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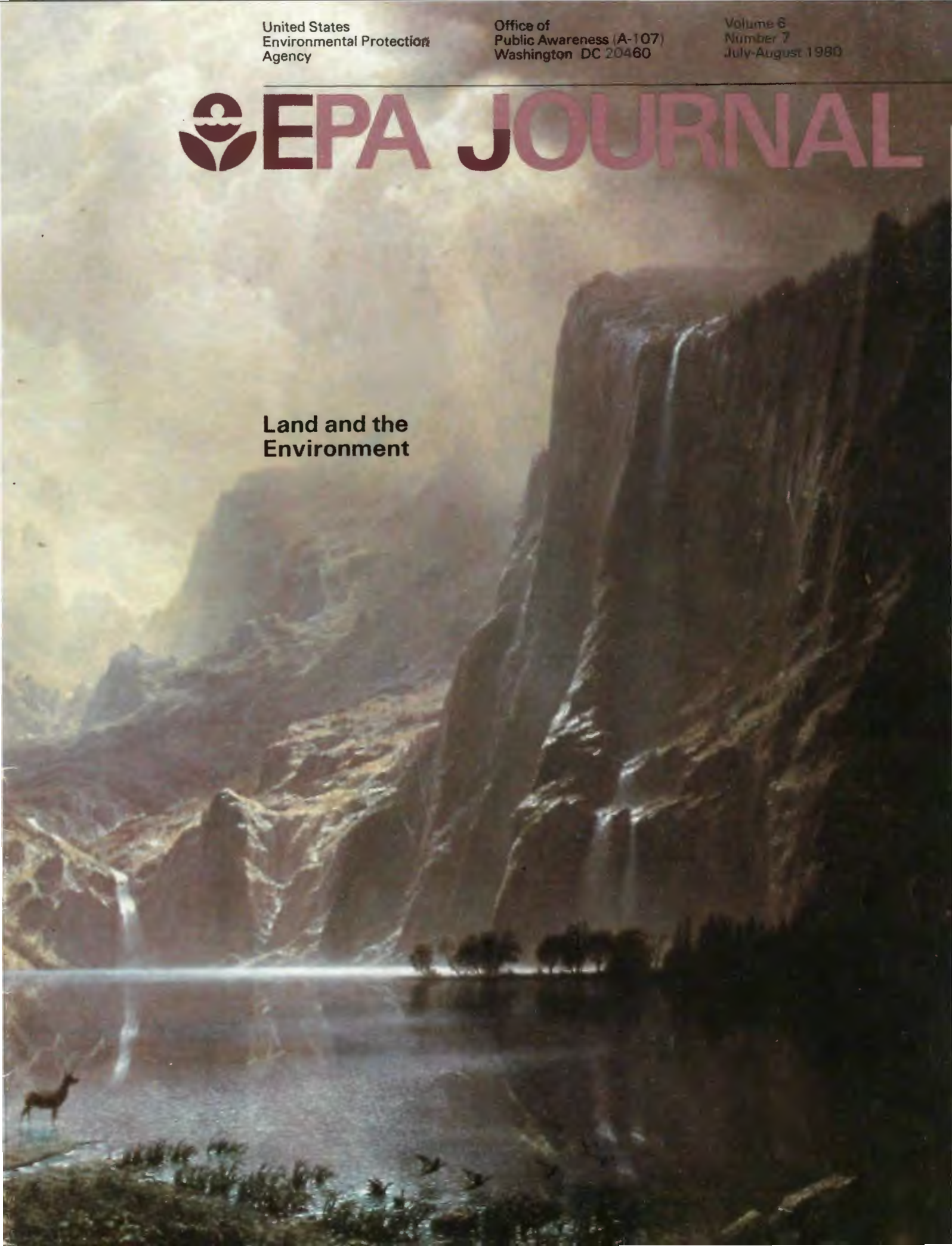

Land and the Environment

The Changing Land

The painting by Albert Bierstadt on the cover of this issue of EPA Journal portrays the grandeur of the West. One of the most impressive artists of the Hudson River school, Bierstadt sought to elevate nature and to make people proud of their country and its landscapes.

While a great deal of America's land still has the kind of beauty and grandeur that inspired Bierstadt, much of it is being changed with alarming rapidity. The inside front cover, a view of street sign pollution in Las Vegas, and the inside back cover, a photo of clear cutting in California, illustrate some of these changes.

Population growth, technological developments, new chemicals and the accelerated pace of life are causing sweeping changes not only in this country but around the world. The impact of these shifts is reviewed by Administrator Costle in this issue.

Two Members of Congress, Senator George McGovern and U.S. Representative James M. Jeffords, write about what is happening to the Nation's farmland. Barbara Blum, EPA Deputy Administrator, analyzes how environmental control measures can either solve or aggravate land problems.

Eddie Albert, an actor with an interest in environmental causes, writes about the consequences of poor land management. LaDonna Harris, president of Americans For Indian Opportunity, explains why the Indians were the first environmentalists in this country.

Merna Hurd, Director of the EPA Water Planning Division, reports on the impact of erosion, pesticides and fertilizers on water quality. William C. Galegar, an EPA laboratory director, discusses research on soil and ground water.

The magazine also carries a report on the recent World Congress and Exposition on Bio-Energy which explains the prospects for converting organic material such as trees, crops, and seaweed into energy.

As part of EPA Journal's occasional series of articles on American rivers and their pollution problems, this issue examines the Nation's greatest river—the Mississippi.

The role of land problems in the collapse of the Mayan civilization and the use of dredgings to form new islands off the Maryland coast are the subject of two other articles in this examination of land use. □

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EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise and radiation, 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.

Articles

Departments

Cover: Albert Bierstadt's painting, "The Sierra Nevada in California," portrays an idyllic scene. (National Collection of Fine Arts—Gift of Helen Huntington Hull. Smithsonian Institution.)

Opposite: A contemporary view of the Las Vegas downtown strip.

Photo credits: USDA Soil Conservation Service; Documerica; Tourist Department, Organization of American States; U.S. Department of Energy photos by Jack Schneider; Glenn Therres; Calif. Dept. of Transportation. Minneapolis Tribune: Louisiana Office of Tourism.

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Gail Hansberry took the photos of Hattie Carthan in the April EPA Journal.

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Growth, Land and the Future

By Douglas M. Costle
EPA Administrator

Some months ago, I was required to review the scientific data on a class of chemicals known as "phenoxy herbicides." These are, in essence, chemicals used to kill plants that interfere with the growth of farm crops—plants that we would refer to as "weeds."The question facing me was, should these chemicals be allowed in commerce because of their beneficial values, or should they be banned because of their harmful side-effects? In the process of reviewing these chemicals, I was particularly struck by the precise fashion in which they worked.

My uninformed view of all such chemicals—pesticides, herbicides, fungicides, rodenticides, and so forth—was that they simply poison whatever they are applied to. The suffix "-cide," after all, comes from the Latin verb meaning "to kill." But these phenoxy herbicides work in a much more devious way. Instead of forthrightly poisoning the weed, they stimulate its metabolism to an extraordinary degree. So stimulated, the weed consumes energy from photosynthesis much more rapidly than it can replenish that energy. In a quite literal sense, this herbicide forces the weed to grow itself to death.

This class of chemical and its way of operating strike me as useful in helping to understand the distinction that the United States of America must learn to make about the concept of growth. The first dictionary definition of growth—and the one with which we are probably most familiar—denotes an increase in size, weight, or some other quantifiable dimension. In one way or another, this type of growth means "more." But the second definition introduces a much more subtle meaning of growth: it is the progressive development of an organism from a lower or simpler form, to a higher or more complex form. This second form of growth—a gradual unfolding toward maturity—usually means "better." At the very least, it means "different."

This distinction between growth as an addition to quantity, and growth as an improvement in quality, is a critical one for societies to make. For—as that herbicide illustrates—in pursuing one kind of growth without limit, we can jeopardize life itself. Like plants, societies can grow themselves to death.

We have begun making that distinction in the United States. Indeed, this insight underlies most of the environmental law that has been passed in the last decade. Until about 1970 or so, our economics tended to treat air and water as free goods—goods without limit that could be used as convenient Disposalls for the waste by-products of what someone has called the effluent society.

Over the last 10 years, we have managed a major reversal in that kind of thinking. The ecologists have assured us that "there is no free lunch." Somebody has to pay for pollution—either in the health and amenities costs associated with dirty air and water, or in the treatment costs necessary to restore those resources to their former quality. We have accepted the idea that growth is not an unmixed good, that it has its price—and we have begun paying that price.

Paving Over Farm Land

But there remains one area of resource use in which we have yet to make the distinction between the two types of growth. That area is agricultural land.

Every day in this country we shift four square miles of our prime farm land out of agriculture and into urban use—highways, shopping centers, residential developments, airports, and so forth. That amounts to one million acres a year. In addition, urban conversion claims another two million acres a year of lesser quality agricultural land. The total annual loss of three million acres is the equivalent of 320 acres *every hour.*

From one perspective, this conversion can be viewed as "growth." A shopping center or a subdivision can produce vastly more income for the builder than it can produce for a farmer. Indeed, many farmers who would vastly prefer to retain their land cannot afford *not* to sell.

From any perspective other than the dollars-and-cents viewpoint, however, it is impossible to regard this conversion of our best land as "growth." Once land is paved over, its productivity is destroyed—for all practical purposes, perhaps destroyed forever.

The Soil Conservation Service estimates that the U.S. has about 135 million acres of land that is not now used for growing crops, but could be so converted. However, only 22 million acres of this land is prime land. At present rates of conversion, therefore, this reserve of prime land would be totally consumed by the turn of the century.

Hidden Land Values

Further, converting secondary land to crop production—while it can be done—is expensive. Prime acreage is flat or gently rolling, and hence easy to protect against soil erosion. It is energy-efficient land, producing the largest quantity of crops with the least investment of fuel, fertilizer, and labor. Secondary land, by contrast, requires markedly higher inputs of fertilizer and pesticides; often it is located on slopes highly susceptible to erosion by rain . . . and that erosion carries with it chemicals that further pollute rivers and bodies of water.

Last year, American agricultural exports brought in nearly $40 billion . . . a critical contribution to our balance-of-payments problem when we import 8 million barrels of oil a day. Beyond this monetary consideration, American food exports literally mean the difference between life and death to millions of people abroad.

The choice facing us is not whether we shall have farmland *or* whether we shall have shopping centers. Urban development can be directed away from prime land and restricted to land less suitable for crops. Intelligently managed growth need not penalize States and local governments that also wish to preserve a distinctive, irreplaceable resource.

This is demonstrated by the experience of Vermont, for example, with Act 250, its land use and development law. Despite the predictions of economic doom that accompanied passage of the Act 10 years ago, Vermont has not only survived but flourished. In the seven years following passage

of the Act, one-and-a-half times as many new companies located there as had done in the seven preceding years. Plant expansions between 1970 and 1977 were four times the number between 1963 and 1970

Moreover, the development that *was* permitted under the Act avoided the deficiencies of the anything-goes projects that plagued Vermont in the 1960's. No longer were second-home developments perched on hillsides with inadequate plumbing that threatened water supplies. No longer could shopping-centers be sited without regard for the traffic problems they might cause. As former Governor Davis commented, "The unwieldy developers went somewhere else—and I'm glad they did."

The Perils of Change

The temper of our times is hostile to government intrusion into private activity. There is nothing surprising about that. It is frequently said that big government creates big regulation just to keep itself in business. The much larger truth is that a big society has spawned problems that the founding fathers could never have anticipated. And the sudden *increase* in regulation during the last decade stems from four phenomena:

First, population growth without precedent in the history of our species. It is generally estimated that we humans did *not number one billion until* A.D. 1830. After that, it took another century—until 1930—for us to add a second billion. Today, there are more than four billion of us, and we will add another billion by 1990.

Second, technological change has magnified the size and scope of our tools beyond the wildest imaginings of any medieval Faust. In 1945, the largest oil tankers had a capacity of 18,000 tons; by contrast, in 1978 the *Amoco Cadiz* all by itself dumped 220,000 tons of oil—the equivalent of more than a dozen pre-war cargoes—off the coast of Brittany. In fact, I seem to remember that that is roughly enough oil to supply New England's entire oil-based electrical energy needs for a whole day.

Third, our technological skill has introduced into our world substances that are utterly strange and alien to the filtering processes of the Earth. Until 1940, for example, most chemicals in common use were derived from naturally occurring materials such as plants and minerals; each had been "screened" by the physical and historical environment. Three million years of human beings had learned, through trial and error, which were edible, useful, or dangerous.

But since 1971 alone, the chemical revolution has produced 3 million synthetic compounds. Today 5 million such compounds are known, about 65,000 are in commercial distribution—and it takes a team of pathologists, 300 mice, two to three years, and about $300,000 to determine whether a *single* suspect chemical causes cancer.

Finally, we are dealing with accelerated *pace*—the astonishingly brief span, about 35 years, in which so many novel, massive changes have been introduced into our 5-billion-year-old habitat. Coming both swiftly and simultaneously, these changes magnify each other's impacts into an often devastating synergism. The *convergence* of these four factors—rapid population growth, the scale of human tools, the ecological strangeness of our synthetic compounds, and the pace of their combined assault—heightens the possibility that some damage to our Earth will be *irreversible.*

It seems to me we are suffering from dismay at events of very recent decades whose effects have just begun to show up, and which we are struggling to assimilate. The sudden increase in government regulation of industrial activity is one aspect of that struggle.

Understanding Our Limits

But that increase, in turn, merely reflects a much more important phenomenon: the *perception of limits on our ability to exploit* our habitat without regard for the consequences. We are, in the genuine sense of a much overused word, living through a revolution. Yet this revolution does not necessarily mean that, having enjoyed our brief day in an abundant sun, we must now return to a Dark Ages of spartan living and pinched outlook.

It does, however, mean a different concept of economic and industrial development. Such a concept will be characterized by several features whose outlines are already clear: an analysis of environmental impacts *before* a project is undertaken, as contrasted with after-the-fact mitigation of damages; conservation of resources—not only of energy, but of all finite resources including the most threatened of all, our soil and water; and most significant, a new definition of economic "growth."

Such changes in thought and action are already occurring, both in our lives and in our laboratories. We have come to see waste and excess not as the admirable surplus of a productive economy, but as simple stupidity—a symptom of social corpulence. The perception of limits, still denied by some, has evoked from others a fresh wave of invention and ingenuity: we see it in the drive toward conservation, the effort to develop solar energy, the re-examination of industrial processes to minimize pollution beforehand rather than cleaning it up after. We are finding that, like all our familiar resources—timber, land, fossil fuels, and labor—so the recognition of scarcity can itself be a resource . . . an intellectual resource that points our technology in a new direction: toward an infinitely more creative mode of invention that keeps human demands in balance with Earth's supply.

The Impact of Change

One of the great anthropologists—I believe it was Ruth Benedict—once speculated on the impact of sudden change. She noted that, within a few months after the Allied landings in the South Pacific during World War II, natives who had not the vaguest conception of radio waves learned nonetheless how to repair radios. What are the effects on a human being, she wondered, of leaping so quickly from the Iron Age to the Electronic Age? She offered no answer.

But I once saw a film that offered a graphic reply to that question. Some of those same natives watched the Allied ships pull in to the beaches and disgorge bulldozers. The bulldozers began knocking down trees, leveling the land, and building airstrips. And within hours after the airstrips were completed, in came one plane after another, bringing food and medicine in a seemingly infinite abundance.

The natives—interpreting this sequence of events with a primitive understanding of causality—began building their own airstrips. Laboriously chopping down trees and straightening the hillsides, they fashioned their own rude runway. And not only by day, but by night, too, they waited for their birds to come down from the sky; the film showed them, hundreds of them, standing silently with torches to guide the arrival of their own cargo through the dark.

It can be confusing and threatening to live during a revolution as fast-paced as this environmental revolution. It has altered our thinking and behavior in a surprisingly brief period. Many of us have become concerned about the unnatural speed and nature of ecological change. We have come to realize that growth without management—growth which emphasizes quantity only, and ignores quality, including destruction of high quality farm land—contains within it the seeds of our own destruction. But I think enough of us have begun acting on that concern to shape the future to our will.

In doing so, we can make sure that succeeding generations will become beneficiaries of change, not its victims. We can make sure that our children will never stand—prisoners of an obsolete economic credo—waiting along some rude runway of the mind, holding pathetic torches out against the night, and hoping for an abundance which only our intelligence and self-discipline can win. □

Farmland and Water Pollution

By Merna Hurd

From the orchards of Virginia to the dairy lands of Wisconsin, through the Corn Belt, the Wheat Belt, and the ranches of Texas, and out to the great vegetable gardens in the valleys of California, America's farmers now feed more people than ever before. Thanks to a virtual revolution in agricultural technology in recent decades, the United States is able to feed itself and still export $37 billion worth of farm products each year. We have become the Saudi Arabia of grain in a hungry world.

All the same, the agricultural revolution has its price. Erosion, like a silent, almost invisible army of bulldozers, scrapes topsoil off many of our richest farms and pushes much of it into ponds, lakes, streams, and rivers. This runoff often carries pesticides, fertilizers, and animal wastes which can find their way to ground and surface waters. The results have been dramatic.

At a cost of one billion dollars, this country's farms lose four billion tons of topsoil every year, enough dirt to fill a one foot deep hole about one and a half times the size of Delaware. Natural processes replenish much of this topsoil but not nearly enough and not on a uniform basis. Even more alarming, since 1935 agricultural practices have so severely damaged farmland that one hundred million acres of land cannot be cultivated, and over half the topsoil on yet another hundred million acres has been lost. This is like losing the State of California and declaring Illinois, Iowa, and Ohio missing in action.

Furthermore, agriculture seriously affects water quality in two-thirds of our river basins and provides over half of the Nation's total man-made sediment load. The United States pays five hundred million dollars yearly just to remove sediments (both natural and man-made) from its waterways. We pay still more to clean up drinking water supplies for both people and animals. We lose swimming, fishing, and other recreational opportunities. And in irrigated areas, salt contamination reduces crop yields on 25 percent of the land, and ground water quality is degraded to the point that its use is greatly restricted

Problems Unseen

The problems of erosion and rural water pollution go unseen by many farmers. Topsoil erosion, even at an annual rate of five to ten tons per acre, removes only a very small layer of soil each year. Because of this, the incentive to take preventive measures is often weak. Productivity may drop only after a number of years and may be masked as the farmer applies expensive chemical fertilizers and pesticides more and more heavily. The effects of these chemicals on water quality are also hard to see, since they may not occur until the chemicals reach other farms and cities downstream.

Many culprits contribute to our agricultural pollution problems: excessive tillage (made easy by today's super-tractors); careless land management; the heavy use of chemical fertilizers, insecticides, and weed killers; one-crop farms; the pressures of farm economics; inefficient irrigation; and a growing belief that land must be exploited at full capacity rather than nurtured for long-term health. Government has been no angel either. All too often the signals coming from Washington have been conflicting or have encouraged plantings on marginal lands that should never have been put into production (so-called fence-to-fence planting). In some areas, local laws and policies work against efficient water use, as well as clean water.

American farming has proven itself one of this country's great success stories over the last thirty years. Along with this success, however, has come a loss of flexibility, a sort of paralysis. The farmer's ability to innovate and to cope with changing conditions has diminished.

Farm economics, in particular, have often forced farmers to cut corners and bring marginal lands into production just to survive. Good husbandry practices have sometimes been given up in the name of efficiency. Dependence on petrochemicals and capital investments has grown. Diversified farming operations are a thing of the past. And as fertilizers and pesticides have become less effective per unit used, the response has generally been more chemicals at higher costs rather than application of other methods and techniques.

Size may also be a factor. As farms grow bigger, good operations and maintenance practices can become more complicated, more time consuming, and more costly. To blame the farmer in such a situation may be unfair. The high stakes involved in large-scale farming have lowered his willingness and often his ability to take risks, no matter how promising.

To cope with the problems it creates, agriculture must face the task of applying the relatively small-scale tools of good farm management to large farming operations. Contour plowing, crop rotation, terracing, no-till planting ,integrated pest management, sediment dams, grassed waterways, barnyard runoff controls, sprinkler irrigation, reduced water waste—these are the types of Best Management Practices (BMP's) that EPA is promoting within the farming community in order to improve water quality and reduce soil loss.

Methods Not New

Although terminology such as "Best Management Practices" and "Integrated Pest Management" may be new, the techniques are not. In fact, they involve the management and husbandry practices that good farmers have always used, along with the innovations of modern research and development. These techniques also involve a genuine concern for the land and the environment which, though they may seldom consider it, many farmers reflect in their daily activities.

