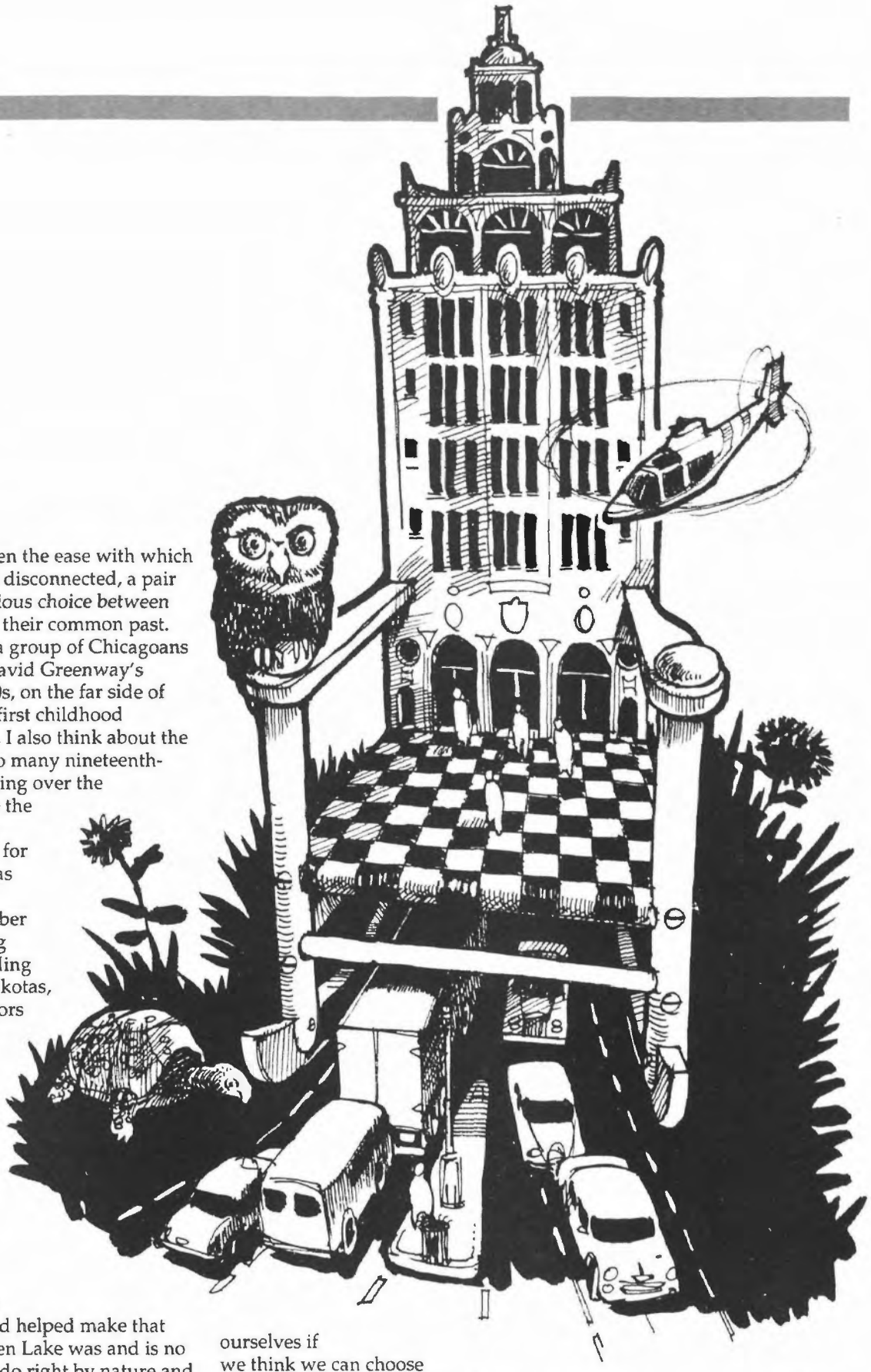

Illustration by Jan Adkins

ON THE MOVE

Rondeau

Fitzsimmons

Gagliardi

Dan J. Rondeau is the new Director of the Office of Civil Rights. He plans to emphasize training and education as key tools in accomplishing the Office's mission, particularly courses in affirmative employment, the new Equal Employment Opportunity complaint procedures, and preventing sexual harassment.

A 26-year federal employee, Rondeau was the Deputy Director of Equal Employment Opportunity for the U.S. Public Health Service (PHS), a position he held since 1984. Previously, he worked for PHS as a social science analyst. He began his federal career with the U.S. Department of Labor.

Rondeau began his career in public service as a Counselor Aide to the Mayor's Committee for Human Resource Development and later served as Director of Community Services and the Youth Development Programs for Detroit, Michigan. Educated in Detroit's public schools, he holds advanced degrees in Legal Studies (MLS) and in Public Administration (MPA) from Antioch University and the American University, respectively.

Michael J. Fitzsimmons has been promoted to Deputy Assistant Inspector General for Investigations in the Office of the Inspector General (OIG).

Fitzsimmons began work as a Desk Officer for OIG in October 1987 and was promoted to Senior Desk Officer in 1990. Before joining the Agency in 1987, he was a Federal Special Agent with the Internal Revenue Service's (IRS) Criminal Investigation Division for 22 years. While with the IRS, he served as an analyst on the staff of the Assistant Commissioner; instructor in charge of Special Agent Investigative Training in Glynco, Georgia; and Senior Special Agent in the Boston district.

Fitzsimmons graduated from Salem State College in 1969 with a B.S. in Business Administration.

Carl S. Gagliardi has been named the Acting Associate Administrator for the Office of Communications, Education, and Public Affairs. Gagliardi has served as Deputy Associate Administrator since 1990.

He worked for EPA from 1983 to 1986 as a Press Officer and Deputy Director of the Press Division before transferring to the Department of the Interior, where he served as a Special Assistant in the Secretary's office, and subsequently as Director of Public Affairs for the Bureau of Reclamation. He left the government to work with a Washington-based public relations firm before returning to EPA as Special Assistant and Director of Communications Strategy in 1989.

Gagliardi graduated from the University of Maryland at College Park with a B.S. in government and politics in 1975.

Jonathan Z. Cannon is the new Director of the Gulf of Mexico Program. The program is based at the John C. Stennis Space Center in Mississippi and was established in 1988 to respond to signs of long-term environmental degradation throughout the Gulf ecosystem. The program is focusing on cleaning up marine debris; reducing health risks from unsafe beach waters and the consumption of shellfish; reducing the impact of coastal and shoreline erosion; preventing habitat loss; and controlling nutrient enrichment.

Cannon served at EPA from August 1986 until November 1989, as Deputy General Counsel for Litigation and Regional Operations in the Office of General Counsel; Deputy Assistant Administrator in the Office of Enforcement and Compliance Monitoring; and Deputy Assistant Administrator and Acting Assistant Administrator for Solid Waste and Emergency Response. He received the Agency's Gold Medal for Exceptional Service in 1989.

He has been a partner with the Washington, DC, law firm Beveridge and Diamond since February 1990 and was with the same law firm from July 1975 until August 1986. He holds a B.A. degree from Williams College and a J.D. degree from the University of Pennsylvania. ◊

Wild rice in Chesapeake Bay.

Pat Haddon photo.

Back cover: Acadia National Park, Bar Harbor, Maine.

Photo by Larry Lefever for Grant Heilman Photography, Inc.