At present, through Model Implementation Projects, the Agricultural Conservation Program, and the Rural Clean Water Program, cost-sharing funds and technical assistance will be made available to encourage farmers to install BMP's. Participation is totally voluntary, and the early results have been encouraging. But if rural pollution continues at critical levels, stronger measures may also be needed.

There are many alternatives: economic incentives such as more cost-sharing or tax credits, economic penalties such as soil loss taxes, and direct controls such as land use limitations, performance standards, or permits. Interest has been shown in requiring farms to be certified as carrying out approved conservation plans before they can become eligible for low-interest loans. Federal price supports and crop insurance could also be tied to certification.

At this time, EPA believes in voluntary programs. Nobody wants more regulation.

All the same, these options must remain open. Farm runoff and soil loss are that serious a problem.

Agriculture's future lies in its willingness to emphasize farm health, as well as farm production. A partnership must be worked out among the farmer, the agriculture industry, and government which, in the longterm, promotes both of these goals. I list the farmer first because his understanding, support, and sweat are the key elements in the success of such a partnership.

Acceptable solutions to our agricultural pollution problems either exist today or can be found. Our stake in the future lies in our willingness to use them. EPA will continue to pursue programs for solving these problems, but water quality concerns must also be given a high priority by the agriculture community. Pollution problems do not just go away. Without this sector's active support and determined effort, the stronger regulatory measures discussed earlier may unfortunately become inevitable. □

Merna Hurd is Director of the Water Planning Division, Office of Water Program Operations. Copies of the Water Quality Management Bulletin for March, 1980, which contains this and related articles, may be obtained from WQM Bulletin (WH-554), Environmental Protection Agency, Washington, D.C. 20460.

The Green Revolution Is Alive and Well

By Jerry E. Rosenthal

Remember the Green Revolution—the dramatic breakthrough in agriculture that brightened the hopes of an ill-fed Third World a decade ago?

It's alive and well, and still one of the great weapons in the battle against global hunger. Some of the glamour has dimmed, but the engine that powered the "revolution"—research and development of foods grown and eaten in the developing countries—continues to function.

The big question is—does the world know how and does it have the resolve to take advantage of what has been learned and what can be achieved?

CIMMYT, the international agricultural research center in Mexico where high-yield wheat, along with the so-called miracle rice developed in the Philippines, sparked what came to be called the Green Revolution in the 1960's, is working on the answer. CIMMYT, pronounced "SIM-it,", is the Centro Internacional de Mejoramiento de Maiz y Trigo, or the International Maize and Wheat Improvement Center.

"By the year 2015, the world must produce twice as much food as it achieved in the past 12,000 years."

That verdict comes from Norman E. Borlaug, director of the wheat program at the Center, and winner of the 1970 Nobel Peace Prize for his work in breeding new varieties of wheat. What his statement means is that the 3.6 billion tons of food produced yearly in the world today must be doubled in 35 years.

Little cooperation in the international community and inequitable income distribution make world hunger a growing concern. Meanwhile, a predicted 8 billion people will have to be fed in 2015—almost twice as many as the current 4-plus billion.

One of the solutions is to make each acre of land produce more than it does now. To do this, new, higher yield varieties of wheat, corn and other grains must be developed and tested for suitability in different climates.

That is the job of CIMMYT, one of the 12 international centers forming a worldwide network called the Consultative Group on International Agricultural Research.

With an annual budget of $13 million—25 percent of which comes from AID—and several agricultural sites around the country, the Center's staff of about 80 researchers has devoted itself to developing varie-

Nobel Prize-winner Dr. Norman E. Borlaug recording data on growth in a breeding plot in Mexico

ties of grains that are more resistant to disease, produce more per acre and are more nutritious.

The Center's most spectacular product to date is wheat.

In the 1950's, Borlaug began to experiment with seeds that had been produced in the United States by crossing a Japanese dwarf variety and another type called Brevor. The Norin-Brevor cross laid the basis for achieving a much higher-yield and more disease-resistant wheat.

After thousands of further crosses and trials in the 1960's, new Mexican varieties were released and successfully grown in India and Pakistan.

Today, the descendants of these semi-dwarf, high-yield varieties are being harvested on every continent, providing the bread, chapati, couscous, semolina, macaroni and noodles that feed more than one-third of the developing world's population.

Wheat output has soared 50 percent over the past 10 years, surpassing all other grains and outpacing the 30 percent increase in population. Rice has shown a rise of 27 percent, and even sorghum and millet, the poor relations in the cereal family, have gained over the decade.

But the hope of the tropics and subtropics—where the world's hungriest people live—is maize, what Americans call corn. It was left behind in the high-yield breakthrough of the 1960's, now ranking third in world production, behind wheat and rice.

CIMMYT is the keeper of the largest corn-gene bank in the world, from which the breeders develop their new lines. The seeds are kept in a vault at a temperature of 32 degrees F. and have a shelf life of 25 years. Backup duplicates are stored in Fort Collins, Colo., in a vault where the temperature is 18 degrees below zero. These will last 100 years.

So far, new varieties of maize have accounted for a 38 percent boost in production. The Center's breeders believe that successful short-stalked, high-yielding, disease-resistant and more nutritious varieties will come soon and help feed a larger future generation.

But a larger future generation is just the obvious, and not the only, problem facing the Center.

Borlaug, who constantly treads the croplands of the developing countries to discover the problems and needs of the farmers, sees poverty as the biggest immediate obstacle.

"It's not that we're not producing enough food right now," he said. "We are, but it's not equitably distributed. Too many people don't have the money to buy it.

"For example, India in 1977-78 produced 125 million tons of grain. This is 10 to 12 million tons more than needed—based on present diets—but millions of Indians are too poor to buy it.

"The developing countries need public-works projects in the rural areas to enable the rural poor to buy food. Small factories and other localized activities can provide the jobs that are needed."

Borlaug believes China may have found a way. "On two trips to mainland China," he said, "I never saw a hungry person. Everyone seems to be working. The Chinese have done a creditable job in building up rural industry and food.

"I believe planners should think small when it comes to agriculture. And I think we need more people looking at the overall picture rather than specialists doing the planning. I would like to see bronze plaques erected for every small irrigation ditch that's dug. This is the type of water management that can really help the small farmer. Big dams have their place, but the small irrigation ditch is vital."

Some agricultural development projects and programs in developing countries, he claims, are either misbegotten or misdirected. He cites a situation in Pakistan where with construction of the massive Tarbela Dam, largest earthen dam in the world, timber areas previously untouched became available to private interests. They clear-cut entire hillsides, causing vast erosion and hastening the silting of the reservoir.

"I was there on a rainy day," Borlaug said, "and soil once held by trees was pouring down into the Indus River like a cascade of chocolate."

The scientists, technicians, and professionals at CIMMYT all emphasize collaboration with small farmers.

When Dan Winkelmann, an economist, first came to the Center, he rented a six-acre farm nearby. He worked it as many Mexicans do—without sophisticated equipment—to grow maize and beans.

"There is no free lunch in farming," he said. "You're constantly weighing the biological feasibility of what you're doing against the economic feasibility. There has to be give-and-take, which means early collaboration among all research disciplines studying aspects of production."

Other staff members, like Narendra Lal Dhgawan on the maize breeding staff, serve as key links between the breeders and the countries testing new varieties emerging from the international program.

This year Dhgawan is airfreighting half a million envelopes containing seeds for 700 trials in 88 countries. He will feed the results into a computer and send printouts to all participants in the trials and others interested in the program.

These printouts can tell a scientist in Turkey, for example, that a certain variety of maize grown in Egypt might do well under similar conditions in his country.

Because wheat is such a universal food and is eaten in so many ways, the varieties developed at CIMMYT are being evaluated continually in the Wheat Industrial Quality Laboratory, headed by Arnoldo Amaya Oelis. Bread wheats—both winter and summer—are analyzed for their milling and baking qualities. Amaya and his staff work with 20,000 lines of bread wheat, 8,000 lines of durum—the wheat that becomes pasta—and some 2,000 lines of triticale, a high-protein cross of durum wheat with rye.

Some 10,000 men and women from the developing countries have come to the Center for in-service training in research techniques so that they may practice them in their own countries. In addition, other professionals spend from a week to several months working on specific problems in wheat and maize.

Scientists at the Center do not look on themselves as "revolutionists" in the field of agriculture. But they are keenly aware of the importance of their work and the impact it can have on the future of the world.

Their attitude is symbolized by a modest exhibit in Mexico City's magnificent Museum of Anthropology. Amid the massive stone carvings and impressive relics of the Mayan, Toltec, Olmec, and Aztec cultures is a small display of corn, dug up from the centuries-old ruins and tombs.

The smallest ear is barely two inches long and has tiny kernels. It dates back several thousand years. The other ears in the display get progressively larger with each agricultural improvement of our early ancestors.

At the end of the case are several ears of the 20th century, many times the size of the first. □

Jerry E. Rosenthal, now retired, formerly was chief of the press and publications division in AID's Office of Public Affairs.

Who Gets Cleanup Benefits?

By Barbara Blum
EPA Deputy Administrator

Acid rain, airport noise, pollution of the Great Lakes, Los Angeles smog, poisons seeping from Love Canal—all are affected by use and misuse of the land. Cleaning up pollution also affects the land, and how we clean it up can either solve or add to the problem.

Programs to clean up the Nation's rivers and streams sometimes pay for sewers that promote urban sprawl, aggravate air pollution and lead to development patterns which reduce the economic vitality of cities. Effluent standards can affect where industries locate. Hazardous waste disposal sites, air pollution requirements, and the availability of clean water may influence regional growth.

Congress recognized the critical environmental nature of how we use the land when it enacted the National Environmental Policy Act (NEPA) ten years ago. Concern for effects of population growth, high density urbanization, industrial expansion, and resource exploitation is specifically noted by the Act in the declaration of national environmental policy. NEPA goes on to require that environmental impact statements be written to consider these land use issues together with health, cultural, and natural resource issues for any major Federal action.

But NEPA is more than just preparing environmental impact statements. There are important responsibilities and authorities in other than the portion of the Act involving environmental impact statements. The President, in furtherance of the NEPA authority, has addressed several specific land impact concerns through Executive Orders and policy statements.

Presidential Executive Orders establish policies for floodplain management and wetlands protection. White House directives also give guidance for agricultural lands, coastal zones, barrier islands, and urban community conservation.

To guarantee that all aspects of NEPA are properly considered the President also authorized the Council on Environmental Quality to develop regulations telling Federal agencies what they must do to achieve our national environmental policy goals. Regulations published in November, 1978, require that the environmental consequences section of any impact statement must address indirect effects (induced growth, population density, land use changes) and their significance; possible conflicts between the proposed action and the objectives of Federal, regional, State and local land use plans; and urban quality.

Each agency is required to have regulations which implement the Council's requirements. EPA's regulations identify specific requirements for dealing with the land use implications of our programs. EPA's decision to issue grant funds to communities to build or upgrade municipal sewage treatment plants has a great potential for affecting growth and land use patterns in a community. However, because of NEPA and its supporting requirements, negative effects can be managed.

An example is Cape May, N.J. Through a NEPA analysis EPA's Region 2 office found that waste treatment proposed for certain growth areas around this Atlantic coast resort community would directly and indirectly affect the coastal floodplain. To prevent this from happening Region 2 conditioned their grants to Cape May not only to restrict all sewering in the undeveloped floodplain, but also to make the community accountable for all future sewage hookups within the city to keep effects on the floodplain to a minimum.

Health and safety considerations are involved with this type of decision as are future costs. As Administrator Costle has pointed out, "EPA does not want to subsidize the creation of additional environmental problems which will require additional funding to resolve."

EPA Farm Land Policy

It was the same thinking—anticipating impacts, cost-effectiveness, "replacing our own divots," that led to the development of the EPA policy to protect environmentally significant agricultural lands by the Office of Land Use Coordination. Signed by Administrator Costle in September, 1978, this has become an important part of President Carter's rural policy. The policy has been described by the American Land Forum as "the first and most resolute of any Federal Agency," has been praised by the Chairman of the House Science and Technology Committee and other members of Congress, and has served as a catalyst to other agencies and a source for draft legislation.

Why the recognition and interest? Because America has an enormous stake in productive farmland for economic and humanitarian reasons. Wasting valuable land can hurt our international balance of payments and our ability to continue as a food source for hundreds of millions of people outside of the United States.

The recently announced *World Conservation Strategy* emphasizes that our planet's capacity to support people is being severely reduced. "If current rates of land degradation continue," it states, "close to one third of the world's arable land will be destroyed in the next 20 years." During this period the world's population is expected to increase by almost half—from four billion to almost six billion, according to the report. Only about 11 percent of the world's land has no serious limitations for agriculture, so we owe it to present and future generations to conserve what we have.

The EPA policy also firmly establishes the environmental value of farmland. The policy's backbone is the National Environmental Policy Act; but the Clean Air Act, Clean Water Act, Safe Drinking Water Act, and Resource Conservation and Recovery Act also provide a basis for EPA action and concern. The policy points out: "Agricultural land reduces runoff by absorbing precipitation, aids in replenishing groundwater supplies, buffers environmentally sensitive areas from encroachment, serves in wastewater treatment through land treatment processes, and . . . assists in protecting ambient air quality."

Problems for the future of agricultural land include soil erosion, acid rain, water shortages, and water quality as well as the conversion of land for other uses. EPA is interested in all of these problems, and has helped to fund the National Agricultural Land Study as part of an Administration-wide program request.

During the past year and a half, guidelines and regulations reflecting the agricultural land protection policy have been developed in the wastewater treatment construction grants program of the Clean Water Act. This multi-billion dollar effort has the greatest impact on farmland of any EPA program. Regulations implementing NEPA also include farmland protection, as do guidelines for solid waste disposal. Research in this problem area is being pursued by the Office of Research and Development. In December, 1979, the Office of Environmental Review, directed by William Hedeman, assumed the functions of the Office of Land Use Coordination and now has overall responsibility for monitoring the implementation of the policy. Regional coordinators have been identified in every region and progress is being made in tailoring projects to avoid or reduce their impact on prime unique farmland. Here are some examples:

- Sacramento, Calif.—20,000 acres of prime land have been placed into a permanent agricultural zone as part of a mitigation agreement with local government on a sewage treatment plant. The grant was conditioned to ensure protection of the land.
- Modesto, Calif.—Staged sewering, channeling city growth to lower quality lands, and promoting infill (the development of vacant parcels in already developed areas) will reduce agricultural land loss by 20 percent compared to an earlier plan.
- Aurora, Ill.—Strong consideration is being given to rerouting a sewer interceptor to avoid 19,000 acres of agricultural land.
- Pennsylvania—Mitigation measures are reducing farmland impacts in at least three projects.
- Patuxent, Md.— Clustered growth strategy will protect agricultural land and minimize primary and secondary costs to industry for waste treatment.

These are just a few examples. The important point is that protecting environmentally significant agricultural land is becoming a routine consideration in doing business in many parts of EPA.

An example of creative land use is this golf course, converted from a former town dump in Jackson, Mississippi.

Getting Full Benefits

EPA is investing billions of dollars in projects which, by cleaning up bays, rivers, and lakes, enhance the value and usefulness of neighboring land. How can we recapture some of these public benefits coming from environmental protection? With a little innovative thinking, and a lot of perseverance, a community can establish an exciting mixture of public and private water-oriented recreation and park possibilities as part of their cleanup responsibilities.

Congress recognized this potential with amendments to the Clean Water Act in 1977. There are several ways for making this happen.* The unifying concept involves obtaining multiple use of land and facilities dedicated to wastewater treatment and then developing recreation projects. For example the site on which a treatment plant is built often uses only a fraction of the land purchased for it. It can be designed for a number of compatible recreation activities including tennis and basketball courts, softball, boat launching ramps, and a host of other recreation facilities.

In one innovative project in Evergreen, Colo., the roof of a treatment facility has been used to provide recreation space. Easements obtained for an underground wastewater collection system might also be negotiated to allow for development of a walking and bicycle trail system like the one at the Tallman Island plant in Queens, N.Y.

Joint development is another option. It applies the principles of multiple-use to other kinds of projects close to the waste treatment facility. An example would be the joint use of a sewer right-of-way with railroad, highway, or power line right-of-way to develop a continuous trail system throughout a community. A prime example is located at Yellowstone Canyon Lakes. This project in Lubbock, Texas, is an exciting use of joint development of a wastewater treatment system, farming, recreation lakes, and over 26 miles of trails.

The dimensions of these opportunities nationally are enormous. Currently, some six thousand EPA-funded wastewater treatment plants are actively being planned or in construction. Construction grant money can be used to help plan the recreation facilities, so this offers communities an opportunity to get more for their recreation dollars. It also gives the public the opportunity to recapture some of the added benefits which come to the land from good environmental cleanup.

The success that EPA is having with its agricultural land protection policy and the success it can have with programs like the public benefit recapture program described above should give support to those who say that we can do more to protect the land from pollution and misuse. □

** An overview publication on these concepts was recently released by EPA and the Department of Interior entitled: "Recreation and Land Use: The Public Benefits of Clean Waters."*

Copies are available from John Gerba (A-104), Office of Environmental Review, EPA, Washington, D.C. 20460 or any EPA Regional Office, or from the Interior Department's Heritage Conservation & Recreation Service, Division of Community and Human Resources Development, Washington, D.C. 20243, or any HCRS Regional Office.

To Rebuild The Earth

By Eddie Albert

I want to talk to you about dirt. At least some people call it dirt. I call it topsoil. It's that precious razor-thin skin of life that covers our earth in most places. It averages around eight inches in depth.

On topsoil, the life, the health and the happiness of every human being on Earth depends: every morsel of food we eat, all of our clothes, our houses, timber, bricks, wallpaper, furniture, books, magazines, newspapers, to keep us warm or cool, and to cook our food. They all come from plants, trees, and that eight inches of topsoil.

When we arrived on this continent a few years back, our topsoil averaged around 18 inches in depth. With our intensive agricultural practices we have eroded it down until about eight inches are left between us, starvation, and world disaster. When that goes, you and I go.

There are innumerable examples of civilizations which have already travelled this route. For thousands of years, rich, powerful empires, their kings, and governments have sold off the sources of their wealth, and power—their oil, trees, land, metals, other precious resources—in order to extract for themselves dollars, votes, and security. They didn't know any better. We do, or we had better learn it fast!

Trees were the first to go. It always started with the trees. As the local populations grew, wood was needed for warmth, cooking, lime burning, and timber for housing. Solomon cut the famous Cedars of Lebanon for his great temples. Alexander and the others cut trees to build their warships. They sold trees for money for their treasuries. Rome deforested southern Europe from Spain to Palestine. The whole north of Africa was ripped off to plant more wheat for the expanding Roman population.

Replanting was unheard of. When the trees were gone, the topsoil exposed to the rain and wind and sun lost its organic matter, humus, source of soil life and the spongy quality that gives the soil its ability to hold water through droughts. The soil dried out, became dead dust and the next wind blew it away, or the next rain washed it down the river, and the land died. The plants and trees could not survive. The climate changed as the rain cycle slowed down with the deforestation, and the remaining trees expired.

The wild grass that came was soon demolished by goats who ate roots and all, and the once glorious lands of trees, lakes, rivers, cities, palaces, universities, families, artists, millions upon millions of healthy, working, creating, achieving people, quietly blew away. Splendid civilizations collapsed, and are now visible only as footnotes in the history books, or a few fragments of pots on a museum shelf.

Eddie Albert narrating script for an environmental project.

In Asia I looked down on an area that had once supported half a million people. Years ago it was covered with trees, houses, and people. Today you see only coarse sand, gravel, and thousands of gullies, caused by water erosion and deforestation, a wide, sickening expanse stretching to the horizon, that gashed and cut the once rich farmland. Their only harvest: dust and endless desert. Even the goats are gone. It was not a climatic change that doomed these ancient civilizations, it was mismanagement of the land. We are following that path.

It takes centuries of the weathering of rocks to grow an inch of topsoil, and thousands, even millions, of years to create a deep, fertile layer. On shallow sloping hillsides one great rainstorm can gash and gully slope down to bare rock in an hour. When nature's protecting cover of plants and trees is cut down, or the carpet of grass with interlocking roots is cut open by the plow, the destroying power of rain or wind is multiplied a thousand times.

Not long ago I remarked to my wife that a lot of people would be drowned in Bangladesh in five or six days. A week later she looked at me strangely and asked, "How did you know? The radio just announced that hundreds of people were drowned by floods in Bangladesh." I explained that a week before I had read that there were heavy monsoon rains in Nepal. Nepal is mountain country, and on the slopes the soil is very thin. When the trees that anchor the soil are cut down by the growing population, the unprotected soil can be washed down the hill in one storm. It takes about a week for the floods and silt to make the trip down the river to Bangladesh.

Millions of tons of eroded silt are carried down the rivers of the world and as the river slows down, the silt falls to the bottom and clogs up the center channel. The river floods over its banks and spreads out over the countryside, creating deep gullies, washing away farms, herds, villages, fathers, mothers, and children.

Our population explosion is at the heart of our problem. We can't increase our food production as fast as our world population increases: three new mouths to feed each second, 230,000 new mouths to feed each day. But with each passing day we have less land to work with. To meet this growing demand farmers are forced to put unbearable pressure on the soil, pressures our soil is unable to sustain.

Rotation of crops—wheat, soybeans, alfalfa—has been replaced by monoculture: corn, corn, corn, or wheat, wheat, wheat. This method exhausts the organic matter, the life in the soil, and increases pest problems, but people are hungry and the cash register is jingling. For every bushel of corn we harvest, we lose two bushels of topsoil. Topsoil is crucial to crop production, because it contains most of the organic matter, and the major share of nutrients required by the plants.

Terracing and contour plowing, both water-holding and erosion-preventing practices, are being dropped. The big new machines are too wide, and you can't afford to slow them down. The use of these large, heavy machines causes soil compaction. Compaction wastes water when the soil's hard surface permits the rainwater to rush off the hard surface.

Because of the high price of grain, there has been an appalling rush to put under cultivation millions of acres of the wrong land, marginal land, and farm it in the worst, non-conserving way.

Three or four years ago we added around nine million of such acres of marginal land, but less than half was put under good conservation practices. The following year we lost, through the resulting erosion, 60 million tons of rich, vital topsoil, 60 million tons that are gone forever. Can you calculate how many starving children could live off that?

After the Oklahoma Dust Bowl disaster in the thirties, a disaster that occurred because of cultivating marginal land in the wrong way, the government encouraged trees to be planted, green belts that would slow down the eroding wind and protect the topsoil. Millions of trees were planted and for forty years the trees did their job of protection. However, when the high grain prices hit in 1973, the Secretary of Agriculture encouraged the green belt trees to be cut down. "Plant fencerow to fencerow," he said.

"It was a short-sighted thing they did," says Professor John Timmons of Iowa State, "but we got an exhortation from Washington to increase yields, so farmers went out and plowed up everything."

When the marginal land lacks sufficient rainfall, the farmers must resort to irrigation. He often pumps up the ancient water from the underground pools. It took nature millions of years to fill these pools and we are emptying some of them in an eye-blink of time, faster than they can be recharged.

The Ogallala aquifer irrigates millions of acres in Texas and neighboring states. Heavy pumping has lowered the water table as much as 700 feet. Some of the wells around Lubbock have gone dry and land has been abandoned, left as potential desert. California has 6,000 new wells this year and the water table is dropping at the rate of six feet per month. In other words, the water pools are being mined, like coal. Eventually, they will be empty. It should be remembered that mining always ends in abandonment, and more desert. We are consuming our children's water. This kind of irrigation makes rich fathers, but poor sons.

Good flat farmland is also lost, being taken over for city development. We in the U.S. lose two to three million acres yearly with the building of dams, oil refineries, strip mining, housing developments, shopping centers, highways, parking lots, freeways, air fields, military uses, etc. on good arable flatlands necessary for food production.

Even recreational lands are suffering painfully. Armies of dune-buggies, skimobiles, motorcycles, four-wheel drive vehicles, campers, motorhomes, and trailers regularly descend on the desert areas, devastating the vegetation, compacting the soil, littering the streams, stirring up clouds of dust, setting fires, frightening and killing wildlife, killing the shrubs that hold the topsoil, and starting more soil erosion.

We in America have lost about one-third of our arable land since we arrived here. At the rate we are going we will lose another third in the next dozen or so years, while the population almost doubles. Today each acre feeds barely one person. At the turn of the century, twenty years from now, with the loss of acreage and our increased population, not one, but three people will be trying to eat off each acre that's left. Our children are going to be very hungry.

I recently have been in Peru, Colombia, Hong Kong, Mexico City, Manila, Malaysia, and Kenya. In each city I've seen tens of thousands of acres of shacks made from flattened kerosene cans and cardboard, millions of families with little food, water, no jobs, no sewage disposal, no medical care and no hope. In twenty years Mexico City and Tokyo will each have thirty million people. How will they get water? Where will the food be grown? How will it be delivered through the crowded streets? These people will not be mere numbers or statistics. They will be suffering babies, screaming children, weakened gasping mothers and fathers with no hope for the end of pain but death. And each day, the world has 230,000 more hungry mouths to feed.

My father used to say, "We learn from history that we learn nothing from history." We are devout in pursuing the same suicidal behavior of exploitation of the land, deforestation, refusal to study the needs of our precious topsoil, and indifference to the health, the survival of our grandchildren and our future generations.

What can we do? Fortunately, the road ahead, if we wish to travel it, is well charted. But it is difficult.

We can slow down the birth rate. All are familiar with that problem. We can stop our waste and over-consumption. We can stop our waste of food. The food we throw away daily could feed over 100 million hungry people. We in the U.S. are about 6 percent of the world's population but we use up 38 percent of the world's energy and food.

When we look at that photo of our little earth, taken from the moon, it looks small and beautiful, but it also looks lonely. It is. The nearest neighbor is light-years away. We are all by ourselves, and there is only so much land, so much water, oxygen, space, and that's it. There isn't ever going to be any more, and there is no place next door where we can go to borrow. We must learn to love and respect this beautiful earth, and learn to protect and conserve what we have left.

There isn't a whole lot of time. The eminent historian, Toynbee, who has spent a lifetime studying the birth and death of civilizations, puts it this way. He says, "I am not sure whether it is my daughter, or my grand-daughter who will witness the death of this civilization."

There are moments in the history of the world when a new time begins. Usually it is at a time of desperate crises. We are at such a moment of great change in our history, and we must be aware of it. We have a choice. We can stand off and let history repeat itself and watch the death of our hard-earned country; or we can pull ourselves together, go into action and solve the problems of food and soil. We have the know-how, the technology. We need discipline and courage, both good American words, but we also need a new awareness and greater vision.

There is a specific moment which we can look to as the beginning of this new Age of Awareness. Do you remember the first time you saw the photograph of the earth from space? That was the moment, the Apollo shot. We can never be the same. That photograph showed us that this earth is our home, that we are indeed one family, that we are in this together and we have a fight on our hands. We know that there is enough for everyone's need, but not for everyone's greed. We must use our knowledge now for the survival of the human family.

Our task: to rebuild the earth. □

Eddie Albert, film and TV actor, has narrated and appeared in several productions on environmental subjects including EPA television spots on ocean dumping and an EPA / Department of Energy film, "Solar Energy: The Great Adventure." The above article was excerpted from a speech this year to the National Association of Conservation Districts.

We Must Not Break the Hoop of Life

By Senator George McGovern
(D., S.D.)

The hoop, or circle, is the symbol used by the Sioux Indian people of South Dakota to depict their understanding of life. It characterizes the interrelationship between man and nature.

The lesson of the hoop is that man cannot dominate nature. Man, animals, water and plant life; all occupy equivalent positions along the hoop of life. What man does must be in harmony with nature or he risks breaking the hoop—disrupting nature's equilibrium—with unavoidable consequences for occupants of other niches along the continuum leading inevitably back to man. It was their desire to stay in "right relationship" with the world as they understood it which is the source of the Sioux's rich heritage of ceremony and superstition.

The people who then "settled" the Great Plains had a different philosophy. They placed God over man, with man as the steward of God's creation. Our conservation ethic springs from the desire to be good stewards. The environmental movement has refined that concept for modern, scientific minds.

Today we use the science of ecology to enlighten ourselves to the pattern of interrelationship between ourselves and our environment. The logic of ecology is the motivation in environmentalism.

Soil conservation and cropland conversion haven't yet become environmental "glamour issues" able to compete with preservation of wilderness, designation of wild and scenic rivers, promotion of clean air and water, or rejuvenation of endangered species populations. But remarkably, a Louis Harris poll commissioned by the U.S. Department of Agriculture reveals most Americans recognize the need for national policies addressing the problems of erosion and loss of prime farmland.

Published earlier this year, the poll indicates half of our people consider the misuse of soil and water resources to be a serious problem. By a margin of 7-to-1 they are willing to accept Federal action to protect farmland from erosion. Over half consider the loss of good farmland a serious problem.

My experience as this Nation's first Food for Peace Director in 1961 and 1962 drove home for me the lessons I learned growing up in South Dakota's agricultural economy. The United States' agricultural productivity is the greatest in the world. The American farmer feeds not only our people here at home, but his labors mean the difference between life and death for millions of people throughout the world whose lives are marred by chronic hunger and malnutrition. American agriculture is the foundation of our national economy. The value of exported agricultural produce is more than $37 billion.

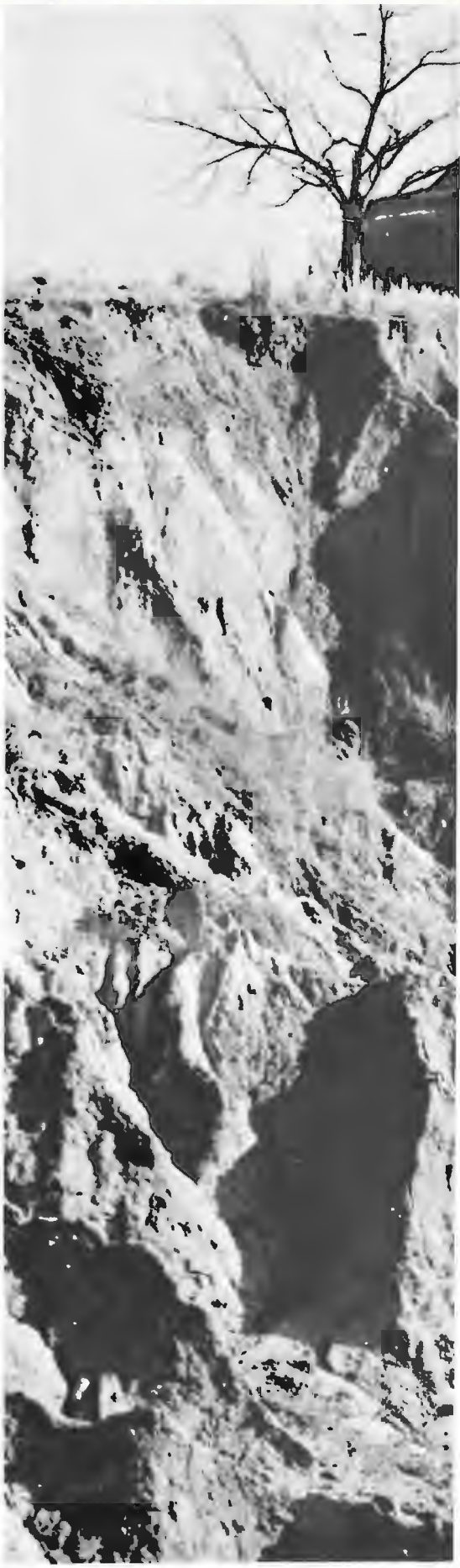
As proud as we can be of those claims, our Nation's land-use patterns are jeopardizing our productive capacity. In this "era of plenty" we've allowed our cities to sprawl into the countryside. Massive erosion is reducing the productivity of our remaining cropland acres.

Cropland Conversion

In 1978, the Land Use Executive Committee of the Department of Agriculture looked at the problem of diminishing cropland and concluded we aren't facing a major crisis. They did recognize we are today cropping 367 million acres, only 20 million acres short of the upper limits available for our use. They found that although we lose 2.5 million acres of cropland through conversion to other uses we can draw comfort from the fact we add another 1.3 million acres to our cropland base each year.

The fact is, these additional acres aren't our best. They require irrigation, special drainage techniques, land-clearing and energy intensive technologies to make them tillable. In the process, we also pay high environmental costs. Why, then, do we convert cropland acres to other uses?

"Prime farmland" is the best available for agricultural production. It's either flat or gently rolling and isn't susceptible to erosion. It's our most energy-efficient acreage. The quality of its soils, its growing season, and annual precipitation rate assure its high productivity. But, these same qualities make prime farmland ideal for building houses, constructing roads,



". . . Despite the harsh national lessons of the Dust Bowl era and the Depression that followed, we are continuing to lose about 4.5 billion tons of topsoil to wind and water erosion each year."

and paving-over as parking lots for shopping centers.

Soil Erosion

When I was a boy growing up in South Dakota, the impact of soil erosion was driven home to me by the desperation of farmers who couldn't work a living on parched land from which topsoil was stripped in dramatic dust storms. When those dust clouds blew into Washington, D.C., the Nation mobilized to combat soil erosion. Shelter belts were planted. The Civilian Conservation Corps was recruited.

But despite the harsh national lessons of the Dust Bowl era and the Depression that followed, we are continuing to lose about 4.5 billion tons of topsoil to wind and water erosion each year.

The loss of topsoil to erosion impairs the long-term productivity of our cropland. But, as the Soil Conservation Society of America points out in their recent assessment of soil conservation policies:

The process of erosion is invisible to most people. . . . Because [it is] we have a sense of complacency about it. Statistics stir the blood of only a handful and that handful cannot do the job alone.

I find myself among that handful of people and the statistics do stir my blood.

Average soil loss tolerance is expressed in terms of "T-value." On cropland, pasture and forestland, T-value is generally estimated to be a 5-ton annual loss per acre. Any loss greater than that annually is beyond the soil's ability to maintain the same quality of production.

The National Resource Inventories estimate 97 million acres of cropland in the United States experienced rates of sheet and rill erosion in excess of T-value in 1977. That's an area the size of Iowa, North Carolina, and Ohio combined.

While harder to come by, the statistics on wind erosion are equally as startling. We know with some certainty that Colorado lost 8.9 tons of topsoil per acre in 1977. That's 3.9 tons over T-value or the soil's tolerance. New Mexico fared worse, losing 11.5 tons per acre; over twice the soil's T-value. Texas was worst of all losing 14.9 tons per acre; almost three times the T-value of Texas soils.

The problem of erosion is compounded by the fact that it sometimes stimulates cropland conversion. A farmer with erosion problems may begin to see his crop yields drop to unprofitable levels. Unless he spends a great deal of money in soil treatment or uses greater amounts of expensive petroleum-based fertilizers, he must accept the reduced yields. Often he will instead convert that cropland to pasture and bring some of his pasture into crops. While this will help defer his immediate loss in production for another generation, he is at the same time masking the full impact of erosion and its eventual impact upon our national economy.

The Combined Problem

The National Agricultural Lands Study undertaken by the President's Council on Environmental Quality and the U.S. Department of Agriculture estimates if conversion of prime farmland continues at its present rate, we can expect Colorado to lose another 345,000 acres by the year 2000, leaving only 1.5 million acres of prime farmland in the entire State. New Mexico, by the same projection, will have lost 44 percent of its prime farmland by that time. And most startling, Florida will have lost *all* of its prime farmland by the year 2000 if present rates of conversion go unstemmed there!

Think of it: Florida produces over half of the entire world's grapefruit and a quarter of the world's oranges. Florida's cash receipts from citrus fruits alone exceed $1 billion annually. Its return on a whole array of fruits and vegetables—including tomatoes, celery, sweet corn, lettuce, green peppers, snap beans, cabbage, watermelons and potatoes—comes to almost $500 million. Cash receipts on Florida strawberries are over $16 million, and even the lowly cucumber weighs in at $22 million annually.

While it may have been politically soothing for the Land Use Executive Committee of the Department of Agriculture to conclude we didn't face a "major crisis" in 1978, there can be little doubt one is on the way. Sadly enough, our first chief of what is now the Soil Conservation Service made the same prediction in the 1930's. He was heeded then. His words shouldn't be forgotten now.

Hugh Bennett, as the Soil Conservation Society of America claims in the preface to their assessment of soil conservation practices, wasn't wrong; he was only ahead of his time.

Soil erosion . . . and the conversion of our most productive land . . . to nonproductive uses cannot fail to reduce our nation's productivity. . . . Soil is worth saving. We must keep making that point again and again. Making the point becomes more difficult as society becomes more and more urban oriented and many people think of milk as coming from supermarkets instead of the cow. We must work harder with each new generation to make our case as people get farther and farther removed from the land.

The American Land Forum puts it another way: "The trouble is, when the problem 'goes critical' it may well be beyond remedy."

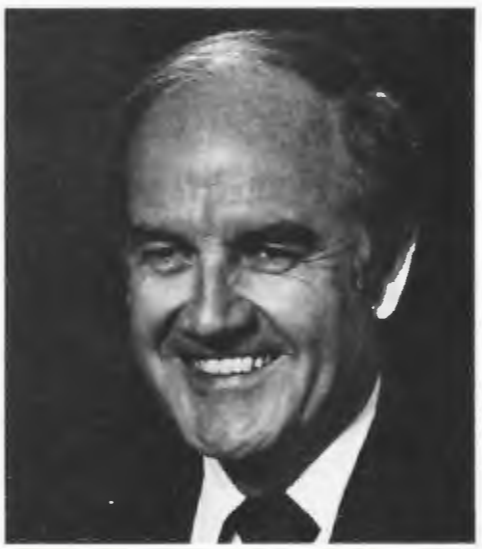
In the absence of an aggressive national policy designed to meet this problem directly, we are forcing ourselves in the decades ahead to advance programs with little more vision than razing our suburbs and shopping centers and jackhammering our highways and parking lots out of existence in what will be a futile effort to to return the land to agricultural production. We are going to force ourselves to spend time and energy seeking ways to carry topsoil back to the land—assuming we can "catch" it—in an effort to do what nature does "naturally" over eons. These won't be attractive policies by any criteria; economics, social impacts, energy conservation, or environmentally.

Homilies passed down the generations from the farmers who were the first stewards of America's cropland give us a clue to a wiser course in saying, "A stitch in time saves nine," or "An ounce of prevention is worth a pound of cure."

The science of ecology, if we will but heed its lessons, tells us what must be done so that we don't upset nature's equilibrium in a way that will jeopardize man's existence and that of a host of plant and animal species.

But sadly enough, the heritage of the Sioux held the answer all along. We must not break the hoop of life. Having done so there are no ceremonies or superstitions in which modern man can escape the consequences of his action, but we can use our minds and our technology to help return us to "right relationship" in regard to the land over which we are today the stewards.

The impacts of the crisis will be so profound and so less easy to remedy than our energy problems that soil conservation and cropland conversion deserve to be the environmental "glamour issues" of this decade. □



Senator McGovern is next in line for Chairmanship of the Senate Agriculture, Nutrition and Forestry Committee and is Chairman of its Subcommittee on Nutrition. He also is a member of the Senate Foreign Relations Committee and the Joint Economic Committee.

American Indians: The First Environmentalists

By LaDonna Harris

Most of our history books give the impression that until the Europeans came, this continent and its resources were unused and that their values were unrecognized. But those of us who are from or studied the first people on this continent know otherwise.

The First Americans

The first people on this continent were groups of people who lived in harmony with its life cycles. They were different groups of people—different from one another who had different languages, different cultures, different religions, different beliefs—nations of people joined together for common purposes. These nations had systems of governments and regulated themselves to provide for their common defense and common welfare. Each nation thought of themselves as "The Peoples." All the nations had one underlying commonality—an understanding and a respect for the total environment. Every rock, every plant, every animal, every insect, every person had a role to play in maintaining the delicate balance that made life possible or impossible. Indians were not only the first peoples on this continent, they were the first environmentalists.

The Newcomers

The newcomers, on the other hand, came with a much different perspective, "Civilization" had come early to them. In their homelands many had already crowded into cities. Some were adventurers bent on gaining riches based on their own economic values. Some were criminals. Some were religious fanatics. Most were victims of oppression either of the rich and ruling classes or of religious persecution. They came seeking freedom and a new way of life.

The Difference

If there was a basic difference between the newcomers and the people they found here, it was in their approach to nature. The new people attacked their new environment, determined to conquer the land and its people. They were not willing to learn to live within the existing system. The first peoples lived within the various environmental systems of the land. They understood its hurts, understood its needs, and its methods of healing itself. They also understood that it sometimes needed a little help from its friends.

Before the influx of Europeans, there was space and there was time for nature to heal itself when something was taken out or added to the environment. With the newcomers intent upon extracting natural resources for their own support and for export to Europe, the balance of nature was relatively quickly destroyed. Wilderness was replaced by farmland in vast quantities. Cities grew up along streams which served as transportation routes and as waste repositories. Trees were cut down to meet housing requirements and to clear more land for farming. New technologies and new diseases were introduced into the environment. Indians died from the new diseases and moved following game or were driven out with the foreign weapons and sheer numbers of newcomers. Their environment protection systems along with education, economic, and governing systems, all of which were closely related to the cultural and religious beliefs, were badly disrupted.

The years that followed were not a proud chapter in the history of America insofar as the relationship between the Indian nations and the newcomers and later the United States are concerned. However, some three hundred Indian nations have survived and are alive and if not well, are recovering today.

Five Hundred Years Later

After almost five hundred years, there is at least a rising consciousness on the part of us who now share this continent that this land and its resources are not endless.

Indians are still the most serious environmentalists. Indian nations were forced onto smaller and smaller plots of this continent. Our reservations, from the largest which is larger than the State of West Virginia to our smallest of just a few acres —are the only land we are ever going to have as a people. We must take care of what we have. We cannot allow our land to be polluted or washed away. We cannot allow the underground watertable to be polluted—our plants to die from this pollution. We cannot continue to pollute our air so our eyes and lungs hurt from the coal dust that is being stripped. We cannot continue digging holes in our mother without reclaiming and revegetating her.

How Do We Work Together?

How do we work together to get more people, lawmakers, law-enforcers and all people to understand and work towards protecting what's left of our environment? And to ask why some people want to do away with the Environmental Protection Agency or any other governmental agency that is responsible for protecting us in our environment? Maybe in asking these questions we will be able to provide new answers and new solutions to our ever-growing problems. Indian people believe there is a purpose in all things—maybe "The People" are here for that purpose.

Indians have survived because of their abilities to cope with changing conditions. Perhaps a part of this comes from an inner strength that comes with the special relationship with the land. As we approach the end of the twentieth century, there is a renewed determination in the Indian community to protect that which we have left. We all have a responsibility in this effort. Some have to make crucial development decisions. Some have the ability and therefore, the responsibility to provide reliable information to the decision-makers. Some have to carry out the decisions that are made. Some will have to question decisions and look for better ways. Some may have to forego immediate economic gains and make extra effort to find environmentally sound means of development.

Indian efforts will bring benefits to those around us and the country as a whole. There is no longer time or space for nature to heal itself. It must have help from its friends. Together, perhaps, we can provide that help. □

La Donna Harris, a Comanche Indian, is President and founder of Americans for Indian Opportunity. She also is a member of the Environmental Advisory Council of the Department of Energy and the National Commission on Mental Health, and serves on boards of several national organizations. She is the wife of former U.S. Senator Fred Harris of Oklahoma.

Vanishing Farmland: Do We Need a Crisis?

By Representative James M. Jeffords (R-Vermont)

Do we need an urgent crisis to form responsible public policy that would balance the need for agricultural land with economic growth?

As *legislators, we like to think that the* answer is *no*—that Congress and State legislatures have the ability, through laws, to balance conflicting demands. Experience of the past, however, shows that such action is slow in coming, especially in Washington.

One example of our slow national response to issues that should have been recognized while they are still only *potential crises* is America's energy situation.

This Nation's energy crisis did not just happen—it was many years in the making,

and it could have been predicted. Up until 1948, the United States was a net exporter of oil. From 1948 on, however, the U.S. thirst for oil increased almost geometrically, and what was then cheap imported oil took a larger and larger share of the U.S. market. Between 1973 and early 1979, U.S. oil imports almost doubled. The magnitude of the impending energy crisis did not become generally known until the 1973 OPEC oil embargo and successive price increases by OPEC delivered powerful political and economic shocks around the world.

The energy crisis is no longer impending, it is *here*—yet the U.S. still does not have what could be called an energy policy.

Terrace farming in contour pattern has long been practiced on many American farms to retain topsoil.

It has only continuing debates over proposed national energy goals.

If the energy crisis has illustrated anything, it is that events of the past can give indications of the future. An increased reliance on cheap foreign oil, in retrospect, should have told us of our possible bondage to foreign desires. Our thirst for oil should have told us that there was a need to develop domestic energy alternatives. Thus, the U.S. dependence on foreign oil, the OPEC oil embargo, and the OPEC cartel oil price increases were only symptoms of an energy crisis; the cause of the crisis was the lack of a domestic energy policy to encourage conservation, domestic self-reliance, and openness to alternative fuels.

It is easy to draw comparisons between these events, and what they should have told us, and the happenings of the past few years related to U.S. food and fiber production:

When there is an abundance of a product, it is hard for people to believe that there may be a scarcity in the future.

Shrinking Cropland Base

The United States has been an agricultural giant. The share of U.S.-grown crops going abroad has risen from one-fifth to one-third, while our own citizens continue to eat better and better.

Even though this food supply situation looks optimistic, the future does not look promising at all for either increasing yields or increasing (or even maintaining) the cropland base.

What is the potential for increasing the cropland base?

Each week, the United States loses to other uses 20,000 acres of its best agricultural land and an overall total of two to three million acres of farmland each year. Most of this land is lost from agriculture forever—it could be reclaimed only at considerable cost and loss of other values. At this rate of conversion, the remaining American cropland "frontier" that could be put into production at minimal cost and without serious environmental damage will be *closed* in another decade.

Preliminary statistics compiled by the National Agricultural Lands Study, now being conducted by the U.S. Department of Agriculture and the Council on Environmental Quality, show that the Nation may lose as much as 22.4 million acres (7 percent) of its prime farmland by the year 2000. In New England, the loss of productive agricultural land already has been so great that the region now imports over 80 percent of its food, and prices are projected to be from 10 to 15 percent higher than if the commodities were produced within New England.

If this country is losing prime agricultural land at such a rapid rate, what about using the marginal or less productive land to increase production? Such a shift would be expensive. Not only does marginal land require more inputs of fertilizer, petroleum fuels, and agricultural chemicals, but also such land is prone to increased soil erosion and other environmental hazards. Over the next 50 years, the loss of productivity due to cropland erosion will be equivalent to the loss of from 25 to 62 million acres. Using marginal land or less productive soils could further increase the potential for soil erosion.

No Technological Fix

What about the potential for increasing productivity through technological advancements? In the period following World War II, American farmers took advantage of good weather and advances in agricultural technology to boost crop production by 150 percent over the 1950 level—on 50 million fewer acres. Yet technological advances in the foreseeable future probably will be less dramatic—evidence seems to run counter to any more "quick fixes." A 1975 report by the National Academy of Sciences concluded that no significant breakthroughs of the magnitude of hybrid corn can be reasonably predicted over the next two decades. A 1976 Congressional Research Service report concluded that past levels of agricultural research and development will not be adequate for America's long-term future needs.

In the absence of more "quick fixes," and with a continuing decrease in the cropland base, I am concerned about America's ability to meet domestic and world food demands.

Worldwide food demands will continue to increase sharply through the next century because of population increases; drives for better nutrition and against starvation; changes in food and fiber preferences and other market adjustments; adaptation by crop pests and diseases; and periodic upheavals in weather and politics. In fact, one expert has predicted that we will need to grow more food by the end of this century than has been produced since world agriculture began.

Will the United States be able to take advantage of either the economic or the humanitarian opportunity that this worldwide food demand presents? I believe strongly that the answer will be *no*, if we don't steady the farmland base and solve these other problems with American agriculture:

- The remaining agricultural land left in production will require more inputs of fertilizer to maintain our level of production.
- Costs of mechanization and agricultural chemicals are increasing rapidly along with the price of the fossil fuels on which they rely.
- Chemical technology, as applied to modern agriculture, can hardly keep up with the growing resistance of insect pests and weeds to the compounds used. Environmental legislation has necessarily restricted the use of many once-routine agricultural chemicals because they are toxic to mankind and to fish and wildlife as well as to the organisms they were designed to inhibit.
- Competition for water, rising pumping costs, and declining water tables may cause the abandonment of farming activities in many areas of the western U.S. So will the significant salinity present in the upper layers of 20 percent of the soils in the western U.S. Production has been eliminated or significantly reduced on 150,000 to 200,000 acres because of increased salinity, and the number of acres is increasing annually at a rate of about 10 percent.

As if those weren't enough troubles for American agriculture, an "oil backout plan" proposed by the Administration without the necessary environmental safeguards could accelerate the acid rain problem in the United States and Canada, just as industrial growth has in Europe and Scandinavia. Acid rain and other forms of atmospheric deposition can cause the leaching of valuable nutrients from the soil as well as directly affecting forest and crop plants.

Finally, we know that vast amounts of American land will be required to grow crops that can be used for alcohol production—a further demand on what is already a limited resource.

An Environmental Resource

Aside from its importance for producing crops, of course, and for providing a satisfying way of life and means of livelihood for several million people, farmland also is an important environmental resource. Open agricultural land provides a recharge area for groundwater supplies. Metropolitan areas have used agricultural land to recycle wastes. Cultivated and forest lands absorb great amounts of carbon dioxide from the atmosphere. The only better sinks for this pollutant are the oceans. Agricultural areas in or near metropolitan areas provide ways for urban citizens to learn about agriculture and the natural environment. I could list many more positive contributions of agricultural land to America, but most should be obvious.

If there is an agricultural land problem, what can be done about it? Even those who agree that there is a problem have trouble answering the question. Some of them are asking the question!

Few of us want national land use planning. Yet, if we continue to wait, as we did with energy, a massive Federal response will be inevitable. The prospect of the Washington bureaucracy's taking over the management of America's farmlands is frightening. Is it inevitable?

Many people inevitably argue that any discussion of a national public policy on agricultural lands protection implies that the discussant is *for* national land use planning. Such an argument is ironic indeed—the Federal Government has had a pervasive influence for many years on how land is used in this country. During discussions of proposed national land use policy legislation in the 92nd Congress, a list was prepared of about 75 major Federal legislative enactments, policy statements, and governmental reorganization efforts for the period 1944-71 that related to land use. Within the Executive Branch, 23 Federal departments and independent agencies were identified as having programs related to land use policy and planning; 112 Federal land-oriented programs were identified. The National Agricultural Lands Study recently identified more than 110 Federal programs that might impact on agricultural land.

Encouraging Local Government

The issue, then, is not national land use planning, but rather how to minimize the impact of Federal programs on the conversion of productive agricultural land, how to encourage State and local governments to consider the protection of productive agricultural land during their own planning processes, and how to help people who want to continue farming or ranching withstand the pressures to get out.

In this session of the 96th Congress, 80 of my colleagues joined with me in sponsoring legislation to encourage the protection of agricultural land. The legislation I introduced had two purposes: *First,* to encourage States and local units of government to develop programs to protect agricultural land. The best and most appropriate land use policy, I believe, is that which is developed and implemented at the local level. *Second,* the bill as drafted would have required that Federal actions would have to be consistent with State and local plans for agricultural land.

The bill failed in the House of Representatives on February 7 of this year, but the need to further the protection of productive agricultural land is still very much alive. I am encouraged that many State and local governments have developed unique ways to protect this vital resource of strategic importance to the future of our Nation. Most of these techniques recognize that the farmer's equity in his land must be protected. I also am encouraged that at least two Federal agencies—the U.S. Department of Agriculture and the Environmental Protection Agency—have developed internal policies relating to productive agricultural land.

The remaining challenge is not only to have other Departments and agencies develop similar internal policies, but also to have better coordination among these agencies and between levels of government. A further challenge is to greatly increase the flow of information to communities that need to make difficult choices regarding their land base and other natural resources.

I am very encouraged by a recent Louis Harris poll that indicated that 53 percent of Americans consider the loss of productive agricultural land to be a "very serious" problem. The public seem to understand an old saying by Will Rogers that "land is something that they don't make much of these days."

As a representative of the people of Vermont, and as one of 435 Congressmen interested in the long-term future of our Nation and all its citizens and neighbors, I will continue my efforts to encourage and support efforts by landowners themselves—and by the organizations and government agencies that assist them—to protect one of our most important natural and economic resources, agricultural land. □

Representative James M. Jeffords is a key minority member of the House Committees on Agriculture and Education and Labor. He has sponsored legislation to help farmers and local governments protect and strengthen American agriculture.

Energy From Biomass

By Philip H. Abelson

(Biomass is organic material such as trees, crops, seaweed, and algae that has captured and stored energy from the sun. This energy can be released through conversion processes to produce various fuels, with byproducts for food, fertilizer and chemicals. The following is a summary of the World Congress and Exposition on Bio-Energy, held in Atlanta last April, where specialists from 40 countries met to discuss progress in utilizing this energy source.)

Many countries are moving with increasing urgency to obtain larger fractions of their energy from biomass. It is evident, based on their presentations at the World Congress, that Brazil, China, Sweden, and the United States are leaders in this field. The Brazilian program is impressive, especially in the production and use of alcohol. At present, most Brazilian automobiles burn gasohol, which in their case contains 10 to 20 percent alcohol in comparison to 10 percent used here in the United States. But the Brazilians are moving beyond gasohol to employ only alcohol as a motor fuel. This is advisable, since an automobile can burn 80 percent alcohol-water mix and thus avoids the expenditure of much energy in distillation.

This year, Brazil will build 250,000 cars designed to use alcohol, and will convert another 70,000 existing automobiles to burn alcohol. The source of their fuel is fermentation of sugar from sugarcane, and hundreds of distilleries are being built in rural areas.

Another very interesting effort is being made by Sweden, which is in the initial stages of a great program to shift from its present 70 percent dependence on imported oil to achieve complete energy independence. The Swedes have no coal, no oil, no natural gas. The thought of a sudden cutoff of oil is something to make them literally shiver because about 40 percent of the imported oil is used for home heating. Prudence dictates they adapt to other energy sources. Fortunately, a large area of the country is covered with trees. The Swedes estimate there is sufficient forest potential to shift to wood as a prime source of energy, and they can even visualize that the gross national product could increase while they do so.

They plan to grow fast rotation trees that can be harvested every three to five years, and they are experimenting with willow and birch. The trees are mowed down and collected in winter and the next spring new shoots arise from the stumps so the tree does not have to use energy in establishing a new root system.

The efforts of the People's Republic of China to produce methane from biomass wastes are very impressive. They have about 715 million biogas installations. One of the dark things happening today is that in many countries the forests are being cut down for cooking fuel, with consequent deforestation and soil erosion. In the Chinese case, replacement of wood with methane derived from human and animal wastes makes a program of reforestation feasible.

Dr. Melvin Calvin of the University of California, Berkeley, examines a member of the poinsetta family (Eurphorbia lathyris), a weed now growing wild that could be cultivated to produce petroleum.

In the United States we are conducting at least six hundred different research and development projects aimed at increasing use of bio-energy. Most impressive was the display of equipment at the exposition. Particularly noteworthy was a tree chipper that could reduce a sizable tree, branches and all, into chips about the size of an old silver dollar in about thirty seconds.

Other pieces of equipment were designed to handle the collection and processing of biomass. One item, available for $6,000, was a complete portable alcohol production device that included all phases necessary to obtain alcohol from grain. One can visualize that alcohol production equipment for the farm will eventually be even cheaper and would fit into a total system.

One of the problems of processing biomass is that the material usually must be collected and hauled to a production plant with high transportation costs. For example, a man from International Paper told me he could get only $30 a ton for wood in Maine, while 200 miles away in Boston he could get $60 a ton. Most of that difference in cost was in handling and transportation.

A small item that drew attention at the exhibit was a solar still that operated under a partial vacuum. Many of the other exhibits at the exposition were capable of playing a role

in small, decentralized energy systems.

One of the lessons to be learned is that each country has its own opportunities for production of energy. For example, in Brazil the emphasis is on sugarcane and cassava, while in Sweden the energy source will principally be wood.

In terms of renewable resources, the various regions of the United States also have different opportunities. Trees will be important in the southeast, in the Atlantic states, in Michigan, and in Oregon and Washington. In certain areas, wind energy will be useful; in others, geothermal. In the southwest, solar energy will have a particular advantage.

The crucial determinant in the adoption of bio-energy will be economics. Governments can encourage the production of fuels such as alcohol through subsidies. But the large-scale use of bio-energy will depend on competitive costs. If big money could be made now in bio-energy, many volunteers would jump in.

Food Versus Fuel

One issue that surfaced repeatedly at the Congress can be described as food versus fuel, or lumber, pulp, and paper versus energy.

Consider the economic situation of the large forest product companies in the United States. High-grade lumber can be sold for as much as $1,000 a ton. At present, the price of oil is about $200 a ton. There is about twice as much energy in a ton of oil as in a ton of wood. Thus, there is a difference factor of as much as 10 in the energy cost of those two items.

A similar situation prevails with some of the paper products. The cellulose in them is much too valuable to be used as energy. The going price of paper is on the order of $400 a ton. Again, there is a difference factor of 4 in favor of producing paper. Only the wastes and residues that cannot readily be used for products are today economic when used as energy sources. The situation in the future, of course, could change greatly depending on oil prices and on the availability of tree materials grown by fast rotation.

Wood has some advantages. It can be gasified at about 700 degrees Centigrade, against 1000 C. for coal. In addition, there are far fewer problems with sulfur in the use of wood. Nevertheless, the present economics in most places favors coal as the source of the gas. However, if concerns about carbon dioxide problems are demonstrated to be valid, a great social pressure could arise that might curtail the use of coal.

EPA And Bio-Energy
By Don Lief

EPA's role in the development of bio-energy includes many activities directly related to renewable energy sources. The reasons for EPA's involvement include:

- Environmental benefits from reduced consumption of polluting hydrocarbons and fossil fuels.
- Slowing the cost-spiral of collection, treatment, and disposal of biomass.
- Incentives for innovative technologies to meet clean air and water standards while spawning new fuel production.

From an environmental perspective, biomass converted to energy offers considerable promise. Reclaiming the products of photosynthesis, however, will not be without side-effects, some of which are not yet fully understood. Full-scale commitments to bio-energy development will have to deal with questions of human health, ecosystems, and economics.

Several of EPA's laws encourage research and development in bio-energy, particularly the provisions for innovative technology in the Clean Water Act and the Resource Conservation and Recovery Act. Those laws, plus the Clean Air Act Amendments, also have direct regulatory bearing on biomass-derived fuels, especially alcohol and wood.

With its broad interest in bio-energy, EPA was among the first Federal agencies to support research dealing with oil production from wastes, conversion of wood wastes to sugars (the raw material for distilled alcohol), pyrolysis of municipal and industrial waste, and sylviculture. The Agency continues to support the concept of bio-energy in several program activities.

The rapidly growing popularity of household woodburning stoves may pose a serious environmental problem. Airtight stoves emit high levels of carbon monoxide and polynuclear organics. EPA has commissioned the Battelle Memorial Institute to study stove emissions, and eventually the study will lead to proposed improvements in the design and manufacture of woodburning stoves, making them safer and more heat-efficient. Without improvements—and better public understanding of the problem—residential use of wood could undo some cities' advances in air quality.

On the horizon, Federal subsidies for gasohol will inspire expanded production of grain-derived alcohol. As research in cellulose conversion shows results, wood waste may also become a primary raw material for this fuel. Meanwhile, however, EPA is conducting an assessment of the environmental impacts of gasohol production facilities (e.g., treatment of high-volume sludges). The conclusions will be used by State permit-granting agencies in considering industry site applications.

In addition, the actual use of gasohol is being tested by EPA's Motor Vehicles Emissions Laboratory at Ann Arbor, Mich. Its recent studies have found that gasohol-powered autos have much lower emissions of carbon monoxide but hydrocarbon levels increased 18 percent. There were also slightly increased nitrogen oxide and aldehyde emissions.

Solid waste is a major EPA concern. The Agency gives strong support to localities that are interested in different approaches to waste-to-energy conversion. One of the most sophisticated examples of this use of bio-energy is Akron, Ohio's new recycling plant. When in full operation this fall, the plant will supply steam heat for 250 downtown businesses. Air quality will improve because Akron does not have to burn 500,000 gallons of oil a year. In addition, landfill requirements there will drop by an estimated 70 per cent.

EPA planning grants in resource recovery—including waste-to-energy conversion—have gone to more than 60 U.S. cities. These grants are further supported by technical assistance. A detailed model for resource recovery project management has gained wide acceptance, and more than 2,000 persons have attended EPA's regional seminars for detailed "how-to" information.

Ultimately, bio-energy must compete in economic terms to make a significant contribution to America's energy independence. It will require extensive research and development, effective technologies, long-term supplies of raw materials, and public acceptance. Although other agencies retain primary responsibilities for biomass development, EPA will continue to support this trend, while assuring that environmental considerations are not overlooked. □

Don Lief is energy coordinator for EPA's Office of Public Awareness.

Production of Ethyl Alcohol

At this time, an important application in which bioenergy is competitive, or nearly so, is in the form of a liquid fuel such as ethyl alcohol. Already, from the standpoint of Brazil's national economy, domestic alcohol is superior to imported oil. Considering the trend in world oil prices, the economics will soon be much more favorable in Brazil.

Economics will also be favorable here, even without the present tax subsidy. The creation of an expanded capacity to produce alcohol in the United States is now proceeding.

If 10 percent of the corn crop were devoted to alcohol an annual production of 1.8 billion gallons would result. This would replace about 1.6 percent of the annual consumption of gasoline. If larger amounts of grain were used, the argument about food versus fuel would begin to become loud. Already, higher prices have led to a decrease in the use of gasoline, much higher prices seem inevitable, and interruptions of supply are likely. These factors could result in a much larger demand for the use of alcohol.

Only part of a large demand could be obtained from grain. The remainder must come from wood. In addition, methanol derived from wood or coal is likely to be used. At the conference, many presentations were made on the use of wood as a source of alcohol. They dealt with some of the major problems that are involved, largely due to wood's complex molecular structure.

Increasing Production of Biomass

When one surveys the overall situation—demands for food, materials, paper, wood—it becomes apparent that it is necessary to expand the biomass supply. Instead of having a fight about dividing a small pie, let's expand the size of the pie.

For example, there are large areas of scrublands around the world that are not suitable for agriculture. Some are too hilly for agriculture, and tilling them would bring about soil erosion, but the trees on them could be usefully harvested.

As another example, the Brazilians also have great areas that are suitable for cassava, a plant that can be grown in very poor soil. We here in the United States have very large areas that now have only scrub brush on them. We could expand our production of biomass substantially if old abandoned farms were turned into tree plantations.

Yields of biomass are already being increased by genetic improvement. A highly practical method is genetic selection, that is, selecting the best trees and planting their offspring. Improvements potentially could be expedited by cloning, using tissue cultures that can provide fast reproduction of superior stock.

One of the exciting distant possibilities is expansion of marine culture. Typical ocean water is rather barren of nutrients, but in the parts of the ocean where upwelling brings up nutrient-rich water from the deeps, great production of algae and fish occurs. Efforts are now being made to artifically induce the upwelling of water.

There is a pilot installation off southern California, for example, where a plastic pipe 60 centimeters in diameter (about 24 inches) reaches 500 meters below the surface to tap nutrient-rich water and bring it up to about 10 meters from the surface. The energy required to do this is really trivial, and large quantities of cold, nutrient-rich water can be brought up.

A framework is provided on which kelp can attach themselves, grow and be protected. The experiments so far have shown that a very good growth of kelp can occur there.

Chemicals from Biomass

At this conference, most emphasis was placed on the role and importance of bio-derived chemicals to be used as energy sources. A broader view of the situation should be taken. After all, a substantial fraction of petroleum is not burned as gasoline, but is converted into high-priced petrochemicals. Some day those petrochemicals are not going to be available, and then high-priced chemicals from biomass will be able to command a market.

There can be no question of the long-term importance of renewable energy and renewable material sources. Some countries, such as Sweden, will probably move rapidly toward almost complete utilization of biomass. Many other countries that lack coal or other fossil fuels will find it necessary to depend on the sun and its photosynthetic products.

To have an advanced society will require the use of large quantities of organic chemical for materials and for liquid fuels. Thus, I project that in the future, at least half of the world's energy requirements will be furnished by biomass.

There are those who are very impatient for an immediate transition, unhappy such major changes cannot be made overnight. They should remember that earlier transitions from wood to coal and coal to oil and natural gas required about 50 years. Because oil will become scarce and very costly much sooner than in 50 years, the transition this time will be faster.

Others tend to be disappointed that bio-energy at this moment supplies only a small percentage of total energy requirements, but bio-energy is already a multibillion-dollar industry. For this generation, association with the development of bio-energy is one of the most challenging existing opportunities. There is scientific research to be conducted, many processes to be developed by engineers. Imaginative entrepreneurs will find many ways to make their fortunes by inventing processes and producing equipment to meet the needs of this multi-billion-dollar industry. □

Philip H. Abelson is editor of Science *magazine. The above article was adapted from his remarks to the Bio-Energy Congress last April.*

Sources of Further Information on Bio-Energy

The Bio-Energy Council
1625 I St., N.W
Suite 825A
Washington D C 20006
202/833-5656

International Biomass Institute
1522 K St N W
Suite 600
Washington D C 20005
202/783-1133

National Wood Energy Association
P O Box 534
Bloomfield Hills Michigan 48013
313 645 0003

National Gasohol Commission
521 S 14th St
Suite 5
Lincoln Nebraska 68508
402 475-8044

National Alcohol Fuels
Information Center
Solar Energy
Research Institute (SERI)
1617 Cole Blvd
Golden Colorado 80401
800 529 5555
(In Colo 800 332 8339)

Technical Information Center
P O Box 62
Oak Ridge Tennessee 37830
615/574-1000

Institute of Gas Technology
3424 South State St
Chicago Illinois 60616
312/567 3650

National Center for Appropriate
Technology
P O Box 3838
Butte Montana 59701
406 494 4572

California Energy Commission
1111 Howe Avenue
Sacramento, California 95825
916 920 6033

Ozarks Regional Commission
1100 North University Ave.
Suite 109 Evergreen Place
Little Rock Arkansas 72207
501 378 5905

Wood Energy Institute
1101 Connecticut Ave N W
Suite 700
Washington D C 20036
202/857-1181

Alternative Energy Programs
National Rural Electric
Cooperative Association
1800 Massachusetts Ave , N W
Washington, D C 20036
202/857-9795

American Public Power Association
2600 Virginia Ave , N W
Washington, D C 20037
202/333-9200

National Alcohol Fuels Commission
412 First St , S E
Washington, D C 20003
202/426-6490

The Mississippi River

By Dean Rebuffoni

Towboat and barges carrying coal on the Mississippi. (Minneapolis Tribune photo.)

In northern Minnesota, beside a creek that slips quickly through a grove of tall pines, there is a post upon which is carved a short, simple message:

Here
1475 ft above the ocean
the Mighty Mississippi
begins to flow
on its winding way
2552 miles to the
Gulf of Mexico

That creek, the tiny beginning of the Nation's greatest river, flows clear and clean through the conifers, and remains unspoiled for 53 miles downstream, to the city of Bemidji, Minn.

And there purity ends. From Bemidji to the sea, the Mississippi River is, albeit in varying degrees, a polluted stream. Only along those first 53 miles downstream from its source at Lake Itasca is the great river truly free of man's wastes.

But strides have been made in recent years in abating pollution all along the Mississippi's long, meandering course. Indicative of that progress is what has happened at Bemidji, the city with the unenviable reputation of being the river's first polluter.

The community of 12,000 people sits on the shore of Lake Bemidji, a wide reservoir through which the Mississippi flows. It's a popular lake, ringed with homes and cabins and crowded with fishermen and boaters on warm summer days.

For years, the city discharged its sewage directly into the lake. Because of its size—nearly 7,000 acres—and because of the ceaseless influx of the Mississippi's clean waters, Lake Bemidji was able to assimilate the effluent.

But the city was growing, and its treatment plant couldn't properly handle the increasing load of sewage. By the early 1950's, lakeshore residents were complaining about foul odors, algae and water-quality problems.

To quiet the clamor, Bemidji officials in 1956 came up with an ingenious idea—or so it seemed at the time. They built a pipe-

line that skirted Lake Bemidji. That allowed the city to pump its inadequately treated sewage—up to a million gallons a day—directly into the Mississippi downstream from the lake.

That was good for Lake Bemidji, but bad for downstream riverfront property owners, who became the reluctant recipients of the odor, algae and water-quality problems. They began demanding that Bemidji clean up its pollution.

The controversy came to a head in 1978, when the Minnesota Pollution Control Agency directed the city to switch its sewage discharge back to Lake Bemidji. The agency acted on the advice of an independent State hearing examiner, Howard Kaibel Jr., who had listened to the complaints of downstream residents.

Moving the sewage discharge back to the lake, said Kaibel, would provide Bemidji's town fathers with a "built-in policing system" and encourage them to upgrade the 45-year-old treatment plant. He said the city, faced with water pollution at its very doorstep, would be motivated to "move as quickly as possible to minimize the amount of time it will have to live with the problem."

Minnesota officials were able to require Bemidji to accept Kaibel's plan because, to continue operating its antiquated treatment plant, the city needed a permit under the EPA's National Pollutant Discharge Elimination System.

As a condition for getting its NPDES permit, Bemidji also was required to install phosphorus-removal equipment at its plant. Although the city's sewage is again going into Lake Bemidji, the equipment removes enough of the nutrient to prevent a recurrence of the algae and odor problems.

Also, the EPA is preparing an environmental-impact statement that may call for Bemidji to build a new treatment plant. A new plant would protect both Lake Bemidji and the Mississippi from again being subjected to inadequately treated sewage.

The solution to Bemidji's pollution of the river was a rather radical one. But it appears to be working, and things are improving near the river's headwaters.

But that's only a short segment of a very long river, and much more remains to be done along the Mississippi from the pine forests of northern Minnesota to the cypress bayous of southern Louisiana.

The cleanup effort is a big one, because nearly everything about the Mississippi is big. "It is not a commonplace river," Samuel Clemens wrote in 1883, "but on the contrary is in all ways remarkable." Almost a century later, his observation remains quite correct.

The Mississippi's vital statistics are awesome: Along with such major tributaries as the Missouri and Ohio Rivers, it drains a 1.2-million-square-mile basin. It receives its waters from 31 States and two Canadian provinces. Its average volume of discharge into the Gulf of Mexico is 350 billion gallons per day. It carries more than 250 million tons of barge cargo a year.

But it also receives the sewage—some poorly treated—of more than a dozen metropolitan areas and hundreds of small towns. It receives the pesticide-tainted runoff from thousands of farm fields. It receives the toxic wastes of a host of industries.

No one knows just how much sewage, runoff and toxic wastes enter the river because no single government agency is responsible for the entire Mississippi. The river wanders through 10 States, and responsibility for its myriad problems is parceled out to a myriad of Federal, State and local government agencies.

Other great rivers have similar problems created by the overlapping of governmental responsibilities, but the problem is particularly acute on the Mississippi.

As a State-Federal task force studying the river said last year:

"The Mississippi belongs to no one and it belongs to everyone. No one 'owns' the river, yet we all make demands on it to bring us economic wealth, aesthetic beauty, fish and wildlife resources, and recreational enjoyment."

Compounding those conflicts and contradictions is the fact that, in a very real sense, there are *three* Mississippi Rivers,

each with its own distinct character and physical appearance.

The "first" Mississippi is the river that lies entirely within Minnesota, from Lake Itasca to the head of commercial navigation in Minneapolis. Within this segment, it begins as a quick creek, passes through dense northern forests and marshes of wild rice, through a chain of lakes, then grows into a fine stream dotted with small islands and filled with smallmouth bass and walleye.

This portion of the Mississippi has retained so much of its natural beauty that President Carter last year said it "deserves the protection of a wild and scenic designation as pressures slowly are threatening to mar its unspoiled wild character."

Because of strong local opposition in 1978, the U.S. House of Representatives deleted the upper Mississippi from a Carter-backed bill that would have included the river in the National Wild and Scenic River System.

But the President has again called for Federal protection, and has directed the National Park Service to prepare a management plan for including 353 miles of the river between Lake Itasca and Minneapolis in the national system.

In an effort to block Carter's proposal, eight Minnesota counties along the upper river joined forces this year. They entered into a joint-powers agreement, under which they propose to protect the river within their boundaries from uncontrolled shoreline development through their own river-management plan.

That plan is to be completed this autumn, after which its sponsors will begin looking for congressional support. The final decision—Federal or local control—apparently will be made by Congress.

Whatever the outcome, 52 miles of the Mississippi upstream from Minneapolis already have a strong buffer against ticky-tacky shoreline development. That segment is part of Minnesota's own Wild and Scenic Rivers System, which is modeled after the protective Federal program.

The "second" Mississippi River begins in downtown Minneapolis, and the change is abrupt. Here was once the site of the only true waterfall on the river, discovered in 1680 by Father Louis Hennepin, the Belgian missionary and explorer:

"I named it the Falls of St. Anthony of Padua . . . whom we chose as patron and protector of all our enterprises," he wrote. "The waterfall is forty or fifty feet high and has a small rocky island, shaped like a pyramid, in the center."

Today, 300 years after Father Hennepin's discovery, St. Anthony's Falls is largely hidden by a lock and dam, the first of 29 such massive concrete-and-steel structures that span the Mississippi between Minneapolis and St. Louis.

The river at Minneapolis, the stream upon which Hennepin and other explorers once paddled their bark canoes, today is the busy commercial highway for mid-America's barge industry, plied by towboats and barges filled with coal, grain and a hundred other commodities. From Minneapolis to the sea, the tows come and go.

Just downstream, in St. Paul, the Mississippi also becomes the depository for the sewage of a major metropolitan area and, unfortunately, much of the effluent is inadequately treated. It is discharged into the river from the sewage-treatment plant operated by the Metropolitan Waste Control Commission. The plant, located at Pig's Eye Lake in St. Paul, treats 85 percent of the sewage produced in the Twin Cities area.

The inadequately treated sewage from this plant has been the subject of Federal and State enforcement actions since the early 1960's. In 1967, after a detailed Federal study was completed on the pollution in the Metro area, a Federal-State enforcement conference called by the Governors of Minnesota and Wisconsin under the old Federal Water Pollution Control Act, established a clean-up action plan and time tables for the entire metropolitan area with special emphasis on the Mississippi River. Full compliance was to be achieved by 1972. While extremely good progress was achieved, the Pig's Eye plant has never consistently been in compliance with Federal and/or State requirements. As a result, there have been various Federal and State enforcement actions against the plant over the past few years. The plant is now operating under a stipulation agreement entered into by the Minnesota Pollution Control Agency and Metro Waste Control Commission. EPA does not agree with the program specified and is negotiating a more complete control program with the Commission. The longstanding pollution problem has aroused the ire of river front residents in Minnesota and Wisconsin, below Minneapolis-St. Paul.

The wastes from the Pig's Eye plant also have created a furor between Minnesota environmental officials and their counterparts in Wisconsin. Wisconsin officials, backed by private environmentalists in both States, contend that Minnesota has failed to take tough action to bring the Pig's Eye plant into compliance with EPA and State effluent-discharge standards. The State of Wisconsin has served a 60-day notice to EPA saying it will proceed with litigation if the Pig's Eye plant is not cleaned up.

Terry Hoffman, executive director of the Minnesota Pollution Control Agency, recently defended her agency's actions in a letter to EPA Administrator Douglas Costle.

Ms. Hoffman told Costle that attempts to decrease pollution from the plant have been hampered by construction delays and installation of new equipment designed to improve the facility's effluent standards.

The Metropolitan Waste Control Commission also insists that the solution to the problem is under construction, a $300-million dollar expansion and improvement project at the plant. The project originally was scheduled for completion in 1977, but now is expected to be done in 1982. That should bring the big facility into compliance with EPA water-quality standards.

Despite the problems at the Pig's Eye plant, the water generally has shown improvement over the last decade.

"There are no floating sludge balls going down the Mississippi River any more," said Helen Boyer, water-quality manager for the Metropolitan Waste Control Commission.

But she added, "Having addressed the primary problems, we're now in for the long-haul program. We've achieved perhaps 85 percent of our primary goals. . . . The remaining goals are going to take time to resolve and they're going to cost an enormous amount of money."

Salisbury Adams, the waste-control commission's chairman, also raised the question of how much money the public is willing to pay to improve the river's water quality:

"Should we attempt to make the Mississippi (within the Twin Cities) completely fishable and swimmable?" Adams asked. "To do both could cost an additional $200 million to $300 million, with an additional annual operation cost of about $10 million."

While officials attempt to clean up the Mississippi's polluted waters below St. Paul, nature provides its own help in the form of the St. Croix River. According to officials of EPA's Region 5, the influx of clean waters from the St. Croix, which is part of the National Wild and Scenic River System, helps significantly to improve the Mississippi's water quality.

At its confluence with the St. Croix, the Mississippi also takes on a new character and loveliness, flowing between the high, wooded bluffs that have remained largely unchanged since the days of Samuel Clemens:

"The majestic bluffs that overlook the river," he wrote in *Life on the Mississippi*, "charm one with the grace and variety of their forms, and the soft beauty of their adornment."

This portion of the Mississippi, from the Twin Cities downstream 240 miles to Guttenberg, Iowa, has for the last six years been the subject of an intensive study by GREAT, the acronym of the Great River Environmental Action Team.

The team, which is made up of State and Federal officials including EPA representatives, was formed as a direct result of a controversy over the dredging practices of the U.S. Army Corps of Engineers.

The Corps has been active on the upper Mississippi since 1824, when it began removing snags, boulders and other obstructions from its main channel. In 1878, Congress directed the Corps to deepen the channel to 4½ feet so that larger, deeper-draft boats could operate on the river.

In the 1930's, the Corps was authorized by Congress to construct a 9-foot-deep navigational channel in the river from Minneapolis downstream to St. Louis. This was a massive undertaking, achieved by building 29 locks and dams on the river, which converted the upper Mississippi into a series of wide, placid pools or lakes.

That ended the upper river's free-flowing nature, but it also created a watery paradise for fish and wildlife. The dams raised the river's water level, creating many backwaters and sloughs where once there were hay meadows and woods. Some of the backwaters in Minnesota, Wisconsin, Iowa and Illinois are incredibly fertile in aquatic life, in some cases producing 300 pounds of fish per acre, a near-optimum for fresh water.

And that has provided a bountiful resource for fishermen and hunters, because waterfowl love the backwaters. Two sprawling national refuges—the Upper Mississippi River Wildlife and Fish Refuge and the Mark Twain National Wildlife Refuge—were created from riverbottom lands acquired by the U.S. Fish and Wildlife Service. The refuges cover more than 200,000 acres, and serve millions of migrating waterfowl.

In recent years, however, human activities along the upper Mississippi have hastened the natural decline—the slow process of eutrophication—of the fertile backwaters. After more than 30 years of "pluses"—the creation of the backwaters and the increasing public awareness of their benefits—the backwaters have begun to decline.

"It's a sad thing to think about, but most of the shallow, floodplain lakes and sloughs and marshes are being filled with sedimentation," said Calvin Fremling, a biologist at Winona State University in Winona, Minn. "There's simply no fresh water flowing through them anymore and, eventually, they will be choked with silt."

In the early 1970's, Fremling and other scientists interested in the river were concerned that the Corps of Engineers might be the key culprit in the decline of the backwaters. The overall problem, they said, was far more serious a threat to the upper river's rich resources than water pollution.

Although the Corps built the 9-foot-channel project and was responsible for creating the backwaters, it also must maintain the navigational channel and dredge the river annually to remove the silt and sand which endlessly ooze into it, reducing its depth.

Wisconsin officials, charging that the Corps' dredging was harming water quality, went to court to force the Federal agency into complying with State water-quality standards. Private environmentalists and the Fish and Wildlife Service also were at odds with the Corps, contending that it was disposing of the dredged sand and silt across channels leading to the fertile backwaters—thus stopping the flow of freshwater into them—and was also harming valuable fish and waterfowl habitat.

Amid the controversy, GREAT was initiated in 1974.

Three States—Minnesota, Wisconsin and Iowa—and five Federal agencies, including EPA and the Corps of Engineers, became members of GREAT. The team operated under the auspices of the Upper Mississippi River Basin Commission.

As part of the GREAT program, the Army engineers and the Fish and Wildlife Service financed several research projects to determine what might be done to save the declining backwaters.

But GREAT's basic charge was to study how the upper river might be better managed. As part of that, GREAT was to develop ways to reduce the volume of sand and silt dredged from the channel.

Last autumn, GREAT released its draft report, which was based on numerous studies and public involvement meetings throughout the upper Mississippi valley. That report surprised many people who had followed the progress of the Federal-State team.

Among other things, the report identified sedimentation—the result of upland and stream-bank erosion—as the upper river's most damaging problem. It said sedimentation threatens to change much of the aquatic habitat to marshland within the next 100 years. Wisconsin's Chippewa River, a major tributary of the upper Mississippi, was cited as the greatest source of sand sedimentation in the Mississippi itself.

The report also recommended the altering of side channels leading into the fertile backwaters to prevent further decline of fish and wildlife areas.

Working with Calvin Fremling and other scientists, the Army engineers already have taken steps to reopen some of the side channels, and pilot projects have been quite successful. The Corps is being given high marks by environmentalists because of its willingness to undertake those projects.

Also, Minnesota and Wisconsin won their battle with the Corps in 1977, when Congress amended the 1972 Clean Water Act to give States the right to regulate dredging. For example, the Army engineers now must dispose of the dredged material at selected on-land sites along the upper Mississippi in Minnesota's portion of the riverway.

GREAT's draft report also summed up some of the problems facing the upper Mississippi, and some of the conflicts and contradictions preventing quick solutions:

"We expect much of the Mississippi River —commercial navigation, recreation, and preservation of habitat which sustains fish and wildlife," the report said. "We look upon the river as a means of diluting our wastes, providing freshwater supplies, and providing the cooling water for our electrical production and industrial uses—while still expecting it to spawn northern pike; provide a home for the soaring eagle; and sustain the lush marshes and other habitat for egrets, ducks, geese and fish. We want to enjoy its beauty by building houses near its banks, yet we are angered when we get flooded in the spring."

Also, the report said that a "new way of doing business on the river" is needed, adding that "it's now up to the member agencies, the public, and our State and Federal legislative and administrative bodies to respond to that call."

While government officials attempt to put GREAT's recommendations into action, they also are concerned about another problem facing the upper Mississippi: the chemical contamination of fish.

For the last two years, Minnesota and Wisconsin health officials have urged the public to restrict its consumption of fish taken from a 100-mile stretch of the Mississippi from Minneapolis downstream to Alma, Wis. That includes Lake Pepin, the widest part of the upper river.

Certain species including carp and other rough fish taken from that segment of the river may have high levels of polychlorinated biphenyls, or PCB's, which are suspected of causing tumors, birth defects and other serious ailments.

PCB's accumulate in the fat of fish living in waters that have received discharges or atmospheric fallout of the chemicals. Although the use of PCB's in industry has been greatly restricted since 1971, they persist in some wastewater effluents and river-bottom sediments.

Despite the persistence of PCB's in the upper Mississippi, there have been significant pollution-control efforts in recent

years. Some of those success stories have occurred in EPA's Region 7, which encompasses Iowa, Missouri, Kansas and Nebraska—four States within the river's sprawling watershed. Region 7 includes about 750 miles of the river's west bank in Iowa and Missouri, where there are very heavy concentrations of industry.

Among the pollution-abatement successes in which EPA has played a role was one involving Clinton Corn Processing Co. and a sister firm, Julius Wile Sons and Co., a liquor distiller.

The two firms had long been criticized because they were dumping industrial wastes into the Mississippi from a waste-treatment plant they share at Clinton, Iowa. They recently promised to stop polluting the river and consented to pay $213,000 in fines for violations that occurred in 1979. Additional penalties have been paid under the current decree with the companies.

That was part of a settlement with the Iowa Department of Environmental Quality, which had sued the two firms. The settlement requires the two companies to comply with NPDES permit requirements.

EPA officials also have participated in several other enforcement actions that have reduced point-source pollution of the upper Mississippi.

For example, EPA sued the city of Dubuque, Iowa, in 1979 to halt polluting discharges. That case is pending in Federal court, but the city has substantially reduced its pollution, and additional remedial steps—part of a $15.5-million sewage treatment project—are being taken to maintain compliance with Dubuque's NPDES permit.

At Davenport, Iowa, construction is well underway on a $47-million project that includes a regional, activated-sludge plant to provide secondary treatment and several major interceptor sewers. The last interceptor sewer is nearing completion, and the entire project is to be finished this year.

In another major development, EPA filed suit in 1977 against NL industries, the largest St. Louis-area industrial discharger into the Mississippi. The company, formerly named National Lead, at that time held the dubious distinction of having paid the highest civil penalties ever collected for polluting the Nation's streams—a distinction since gained by several other polluting industrial firms.

In a consent decree signed in 1977, NL Industries agreed to pay more than $245,000 in fines for polluting the river from its titanium-pigment plant in St. Louis, and was paying $1,000 a day until pollution control equipment was installed.

The company had until April 1980 to meet EPA standards for Wastewater Discharges, but it decided to exercise its option to close the antiquated plant in 1979 because of economic considerations. NL paid $1.4 million in penalties prior to closing the plant.

The major controversy on the upper Mississippi in recent years has focused on Locks and Dam 26, which spans the river at Alton, Ill., just north of St. Louis. In the mid-1970's, the Corps of Engineers proposed to build a new and larger-capacity locks and dam to handle increasing barge-traffic demands. The Corps and agricultural interests argued that Locks and Dam 26 was one of the worst transportation bottlenecks in the Nation, pointing out that the deteriorating structure was the scene of long, costly delays for barges.

But the project was temporarily delayed through legal action by the Sierra Club, the Izaak Walton League and 21 major railroads. They contended that the Corps intended to use the project at Alton as the "opening wedge" for a $3-billion, publicly-financed program that would quadruple the barge-traffic capacity of the upper Mississippi waterway system.

And that, argued the environmentalists and the railroads, would cause more channel dredging and widespread environmental harm throughout the upper waterway. They said it would have "catastrophic effects" on mid-America's railroads, which traditionally have competed with barge interests to handle the region's commodities.

However, Congress has given the Corps the go-ahead, approving more than $470 million to replace Locks and Dam 26. Opponents were able to convince the Federal lawmakers to tie their approval to a user fee for commercial shipping interests. Also, the Federal-State Upper Mississippi River Basin Commission was ordered to produce a master plan for managing the Mississippi from the Twin Cities to Cairo, Ill. That plan is being prepared, and it is to weigh environmental, economic, and recreational objectives along the upper river.

Just below St. Louis, downstream from the last of the 29 locks and dams, is the beginning of the "third" Mississippi River. Here begins the "Ol' Man River" of a thousand stories and legends. This is the portion of the great river that, in the early 1800's, was the home of some of the roughest and toughest American pioneers: the boatmen.

These men worked the wooden flatboats and keelboats in the early days of commerce on the river. They worked hard and played harder; drinking, fighting and gambling. The greatest, and the toughest, of the boatmen was Mike Fink, whose challenge to would-be rivals has been recorded in all its color and unparalleled braggadocio:

"I'm a ring-tailed squealer! I'm a regular screamer from the ol' Massassip! Whoop! I'm the very infant that refused his milk before its eyes were open, and called out for a bottle of old Rye! I love the women an' I'm chockful o' fight! I'm half wild horse and half cock-eyed alligator and the rest o' me is crooked snags an' red-hot snappin' turkle! I can out-run, out-shoot, out-brag, out-drink, an' out-fight, rought-an'-tumble, no holts barred, ary man on both sides the river . . . ! !"

The Mississippi of Mike Fink's time was as rought-an'-tumble as the boatman, and remained much that way for a hundred years.

Then came the flood of 1927, which changed forever the character of the river downstream from Cape Girardeau, Mo., to the Gulf of Mexico.

Within recorded history, there have been many great floods on the lower Mississippi: in 1849, 1850, 1858, 1903, 1912, 1913, 1916. But the biggest of them all was in 1927. A rainy winter, a wet spring, and the result was disaster. More than 17 million acres of flood plain were inundated. There was an estimated $235 million in property damage—the equivalent of considerably more than $1 billion today. At least 300 lives were lost.

That destructive deluge prompted Congress to pass the Flood Control Act of 1928, which authorized the Army Corps of Engineers to develop a unified flood-control system for the lower river.

Today, from Cape Girardeau to the Gulf of Mexico, the river is walled by a series of high, earthen levees, built to prevent a recurrence of the type of flood that swept the valley in 1927. There are more than 2,000 miles of levees along the lower river.

The levee system was sorely tested in the spring of 1973, during the last major flood on the lower Mississippi. The Corps says the system "performed splendidly" in preventing damage along the river. While there *was* an estimated $1.2 billion in damage, the Corps says there would have been an incredible $15 billion without the levees and other components of the flood-control system.

As it flows between the levees, the Mississippi gains enormous strength. Just above St. Louis, it receives the combined flows of the Missouri and Illinois Rivers. But within the levees, at Cairo, Ill., it receives the even greater flow of the Ohio River. This swelling of its waters is of great benefit, because it gives the Mississippi more ability to absorb man's wastes.

But the natural landscape, and the levees, change the appearance of the lower Mississippi. No longer is it a river bordered by bluffs and high hills, but a stream with a certain monotony, although one still marked by majesty.

Sailboat on Lake Pepin, the widest part of the upper Mississippi, as it flows between Minnesota and Wisconsin. (Minneapolis Tribune photo.)

Samuel Clemens wrote in 1883 that the river from Cairo to Baton Rouge, La., was "a thousand-mile wall of dense forest that guards the two banks all the way . . . gaped only with a farm or woodyard opening at intervals . . . you can't 'get out of the river' much easier than you could get out of a fenced lane."

Today, you can't "get out of the river" for the levees, but they have helped prevent some of the devastation that was caused by floods during the days of the author.

Farther downstream, the Mississippi encounters a heavy dose of pollution as it flows past Memphis, Tenn. Officials of EPA's Region 4—one of four EPA regions with jurisdiction over portions of the river—have long been at odds with the operators of the city's two big treatment plants.

"Both plants have discharged polluting effluents that ended up in the Mississippi," said Joan Boilen, an EPA Region 4 attorney. "Some city officials think the Mississippi is big and can handle the effluent. We don't care: we don't want the river to get any worse than it is."

The EPA has sued Memphis in an effort to force the city into meeting standards of the Clean Water Act. As part of a project that could cost more than $150 million, including $50 million in EPA grants, Memphis hopes to bring both treatment plants into compliance, said Boilen.

Among other measures, the plan is designed to eliminate the discharge of sewage sludge into the Mississippi, a step taken in the past by city officials to relieve pressure on overloaded sludge lagoons.

Farther downstream, in the state of Mississippi, 10 major facilities—including three power plants—discharge directly into the river. Only two of those facilities are not in compliance with effluent limits set by the Mississippi Board of Pollution Control.

But the Mississippi then flows into Louisiana and, once again, it encounters major pollution problems.

According to officials of EPA's Region 6, which includes Louisiana, the deterioration of the lower Mississippi's water quality closely paralleled the rapid growth of a petro-chemical industrial complex which began in the mid-1950's. By the end of the 1960's, there were more than 60 major industries along the river from Baton Rouge, La., to the river's mouth. Most of them discharged their partially-treated or raw wastes into the river.

Studies by EPA in the late 1960 s showed that the wastes were contributing significant quantities of undesirable pollutants to the Mississippi. That was causing taste and odor problems in public-water supplies and the tainting of fish taken from the river. Industrial waste-abatement practices on the lower river were not adequate to control the discharge of organics.

But there has been progress. As a result of the NPDES permit program, all existing—and planned—industrial sources have begun waste-abatement programs to ensure the continued reduction of industrial pollutants into the lower river in Louisiana.

Still, there is New Orleans. The Mississippi there is the end of a huge funnel, carrying to the sea what is, in effect, the collected garbage of mid-America. And its waters, as they flow past the city between high levees, look the part: Murky, brown, dirty and greasy.

But despite its appearance, the Mississippi provides the drinking water used by the city of 600,000 people. In the late 1960's and early 1970's, that fact raised concerns among a small group of Louisiana environmentalists. The EPA also got involved, and after extensive field studies issued a report in 1972 which concluded that trace amounts of organic chemicals were present in the drinking water supplies, creating a potential health threat.

Another survey by the EPA came out in 1974. It, too, warned of potential health problems by drinking New Orleans' water. At the same time, the Environmental Defense Fund, a private organization, issued a study which reported that death rates from cancer in a test group were 15 to 20 percent higher in 11 Louisiana parishes (counties) that got drinking water from the Mississippi than in other Louisiana areas that get their water from other sources.

The two studies gained national attention, and concern over the New Orleans situation prompted Congress to pass the 1974 Safe Drinking Water Act. That law had, in one form or another, been before the lawmakers for several years, but had never gotten out of congressional committees.

But the Federal law has created considerable controversy, pitting city officials—including the Sewerage and Water Board in New Orleans—who want more proof of the water hazards against environmentalists who want the chemicals reduced immediately.

According to officials of EPA Region 6, the controversy of 1974 caused city officials to refuse to take part in studies in 1975 and 1976 on municipal drinking-water supplies throughout the nation.

Because of that, EPA has no data to show that the drinking water in the New Orleans area is improving through the recent construction of new wastewater treatment facilities in the city.

But Region 6 officials do know that taste and odor are no longer a problem, and that the river thus has improved—at least in esthetic water quality. Also, new treatment facilities in New Orleans are to be completed this year.

Downstream from New Orleans, there is another environmental problem, one cited recently by the President's Council on Environmental Quality. The Council pointed out that in the Mississippi Delta area, a substantial loss of wetland forests has occurred. Of almost 12 million Delta acres in forest in the early 1930's, some 40 percent have been converted to soybean cultivation and other nontimber uses, the CEQ said.

That could be one of the key problems facing the river in the coming decades, and it's likely to be a problem that stretches far upstream: The remaining wetlands and bottomland forests are fast disappearing in some areas, and in others are threatened with degradation.

But while there has been progress in abating some of man's degradation of the Mississippi, nobody is predicting that the river's problems soon will be solved. People simply are too busy along, and on, its waters for that to happen. □

Dean Rebuffoni covers environmental affairs for the Minneapolis Tribune.

EPA's Unique Soil Research Laboratory

By William C. Galegar

The mantle of soil is as vital to life on earth as the air we breathe or the water we drink. Although land is not protected by specific pollution control legislation such as the Clean Water and Clean Air Acts, it can also be harmed by pollutants such as acid rainfall or careless disposal of toxic and hazardous wastes. These pollutants also contaminate our rivers and ground water resources.

Protecting soil and its interaction with surface and ground water is the function of the Robert S. Kerr Environmental Research Laboratory, located in Ada, Okla., and named after the late Senator by Act of Congress. Since the Ground Water Research Center is located at the Laboratory, close cooperation is possible between programs studying the role of the soil as a natural waste treatment system and methods for protecting our ground water resources.

Land Treatment of Sewage

The application of wastewater to the land has been practiced for hundreds of years throughout the world in one form or another. Until very recently, the primary objective was to dispose of the wastewater, and very little consideration was given to pollution control, rational design criteria, or the best method of operation. Within the past decade, however, the concept of land treatment of wastewater has changed drastically. Such systems are now thought of as those that can be designed to achieve a predetermined result just like the more conventional mechanical treatment processes. They also have potential for wastewater renovation for beneficial reuse.

The dramatic increase in interest in land treatment systems was stimulated to a great extent by the passage of the 1977 Amendments to the Federal Water Pollution Control Act. These amendments required land treatment and other innovative and alternative wastewater treatment processes providing for reclaiming and reuse of water to be fully evaluated when projects were considered for funding under the Municipal Construction Grants Program.

The Laboratory's research program in land treatment supports EPA's Construction Grants Program by developing reliable design and operating criteria which may be applied under varying climatic, soil, and wastewater characteristics and operating conditions.

Slow-rate systems are the most advanced and most widely used of three types of land treatment systems. They use ordinary farm technology and practices for the production of a crop that uses the nutrients in the wastewater. Although this provides an immediate and direct reuse of the wastewater, the primary consideration must be the proper treatment and disposal of the wastewater in a safe and environmentally acceptable manner.

Rapid infiltration systems are used on coarse textured soils that can receive high application rates. If the treatment area has vegetative cover, it plays a minor role in the treatment process. Treatment and renovation of the wastewater is achieved by physical, chemical, and biochemical interactions as the wastewater percolates through the soil.

Overland flow, the least developed of the three systems, is used on impermeable soils with minimal percolation (that is, hard-packed or rocky surfaces that do not absorb water well). A vegetative cover is necessary to stabilize the carefully graded slopes and prevent erosion. The wastewater is treated through physical, chemical, and biochemical processes that take place as the wastewater moves slowly over the surface of the soil by sheet flow.

A different type of natural system, aquacultural wastewater treatment, could provide a simple and effective alternative to conventional municipal systems for treatment and management of wastewaters. The major areas considered for development of aquacultural processes include aquatic plants, natural and artificial wetlands, and integrated or combined systems.

Managing Animal Wastes

Land has been used for disposal of animal production wastes since the dawn of history. However, post-World War II growth of confined feeding operations for livestock soon produced mountains of wastes which overwhelmed the old disposal methods. The first concern of the Laboratory's Animal Production Waste program was to prevent pollution of lakes and streams by direct runoff from animal feeding operations which caused such adverse effects as fish kills and the closing of lakes for swimming and other water sports. Research centered on the larger animal feedlots which were later subject to the National Pollutant Discharge Elimination System permit program. The very early efforts investigated treatment and discharge of these wastes. However, it soon became apparent that conventional treatment was very costly and for the most part unsuccessful. Research again turned to the land as a receiver of the wastes. The containment of both storm-generated runoff wastes from open lots and the proper storage of manure and the wastes from barn and other farm buildings along with land disposal of these stored wastes, became the only option open to the industry after the passage of the Federal Water Pollution Control Act and the development of the effluent guidelines "zero discharge" for feedlots.

Animal wastes contain a large amount of salt and nitrogen along with a host of other pollutants—some of which would and did destroy the structure of the soil, reduce or destroy plant growth, and in some cases leak into the ground water supply.

Research developed realistic loading rates for animal wastes on agricultural land, to insure proper utilization of the nutrients for plant growth. These loading rates along with the development of proper application methods and timing of applications have allowed the wastes from animal production systems to be used as a valuable resource without causing undue damage to the land or water.

The most recent direction of the program has been to characterize the pollution effects of production of animals in such settings as range and pasture and the smaller dairies, feedlots, and hog farms not covered by the permit program. It is interesting to note that when sound land and grass management practices are carried out, the pollution problems caused by animals using the land are minimal.

The first stage funding for the Rural Clean Water Program under the U. S. Department of Agriculture in Fiscal 1980 has involved the research staff in the development of guidance documents for that program in the actual planning and evaluation stages of the first 13 areas of the program.

Irrigation Problems

A large part of the Nation's food and fiber produced annually comes from irrigated land. While only 10 to 12 percent of the total crop land in the U. S. is irrigated, it produces over 25 percent of the total crop value of the nation. Other economic benefits include creating employment opportunities in harvesting, processing, and marketing of agricultural products. Unfortunately, the use of this technology and the agricultural chemicals to optimize the production system has created major land and

water quality problems. Leaching of naturally occurring salinity from the soils and subsurface has polluted ground water and surface water. The Colorado River in the West-Central United States is grossly contaminated by a high salt load as a result of leaching action of water percolating through soils into subsurface saline shale beds and then returning to the river.

Development of synthetic fertilizers following World War II increased the use of these chemicals markedly over the next 30 years with a corresponding increase in nitrates in some area waters. Merrick County, Neb., is an example of an area in which nitrate concentrations have increased significantly in the ground water. Other agricultural chemicals, some representing immediate health hazards, are showing up in our water supplies.

The purpose of our research program is to find practical and economically acceptable means to control pollutants from irrigated agriculture to surface and subsurface water resources. Many of our projects and investigations have focused upon development of technologies relating to improving water management, i.e., reducing water losses in conveyance systems, optimizing water application in the fields, reducing tail-water losses, controlling sediment losses by reducing transport velocities, and controlling nutrient availability. Case studies provided the necessary experience to help apply these technologies.

These field experiences, combined with studies made on legal approaches and socio-economic considerations, have provided valuable insights on alternatives available to carry out irrigation return flow management.

The Rural Clean Water Program in conjunction with Sec. 208 of the 1977 Clean Water Act, as amended, is presently providing a vehicle for applying many of these research results. Monitoring and evaluation will help to document water quality improvement.

Controlling Toxic Chemicals

Industrial wastes may contain toxic and hazardous substances which pose a serious threat to the well-being of the American people. Current treatment processes tend to concentrate many of these substances in the sludges and residuals. Constraints on ocean dumping and indiscriminate burial of wastes are forcing research on safer disposal techniques such as incineration, pyrolysis, encapsulation, and land treatment. Research conducted at the Laboratory includes treatment and control of wastewaters and residuals from petroleum refining, petrochemical production, pretreatment and areawide combined wastes.

Redford Narrates EPA Film On Land

"Hold This Land," a 23-minute color film narrated by actor Robert Redford under auspices of the Office of Research and Development, is now available from a number of EPA offices.

This film was sponsored by the Robert S. Kerr Environmental Research Laboratory in Ada, Okla., and shows various methods of controlling erosion and sedimentation problems from irrigated land. Filmed in Idaho, Washington, and California, the film explores the subject of soil run-off and shows how progressive farmers are able to halt the loss of topsoil. One method makes use of settling basins to collect eroded soil, where it is then redistributed by farm equipment back on barren, rim-rock land to create new, fertile cropland. Other methods of avoiding erosion by careful watering techniques also are demonstrated. Redford, who narrated the film as a public service, is well known for his interest in environmental protection. He previously has addressed audiences under EPA sponsorship in Region 8 and at Headquarters in Washington, D.C.

Persons interested in borrowing a print of the film may request it from any EPA Regional office; from the Kerr Laboratory, P.O. Box 1198, Ada, OK 74820; or from the Snake River Conservation Research Center, USDA-SEA-AR, Kimberly, Idaho 83341.

Petroleum refineries are located in 39 States; concentrations in Region 6 provide 45 percent of our domestic refined products. Refineries have been researching the use of land treatment technology for disposal of oily sludges for some time with promising results.

The petrochemical industry located along the Gulf Coast produces nearly 80 percent of the Nation's petroleum-derived chemicals. It, like the refining industry, is one of the five major industrial water users in the United States.

The combined wastes research program is unique among EPA industrial environmental research efforts in that it is concerned with the control of point sources on an area-wide rather than individual basis. As such, this program is involved in wastes from all types of industries plus wastes of a domestic origin. This program deals with such programs as the establishment of centralized facilities to treat industrial wastes generated within a defined geographical boundary, pretreatment of industrial wastes prior to discharge into a publicly-owned treatment plant, and the area-wide management of industrial residuals.

Protection of Ground Water

Ground water supplies drinking water to one-half of the American people and is the source of over 20 percent of fresh water used for all purposes. Subsurface waters supply the total needs of 20 of our 100 largest cities; in addition, approximately 200,000 well supply systems provide water to industry, parks, restaurants, mobile home parks, recreational areas, shopping centers, and for irrigation of land. Over 500,000 new wells are constructed annually.

The extremely slow movement of pollutants through the subsurface environment is the reason that the protection of ground water quality is so important to the future water resource needs of the country. While the residence time of contaminants in air is measured in hours, and that in streams and rivers in days, the natural restoration of ground water after contamination requires years and even centuries.

Ground water research was begun in 1967 with an attempt to understand better the magnitude of the contamination of underground water and the means by which this occurs. Such information was paramount to developing sound, long range goals for research in this area.

Efforts have resulted in a significant advancement in technology necessary for conducting sophisticated ground water investigations. Apparatus has been designed and constructed for drilling, coring, and sampling for trace organic and biological contaminants, and methods are under development for tracing the transport and transformation of contaminants in the subsurface environment. These techniques are now being applied to systems in locations such as Long Island, N.Y.; Muskegon, Mich.; and Palo Alto, Calif. to evaluate the pollution potential of waste treatment facilities to ground water quality.

Additional research is showing significant promise in the ability of predicting contaminant concentrations as the waste moves through the subsurface. These efforts are directed mainly at organic contaminants, including pesticides. □

William Galegar is Director of the Robert S. Kerr Environmental Research Laboratory.

Li Chaobo, head of the environmental protection delegation from the People's Republic of China, and Administrator Costle recently signed annexes to the U.S.-China protocol during a visit by the delegation to EPA facilities. The new agreements cover cooperation in environmental health research, pollution control, and research on environmental processes and effects. At right are Qu Geping, deputy head of the delegation, and Stephen Gage, Assistant Administrator for Research and Development.

William W. Rice

He has been named Deputy Regional Administrator for Region VII after serving in an acting capacity since 1979. Before that he was Director of Region VII's Surveillance and Analysis Division.

From 1970 to 1978 Rice held various positions in EPA's Industrial Environmental Research Laboratory in Research Triangle Park, N.C., among them Chief, Planning, Management and Administrative Staff. In 1977 he was the EPA nominee for the William A. Jump Memorial Award for Distinguished Career Service in Public Administration.

Rice graduated magna cum laude with a B.S. in industrial engineering from Oregon State University in 1969 and received an M.S. in management from Duke University in 1977.

Anice M. Reynolds

She received the Agency's Gold Medal for Distinguished Career Service at her recent retirement as administrative officer of the EPA Laboratory in Gulf Breeze, Fla., after almost 28 years of government service. Laboratory Director Henry F. Enos presented the award.

Reynolds' career mirrors the Laboratory's involvement in the Federal effort to evaluate hazards caused by pollutants. She is credited with the development of a blueprint for administrative services as the mission of the Laboratory expanded, and the staff grew from five to 51 full-time employees.

She also helped plan and implement many alterations of the Laboratory site, an island in the Santa Rosa Sound. Dr. Enos called her a "pioneer in the administration of a Federal research facility involved in the formulation of national environmental policies."

Dr. Joellen L. Huisingh

She has been named Chief of the Genetic Bioassay Branch at EPA's Health Effects Research Laboratory in Research Triangle Park, N.C. She was most recently the Chief of the Cellular Biology Section there.

At her new post, Huisingh will direct a staff of approximately 20 scientists and technicians who study complex chemical mixtures to determine whether they might cause cancer or genetic mutations.

Since joining the lab's Biochemistry Branch in 1975 as a research chemist, Huisingh's work has included studies on the potential health effects of gasoline and diesel-powered vehicle exhausts; use of short-term toxicity and mutagenicity assays to screen pollutants from industrial and energy production sources; development of a liver cell toxicity assay; and comparative bioassay studies on lung and liver cells.

Huisingh began her research career in 1966 as a chemist at the Bremerton Naval Shipyard, Bremerton, Wash. She held subsequent teaching, research and administrative posts with Christian Brothers College, Memphis, Tenn.; Memphis City Schools; Memphis State University; North Carolina State University; and Duke University, Durham, N.C.

A nationally recognized biochemist, she received the Outstanding Young Woman of America Award in 1978 and a National Research Service Award for Environmental Toxicology in 1975.

Huisingh received her bachelor's degree from the University of Puget Sound in 1966 at which time she received an award from the American Chemical Society as the outstanding chemistry major in her class. She attended graduate school at Memphis State University and later at North Carolina State University, Raleigh, where she received her doctorate in biochemistry in 1973.

EPA's Director of the Office of International Activities, F. Allen Harris (left), attends the first International Conference on Noise Abatement Policies in Brussels, Belgium, with Deputy Administrator Barbara Blum and Charles L. Elkins, deputy assistant administrator for noise abatement control. At the May conference, sponsored by the Organization for Economic Cooperation and Development (OECD), a unanimous conclusion was reached that noise emission levels on new motor vehicles should be reduced by an additional five to 10 decibels by 1990. The conference also accepted a United States proposal that an ad hoc meeting be held in the U.S. by the end of 1980 to resolve policy issues on coordination of noise measurement procedures. Blum co-chaired the conference.

Engineering Award

The consulting engineering firm of Williams and Works from Grand Rapids, Mich., was this year's recipient of the Grand Conceptor award, the top prize for Engineering Excellence given by the American Consulting Engineers Council during ceremonies held in Washington, D.C. recently. The firm won for its design of modifications for the wastewater treatment plant in the city of Detroit, Mich.

The Williams and Works project involved study and tests of modifications to increase the capacity of the final clarifiers of the treatment plant by 33 percent. The increase was required by changes in EPA and Michigan Department of Natural Resources regulations. The Detroit wastewater treatment plant is one of the largest in the world, serving almost three million people and thousands of industries located in more than 70 separate government units in the Detroit Metropolitan Area. Effluent from the plant could not meet the new regulations, and construction of new facilities would have required extensive land acquisition and relocation of residents.

The firm designed changes in the inlet structure to the clarifiers, reducing the velocity of the flow of waste into the clarifiers, raising the level at which waste was introduced and adding a series of fiberglass baffles to further disperse the flow of phosphorus-removing liquid across the face of the clarifiers. A full-scale test model was installed in the plant at a cost of $411,000. Based on the results achieved, the city is proceeding with plans to incorporate the inlet modification into the remaining clarifiers. The estimated cost of installation is $4 million, a savings of $27 million over the cost of constructing additional clarifiers.

The Detroit project was one of six emphasizing resource protection through wastewater treatment in this year's competition. Energy was a major thrust of six other award-winning projects concerned with the treatment of coal gasification, offshore oil and gas development, production of electricity, and conservation in new building design and renovation. The remaining projects concerned industrial expansion, historic preservation, and safety. A total of 16 awards were given by a panel of 11 judges representing government, industry, and other fields.

T. C. Williams (right) of Williams & Works with Henry Longest (left), EPA Deputy Assistant Administrator for Water Program Operations, and Joe Moore, Jr., Assistant Administrator for the City of Detroit.

Dr. Donald E. Gardner

He has been named Director of the Environmental Toxicology Division at EPA's Health Effects Research Laboratory in Research Triangle Park, N.C. Gardner assumes the position after having served with the laboratory for 10 years. For the past five years, he was Chief of the Inhalation Toxicology Branch.

At his new post, he will manage an animal toxicology and analytical chemical research program, which studies potential health problems caused by exposure to environmental chemicals.

An internationally recognized expert in environmental toxicology, Gardner has published over 100 scientific manuscripts and contributed to several books and documents. He has been active since 1973 in the U.S.-Soviet Union joint research program on the effects of atmospheric pollutants on public health.

He represented the United States on two World Health Organization Task Groups on Environmental Health and is U.S. Coordinator for an environmental health study being conducted for EPA by the Silesian Medical School in Katowice, Poland. He was awarded the U.S. Public Health Service Bronze Medal in 1977 for his contributions to environmental toxicology research.

Gardner is an adjunct professor of biology at North Carolina State University in Raleigh and assistant adjunct professor of physiology and pharmacology at Duke University in Durham, N.C.

He received his bachelor's and master's degrees from Creighton University in Omaha, Neb., and his doctorate in environmental health from the University of Cincinnati.

Four Join Water Council

EPA has appointed four new members to the National Drinking Water Advisory Council, replacing members whose three-year terms have expired. The new council members are: Frederick H. Elwell, Director and Chief Engineer for the Manchester, N.H. Water Works; Ira M. Markwood, Manager of the Public Water Supplies Division, State of Illinois Environmental Protection Agency; Dr. Evelyn Murphy, Chairman of the National Advisory Committee on Oceans and Atmosphere and Senior Lecturer in Urban Studies at MIT in Cambridge, Mass., and Leon L. Williams, Councilman for the Fourth District of San Diego, Calif., since 1969. A fifth member, Dr. Robert Neal, Director of the Center for Environmental Toxicology at the Vanderbilt University School of Medicine, was reappointed for a second term.

Congress created the 15-member Council when it passed the 1974 Safe Drinking Water Act. The body's purpose is to provide expert advice to EPA on drinking water matters and make recommendations to the Agency on activities and policies needed to meet the Act's requirements. To ensure that different concerns are represented on the Council, members are chosen from relevant State and local agencies, private organizations interested in the water supply field, and the general public.

REGION 1

Hazardous Chemicals

EPA Region 1 has confirmed contamination of surface waters in the area of three hazardous waste disposal sites in Rhode Island, Massachusetts, and New Hampshire, and has invoked the hazardous pollutants section of the Federal Clean Water Act. This action commits the Agency to a program of investigation and containment of the hazard from the three sites.

In Coventry, R.I., EPA investigators discovered levels of the industrial solvents toluene and benzene in a marsh area adjacent to the Picillo hazardous waste disposal site.

The Picillo site is located on about 7.6 acres of cleared land surrounded by woods and swamps in Coventry. Approximately 79,000 barrels of wastes are estimated to be buried on the site.

In Raymond, N.H., toluene and other organic contaminants are being discharged as leachate from a disposal site on Blueberry Hill Road. The leachate drains into a small stream that flows into the Exeter River. EPA estimates that there may be 1,000 barrels buried on the site.

In Holden, Mass., EPA investigators have discovered organic contaminants including toluene, benzene, and trichloroethane in groundwater near the area of the Holden municipal landfill. The groundwater drains into the Quinipoxet River which flows into Wachusett Reservoir. This reservoir supplies drinking water for metropolitan Boston.

REGION 2

State Water Plan

Region 2 has given its conditional approval to the statewide portion of New York's plan to resolve serious water pollution problems contributing to contamination of drinking water, restrictions on fishing in some rivers and lakes, limitations on shellfishing in tidal waters, and summer beach closings.

Charles Warren, EPA Regional Administrator, commended the New York Department of Environmental Conservation and the citizens' advisory committees for their commitment and concentrated effort over the past three years in developing the plan.

However, EPA cannot yet approve the strategies and recommendations in the plan for controlling non-point sources of pollution, a problem of serious significance not only in New York but across the Nation. Much more information is required on how specific sources affect actual stream quality and how well specific control measures work before cost-effective control measures will be generated that will produce tangible water quality improvement.

It is expected that by October 1, 1980, the State will submit a revised plan to EPA for final approval which incorporates all the certified area-wide plans, as well as EPA's findings and recommendations, into one statewide plan.

REGION 3

PCB Lawsuit

The Department of Justice, on behalf of EPA, has brought suit against Metal Bank of America for polluting the Delaware River with polychlorinated biphenyls (PCB's). Also sued were Metal Bank's parent company, the Union Corporation of New Jersey, and the owners of the site in Philadelphia where Metal Bank is located.

Metal Bank operated a metal recycling operation from 1968 through 1972. Among the items recycled were electrical transformers which contained PCB-contaminated oil. The oil was drained from the transformers into an underground tank for storage until an off-site disposal could be arranged. However, the tank developed a leak and one or more pools of oil and PCB's formed underground. Groundwater, moving through the site, has caused the PCB's and oil to leach slowly into the Delaware River.

Metal Bank is located near the Torresdale Water Treatment Plant, which provides drinking water for over half the population of Philadelphia. EPA believes that PCB's from Metal Bank could contaminate the Torresdale water supply, although routine testing by the Philadelphia Water Department has not detected PCB's in water in recent months.

EPA has asked that the court order Metal Bank and the other defendants to remove all PCB-contaminated oil and water from under the ground through recovery wells. The water would be filtered to remove the pollutant, and then discharged into the river. The Agency has also asked that the site be regraded, a waterproof cover placed over the ground, and an underground containment wall placed around the site to prevent further water from entering the site and leaching PCB's into the river. Monitoring wells would also have to be installed and monthly samples taken. Finally, EPA has asked that Metal Bank repay the money that the Federal government has already spent at the site.

REGION 4

Toxics Briefing

A Consumer Exchange Meeting on Toxic Substances is scheduled for October 7 at EPA's offices in Atlanta. The meeting is designed to offer leaders of groups representing consumer interests in the Southeast an opportunity to learn about government policy and regulations regarding toxic substances and to offer their comments to the agencies involved.

The Interagency Regulatory Liaison Group (IRLG) is sponsoring the meeting. IRLG members, in addition to EPA, are the Food and Drug Administration, the Consumer Product Safety Commission, the Occupational Safety and Health Administration, and the Food Safety and Quality Service of the Department of Agriculture. The agencies administer 25 laws dealing with protection of public health and safety. The IRLG was organized in 1977 in an attempt to improve the effectiveness of agency programs, while eliminating duplication and inconsistent regulatory actions and unnecessary paperwork.

REGION 5

Hazardous Waste Conference

Region 5's recent cleanup operation at the Seymour Recycling Company in Indiana generated a considerable amount of Congressional interest in the Agency's hazardous waste management activities. In response to this interest, the Chicago Regional office sponsored a three-hour briefing on hazardous wastes in Indianapolis for the staff of the Indiana Congressional delegation and State officials concerned with hazardous waste issues.

Ten of Indiana's Congressmen and Senators were represented. Also in attendance were representatives of the Indiana State Board of Health, the Indiana Stream Pollution Control Board, the office of Lt. Gov. Robert Orr, and associates of the Holcomb Research Institute, which provided meeting facilities and staff for the afternoon briefing session.

Region 5 prepared a 15-page background document, which was distributed with brochures and fact sheets. Regional Administrator John McGuire opened the session with an overview of the hazardous waste problem.

REGION 6

Windborne Pesticides

The Department of Justice, Houston District, has filed a lawsuit on behalf of EPA asking the present and past owners of a former pesticide formulating plant at Mission, Tex., to

cleanup and secure the site.

The site is flat, dry, dusty and windy, and dangerous concentrations of pesticides and related chemicals are blowing onto nearby homes, two elementary schools and a school bus depot. The pesticides and chemicals include DDT, lindane, dieldrin, aldrin, toxaphene, heptachlor and chlordane—all banned for most uses in the United States. The concentrations are thousands of times higher than the concentrations of these chemicals on agricultural or rural land in the area, and exceed water quality standards for these chemicals.

The complaint alleges that, because of the transporting through the air of these chemicals, area residents and children are being exposed to dangerous levels of these substances which may cause cancer, birth defects, aplastic anemia and other poisonous effects. These chemicals are bio-accumulative, meaning they build up in human fatty tissue.

Franklin J. Dusel, the present owner who is in control of the property at this time, and Helena Chemical Company, with Tex-Ag, Inc., former owners and operators of the plant, are named as defendants.

Farmers Honored

Del and Val Akerlund, brothers who jointly operate a 780-acre farm near Valley, Neb. received a Region 7 1979 Environmental Quality Award at a ceremony held recently in the office of Nebraska Governor Charles Thone.

In the 13 years since the Akerlunds discontinued the use of synthetic fertilizers, herbicides and insecticides, they have seen the return of natural productivity and fertility to the soil and the resurgence of wildlife in the area. In fact, their experiment in organic farming has been so successful, the brothers have opened their farm to scientists, farmers and others—as many as 600 visitors a year—in an effort to demonstrate that natural farming methods can be as profitable as more widely accepted chemical methods.

In 1946, the Akerlunds were the first farmers in their area to begin using the petrochemicals that promised to produce high yields and greater profits. Two decades later, their 1967 chemical bill reached $24,000. Bare spots, totally devoid of life, appeared in their fields. Weeds and pests were worse than ever as natural predators fled the chemical-laden land.

In 1976, the Akerlund farm was made part of a study conducted by Washington University in St. Louis, Mo., to compare 16 organic farming operations and 16 conventional farming operations in the Midwest corn belt. The study concluded that organic farmers were making just as much profit as conventional farmers using inorganic fertilizers, while using only one-third as much fossil fuel energy.

Colorado Auto Inspections

Governor Richard Lamm recently signed an auto emissions control program bill making Colorado the 25th State to have such a law. This law establishes Inspection/Maintenance programs in nine Colorado Front Range counties and is aimed primarily at reducing carbon monoxide and hydrocarbon levels.

The Colorado Legislature worked on an auto emissions control program for four years without success. During its 1979 session the legislature set a deadline of March 1, 1980, to enact Legislation but failed to meet that date, prompting the EPA to limit Federal funding on certain sewer and highway projects. This move was delayed, however, by court action and the State was given a stay. Once that deadline passed, EPA's Regional Administrator Roger Williams set the limitations in place, thereby freezing millions of dollars in Federal funds for the State.

Within days a legislative committee representing both Houses developed an auto emissions control bill which was later acted on favorably by the full legislature. Lamm signed the bill, the funding limitations were lifted, and consequently Colorado lost no money.

The new program will begin January 1, 1983, with certified private garages doing the tests under the close supervision of the Colorado Departments of Health and Revenue.

Resource Recovery

Region 9 has awarded six grants to determine the feasibility of implementing resources recovery projects. The grants are funded under the President's Urban Policy program and authorized by the Resource Conservation and Recovery Act. The municipalities receiving this Federal assistance are: San Francisco, Long Beach, Los Angeles, Los Angeles County, Berkeley, and Kauai, Hawaii. Except for Los Angeles County, each project will examine the feasibility of installing a facility to recover energy and materials from solid waste. Los Angeles County will be studying the feasibility of implementing a source separation program for salable materials. The total Federal participation in these projects is approximately $900,000.

Volcanic Ash

Residents of the Northwest digging out from the fallout of volcanic ash from Mount St. Helens were urged by the EPA to cooperate fully with local officials and health agencies dealing with clean-up efforts in their communities.

EPA's chief concern is the potential for long-range health effects stemming from the inhalation of fine particulate matter contained in the ash deposits, according to Donald P. Dubois, EPA's Northwest regional administrator in Seattle.

"Safe removal of the ash is a priority," said Dubois, "In order to reduce public exposure to particles that, once inhaled, often can never be expelled from human lungs.

"While asthmatics, emphysema victims and heavy smokers are among those who are most susceptible to long-term health effects from small particulates, even otherwise healthy non-smokers would be well-advised to limit their exposure. Small particulates, as long as substantial quantities of ash remain on the ground, are certain to be kicked up by winds, by motor vehicle traffic or by other human activities."

Refined estimates of the amount of small inhalable particulates and data about the exact chemical make-up of the particles will be made available upon completion of EPA's evaluation of information.

States Served by EPA Regions

Region 1 (Boston)
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
617-223-7210

Region 2 (New York City)
New Jersey, New York, Puerto Rico, Virgin Islands
212-264-2525

Region 3 (Philadelphia)
Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia
215-597-9814

Region 4 (Atlanta)
Alabama, Georgia, Florida, Mississippi, North Carolina, South Carolina, Tennessee, Kentucky
404-881-4727

Region 5 (Chicago)
Illinois, Indiana, Ohio, Michigan, Wisconsin, Minnesota
312-353-2000

Region 6 (Dallas)
Arkansas, Louisiana, Oklahoma, Texas, New Mexico
214-767-2600

Region 7 (Kansas City)
Iowa, Kansas, Missouri, Nebraska
816-374-5493

Region 8 (Denver)
Colorado, Utah, Wyoming, Montana, North Dakota, South Dakota
303-837-3895

Region 9 (San Francisco)
Arizona, California, Nevada, Hawaii
415-556-2320

Region 10 (Seattle)
Alaska, Idaho, Oregon, Washington
206 442-1220

Why the Mayans Collapsed

By Colin Norman

Just over 1,000 years ago, the Mayan civilization was at its peak. One of its centers, in the tropical forests of what is now northern Guatemala, supported some five million people. But in the span of just three or four generations, parts of the civilization suffered almost total collapse. Population levels plummeted, and some areas remained virtually uninhabited until recent years.

The abrupt demise of this Central American civilization has puzzled archaeologists and historians for decades. There is no shortage of possible explanations, ranging from epidemics to peasant revolts, but the event has remained one of the deep mysteries of human history. Recently, however, a new theory has been advanced: environmental degradation, caused by overpopulation and mounting pressures on the fragile tropical ecosystem, may have been a major culprit.

The possibility that the Mayan civilization was undermined by ecological stresses is of more than academic interest, for hundreds of millions of people in the Third World are trying to eke out a living under equally tenuous environmental conditions today. The plight of the Mayans may thus hold some important lessons.

According to archaeological evidence amassed by scientists at the University of Florida and the University of Chicago, the Mayan population in the Guatemalan rain forests grew steadily for about 17 centuries before its collapse around A.D. 800. The growth rate was slow, however, for it took about 400 years for the population to double in number. By contrast, the population in some developing countries today is doubling every 30 years.

Population growth may have been so slow that its impacts were not perceived until too late. By about the third century, much of the forest cover around the Mayan settlements had been cleared for agriculture, exposing the soil to the full impact of the region's heavy rainfall. The result, according to the recent findings, was extensive soil erosion. Massive amounts of fertile soil were washed into lakes and streams, leaving the land seriously depleted of essential nutrients.

Direct evidence of this environmental degradation has come from a study of the soils and lake beds in a region of northern Guatemala that contained a major Mayan center. Exceptionally high levels of

phosphorus in the lake sediments can be explained only by extensive soil erosion that placed an "undoubtedly severe" strain on the region's agricultural resources, the scientists suggest in a recent *Science* article.

While other forces, such as disease or internal strife, may have contributed to the final collapse, the cumulative damage from mounting pressures on the region's agricultural base may have undermined the stability of the civilization.

Such pressures are depressingly familiar in many parts of the developing world today. Farming practices that were sustainable when population levels were relatively low are breaking down under the demand for increased food production. Extensive areas in Africa, Asia, and Latin America have been stripped of trees as more and more people need land to plant crops and require firewood for heating and cooking. And overgrazing on grasslands in arid regions is contributing to the malignant spread of deserts in many parts of the world.

As with the collapse of the Mayan civilization, the full impact of gradual ecological deterioration may be felt suddenly and dramatically. Persistent and devastating floods in northern India, for example, are partly the result of deforestation in highland areas, which has led to rapid runoff, soil erosion, and silting of waterways. The ecological calamity triggered by the drought in the southern fringe of the Sahara in the early seventies also had its roots in overexploitation of the region's fragile environment.

Rising demands for food from a burgeoning population are pushing farmers onto marginal lands where traditional agricultural techniques are unsustainable. But many other forces are also contributing to the problems. Feudal landownership patterns in many countries, for example, mean a few rich farmers own the fertile bottomlands while poor farmers are forced to scratch out a living from the deteriorating soils on hillsides. And as rising world oil prices drive the cost of kerosene beyond the reach of many poor people, they have no alternative but to cut down trees for firewood.

Curbing the slow deterioration of the ecosystems in many developing countries will thus entail a broad range of social and political reforms. Two countries with markedly different political systems—China and South Korea—have successfully launched major reforestation programs, however, and some community-level efforts are under way in parts of India. These actions indicate at least a spreading awareness of the urgency of tackling the most conspicuous environmental problems. But unless such programs are undertaken in many parts of the world, some ecosystems may be pushed past the point of no return. It is sobering to note that some of the Mayan farmlands have not yet recovered their full productivity, 1,000 years after the Mayan collapse. □

Colin Norman is a researcher at Worldwatch Institute in Washington, D.C., and co-author of Running on Empty: The Future of the Automobile in an Oil Short World *(W. W. Norton, November 1979).*

Mayan statues remain mute reminders of a once-great civilization.

News Briefs

EPA PROPOSES BAN ON LINDANE

EPA has proposed a ban on most uses of lindane, an insecticide commonly used in homes, on farms, and in treating hardwood lumber. EPA proposed the ban because of findings that lindane causes cancer, adverse effects on the unborn, and nerve damage in test animals. Studies on humans have associated aplastic anemia with lindane exposure, and lindane residues have been found in human fat tissue. Residues have also been found in city air, rain water, and drinking water. The proposed ban would affect about 80 percent of the almost 1 million pounds of lindane used annually in the U.S.

NEW FLUE PROCESS ANNOUNCED

EPA announced a $55 million government-industry demonstration project to cut sulfur emissions from coal-fired plants. The project will demonstrate a new process for removing sulfur from gaseous emissions common to all coal-fired power plants. Under the new project, flue gas desulfurization, or scrubbing, traps sulfur oxide contained in exhaust gases produced by the combustion process. These discharges are a major source of acid rain. EPA will provide $9.5 million for the five-year cooperative design, construction, testing, and demonstration project. The additional funds will be contributed by New York State and the electric utility industry. The method differs from the majority of the currently installed methods in that pure sulfur is produced as a byproduct, which can be sold to offset part of the costs of environmental protection.

The Islands of Sinepuxent Bay

By Steve Dawson and Tom Cofield

Rarely do man's often violent "improvements" to the environment—usually in response to the needs of modern society—result in measurable benefits to the wild creatures that share this earth with us.

This is especially true when the "improvements" fall into the category of excavations, such as channel dredging.

But today, located west of Ocean City and Assateague Island in Sinepuxent Bay, on the Atlantic coast of Maryland, a solid example of mutual benefit to man and wildlife exists in a series of small islands which literally were not there before the Sinepuxent Bay Channel was dredged to accommodate commercial and private boat traffic using that coastal waterway.

When it became necessary in 1950 to dredge the Sinepuxent Channel, little if any thought was given to what nature had in store for the small islands literally created by depositing the dredging spoils.

Wisely though, the Maryland Department of Natural Resources retained ownership of the islands which today represent an outstanding example of the benefits to be derived from the creation of wildlife habitat.

Thanks more to good fortune and remote location than to any preconceived plan, the newly formed "dredge-islands" were left to mature and develop on their own.

As time is measured in nature, it wasn't long before various indigenous plants and other dense salt marsh vegetation took hold and flourished, eventually covering and helping to protect the small spits of land from erosion.

Then, in what modern wildlife managers now regard as "expected response," birds common to this unique region began taking advantage of the budding habitat, nesting in isolation from invasion or disturbance by man.

Soon these truly small bits of land became the summer residences for such colony-nesting species as the Little Blue Heron, Common Tern, Forester's Tern, Glossy Ibis, Black-Crowned Night Heron, Herring Gull, Cattle Egret, and others.

In addition, other non-colony-nesting species of bird life began using parts of the islands for nesting sites. These included such species as American Oystercatchers, Mallards, Black Ducks, Gadwall, and numerous small shore birds.

Recently a Pintail nest was discovered on one of the islands. The Pintail previously was not recorded as a nesting species in Maryland.

One impressive aspect of this "colonization" is the many species of bird life nesting within a few feet of each other and in complete harmony.

Since the various species of birds are known to prefer slightly different nesting vegetation, it is the variety of indigenous plants and grasses that is credited with the success of this commune-like example of nature's willingness to take up residence whenever and wherever natural surroundings attract them.

One of the most interesting but as-yet-unsolved mysteries involved here is the fact that nesting periods of the same species have been observed to vary somewhat from one island to another nearby.

Despite losses in total area due to violent storms, the Maryland Wildlife Administration will continue to keep a close watch on this unique though largely accidental peep-preview of what miracles nature can produce.

At the very least, the saga of the Sinepuxent Islands must stand as a breakthrough in the as-yet unplumbed depths of wildlife habitat management. □

The above article is excerpted from the Maryland Conservationist, Jan.-Feb. 1980.

A review of recent major EPA activities and developments in the pollution control program areas.

AIR

EPA Assistant Administrator for Air, Noise, and Radiation David G. Hawkins recently outlined plans for adding new requirements for five pollutants to the regulatory program to prevent "significant deterioration" of air quality in already clean areas of the country.

EPA previously promulgated regulations to prevent significant deterioration (PSD). These regulations require best available control technology for all new sources and provide specific increments (limited pollution concentrations increases) for sulfur dioxide and particulates, which are designed to prevent deterioration of air quality in the Nation's clean air areas resulting from these pollutants. The program outlined will provide additional protection to these clean air regions from carbon monoxide, hydrocarbons, lead, nitrogen oxides, and ozone.

"We intend to study and implement a program aimed at preserving the Nation's air resources in areas that currently meet Federally mandated air quality standards," Hawkins said. "We are seeking extensive public comment on this effort before specific regulations are proposed."

The proposed program to prevent significant deterioration of sulfur oxides and particulates requires the management of air quality increments. The approaches being considered for the new regulations include several other management options such as emission management or control and economic incentive systems where industries would be charged according to the amount of pollution they emit. The more they emitted, the more they would be required to pay.

ENFORCEMENT

Supreme Court Decision

A recent Supreme Court decision may mean less time spent in court by the EPA in its efforts to implement the Clean Air Act. By a vote of seven-to-two, the high court said Congress in 1977 did expand significantly the jurisdiction of the appeals court to review EPA decisions. This ruling, in favor of the EPA, is important because it answers the question of whether challenges to EPA final decisions should be heard in the district court, which is often a long, drawn out process that could result in an appeal, or go straight to the appeals court.

Prior to 1977, actions of an EPA Administrator under provisions not specifically enumerated in section 307 (b)(1) of the Clean Air Act were reviewable only in district court under its Federal-question jurisdiction. However, amendments to the Act in 1977 added to the list of actions reviewable exclusively in the appropriate courts of appeals both actions of the Administrator under other specifically enumerated provisions of the Act and any other final actions of the Administrator under the Act.

Because there are 11 appeals courts as compared to over 90 district courts, the Agency feels that it can now look forward to more uniformity in decisions in the 200 plus appeals that may be pending at any one time.

The case involved arose when the EPA through its Region 6 office informed PPG Industries, Inc., that certain new source performance standards under the Clean Air Act applied to its chemical plant in Lake Charles, La. PPG appealed on the grounds that the equipment involved was in the planning and initial construction stages in 1970, a year before the standards took effect. The Agency, however, contended that since the equipment was not assembled until 1976, it was subject to the standards.

PPG filed a suit seeking review of the Agency's decision in the Court of Appeals for the Fifth Circuit, and a complaint for injunctive relief against the regional administrator in the United States District Court for the Western District of Louisiana.

The Court of Appeals dismissed PPG's petition for lack of jurisdiction under the Clean Air Act. EPA then appealed to the Supreme Court.

The Supreme Court based its decision on the plain meaning of the same section under the Act, specifically the phrase "any other final action." PPG had defended the appeals court decision on the grounds that the Administrator's decision should not be reviewed in the court of appeals since no formal proceeding such as a hearing preceded it.

The case has been sent back to the appeals court for review and the suit filed in the district court dropped.

Firms Sued

The Department of Justice, on behalf of EPA, recently filed a suit against Ottati and Gross, Inc. and the Great Lakes Container Corp., charging that improper disposal of hazardous wastes by these companies at two adjacent sites near Kingston, N.H., poses an imminent fire hazard and a risk of contamination of surrounding groundwaters and surface waters.

Many of the chemicals found at these sites are suspect carcinogens. Some of them also have been found to adversely affect the liver, kidneys, heart, nervous system, and respiratory system of people. In addition, a number of the compounds are highly flammable, and some, including methylene chloride and chloroform, emit toxic phosgene gas when exposed to flame.

Approximately 64,200 steel drums that either did or do contain chemical wastes are stored at the sites.

NOISE

Noise Control

The EPA recently endorsed a plan by the city of Inglewood, Calif., to establish one of the most extensive airplane noise reduction programs in the Nation. The program calls for offering relocation opportunities to quieter neighborhoods for the approximately 4,000 people of the North Lockhaven area in Inglewood who live directly under the flight paths of jet aircraft. The airplanes are landing or taking off at Los Angeles International Airport.

Present plans anticipate an expenditure of $200 million for the relocation-redevelopment project to be provided by industry, private organizations, and Federal and local governments. EPA will provide a $25,000 grant to help the project.

EPA's endorsement of the project represents part of the Agency's initiative under President Carter's urban noise program, announced last year.

PESTICIDES

Herbicide 2,4-D

Barbara Blum, EPA Deputy Administrator, announced recently that the Agency is requesting additional information from manufacturers to determine whether 2,4-D, a widely used herbicide, is safe for humans and the environment.

"We have made this decision following a review of health-effects studies of 2,4-D," said Blum. "The review showed that significant information gaps exist on the effects of 2,4-D, preventing a definite conclusion on the safety of the herbicide. We will ask the manufacturer of the weed killer to commence the studies to provide the missing evidence."

Blum said that if the manufacturers fail to notify EPA within 90 days that they will provide the necessary information, EPA will use a stringent new provision of the pesticides law, which allows the Agency to stop all uses of the pesticide.

If the manufacturers comply, Blum said, EPA will allow 2,4-D to continue to be used while studies are underway. However, should any of the new studies demonstrate a major health or environmental problem, she said EPA would then take appropriate regulatory action without waiting for completion of all the studies.

Perthane

The EPA says it may ban future use of the pesticide Perthane unless the manufacturer agrees to conduct additional studies on its effects on human health and the environment. Perthane is a chlorinated hydrocarbon insecticide chemically related to DDT, a pesticide banned in the United States eight years ago. The manufacturer of Perthane, Rohm and Haas Company of Philadelphia, has not stocked or sold it in the U.S. for two years but wants to retain its right to do so in the future.

EPA told Rohm and Haas it cannot agree to this unless the company is willing to conduct additional studies to fill significant information gaps on the effects of Perthane. Incomplete evidence at hand, said EPA, suggests it causes cancer and birth defects in experimental animals.

If Rohm and Haas complies, EPA will allow Perthane to be sold so long as the new studies do not demonstrate it poses a major health or environmental hazard.

SOLID WASTE

Guide Available

The EPA now has available a guide to assist municipalities with solid waste management through the development of projects to recover materials and produce energy from municipal solid waste.

The 600-page guide, developed for EPA by the MITRE Corporation, is titled "The Resource Recovery Management Model."

The Management Model can be ordered for $27 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Refer to #055-000-00184-7.

To assist local project managers in explaining the guide, a document called "Resource Recovery Management Model Overview" (SW-768) is available free from the U.S. EPA, Solid Waste Information, 46 West St. Clair St., Cincinnati, Ohio 45268 or from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

TOXICS

Changed Plans

A New York City chemical company recently notified the EPA that it no longer intends to manufacture a new plastic compound about which EPA had expressed concern. The Argus Chemical Corporation decided to withdraw its notice of intent to manufacture the new plasticizer at a time when EPA was considering limiting production of the substance until the company provided information on whether it could cause immediate or long-term harm to production workers and the general public.

Prior to this announcement, another company also dropped plans to produce six new plasticizers after the Agency barred production until the firm submitted information on the new compound's potential to cause cancer among people and to harm fish and other aquatic life.

Both withdrawals occurred under an EPA program that requires chemical makers to notify the Agency of their intent to market new compounds so that EPA can review the health and environmental safety of these substances. This program was created by the 1976 Toxic Substances Control Act.

"Toners"

EPA Assistant Administrator for Toxic Substances Steven Jellinek says people concerned about possible health hazards from certain copying "toners" should not be alarmed about the safety of using their present copiers or current copying practices based on the information currently available to the EPA.

The Agency gave this advice as a result of numerous public inquiries both it and Xerox Corp. have received about the safety of Xerox toners and copying machines since news accounts released recently indicated that certain toners contained a chemical that gave indications of being a possible health hazard in certain short-term tests.

EPA officials met with Xerox representatives in Washington, D.C. recently to discuss these tests and other information related to the toners.

WATER

Cost Cutting

Special cost-cutting reviews by the EPA have saved about $141 million in sewage treatment plant cost, the Agency announced recently. To ensure that Federal funding was being used most efficiently to protect public health and the environment, the Agency detailed "value engineering" reviews of planned sewage projects in 1976. Since then, 87 high-cost projects have been reviewed and as a result, estimated construction costs of $2.7 billion for those projects were reduced by $141 million, or 5.1 percent.

"Value engineering" is the review of proposed projects by an independent team of experienced professional engineers prior to construction to make sure the most cost-effective plans and specifications have been used.

Clean Lakes

Federal funds used to clean up the Nation's lakes pay off many times over in benefits to the public, according to a new report prepared for the EPA. Specifically, the study estimates that each dollar of Federal lake cleanup funds has resulted in $8 in measured benefits. Total government investment in lake cleanup, including matching State and local funding, is returned four-fold to the taxpayer. The greatest benefits were in the form of improved recreational opportunities and aesthetics.

These findings are contained in a 150-page report titled *An Assessment of Economic Benefits of 28 Projects in the Section 314 Clean Lakes Program*, prepared under contract by the JACA Corporation of Port Washington, Pa.

New Rules

Thousands of industries and muncipalities will benefit from new regulations announced recently by the EPA that simplify procedures for obtaining necessary environmental permits.

A key element of EPA's "permits consolidation" effort is the use of a single, simplified form to apply for the different types of permits. It specifies the information needed to apply, eliminating unnecessary questions and duplicative information requirements which would result from use of a separate form for each permit program.

The rules apply to new or existing permit programs designed to protect the public from unsafe treatment, storage or disposal of hazardous chemicals; the contamination of underground drinking water supplies; the pollution of waterways by industries and municipal sewage plants; air pollution caused by new sources; and the improper disposal of contaminated dredge materials and destruction of vital wetlands.

AGENCY WIDE

Public Participation

The EPA has proposed its first Agencywide policy on public participation to encourage citizen involvement in all of its programs. Most EPA programs have been providing public participation in the past, but each in its own way. The proposed policy would bring further order to this situation by providing a single set of flexible guidelines for use by all offices.

In addition to clarifying managers' responsibilities for public involvement, the policy emphasizes participation at the early stages of proposed programs and on issues where alternatives exist.

The new policy would apply to EPA operations at both its Washington, D.C., headquarters and 10 regional offices. □

Whitewater Calling

The novice river runners were soaked by waves breaking over their rubber river raft as it wallowed, bucked and lurched through the rapids in the West Virginia gorge of the New River, often called the Grand Canyon of the East.

The drenched paddlers were taking part in a recent trip in the rapidly growing sport of whitewater rafting which is attracting thousands of people this summer on suitable rivers across the country.

The New River offers 21 major rapids in a 15-mile stretch between Thurmond and Fayetteville, near West Virginia's Hawks Nest State Park, an hour's drive from Charleston, W. Va.

The river crashes over and around enormous boulders which line its bed as the stream passes between 1,000-feet high banks and under the New River Gorge Bridge, the highest steel arch span in the East.

Despite its name, the New River is estimated to be 100 million years old and is considered the oldest in the United States. Because of this distinction and its extraordinary and unmarred scenic beauty, this ancient river has been given special protection by an Act of Congress that proclaimed it a National River.

River rapids in the East are rated on a scale of Class I—VI, with Class I having small waves and Class VI extraordinarily dangerous rapids which are almost impossible to navigate. The difficulty of rapids can fluctuate from day to day depending on water level and weather conditions.

On a recent New River trip that we took, the whitewater outfitter guides leaned far out of the rubber raft and stroked their paddles frantically through the churning water as they steered through several Class V rapids.

Between rapids the river calms down and paddlers sometimes use their plastic bailing devices for water fights with neighboring craft as the group glides through "flatwater." On the towering banks flashes of cascading streams can be seen through the thick tree foilage as these tributaries hurtle down to join the river.

The American Rivers Conservation Council, a group formed in 1973 with a Washington, D.C., headquarters to help protect wild and scenic rivers, sponsors many whitewater river trips around the country.

Some of the rivers on which trips are planned this summer and fall include the Gauley (with rapids named "Mash," "Heaven Help You," and "Pure Screaming Hell") and the Cheat in West Virginia, the Youghiogheny in Pennsylvania, the Salmon in Idaho, the Snake in Idaho-Oregon, the Rio Grande in Texas and a stretch of the Colorado in Utah.

From an environmental perspective the surge in whitewater boating has many advantages and some drawbacks.

People who were used to having the Nation's wildest and loveliest rivers pretty much to themselves resent the sight of large numbers of helmeted paddlers in flotillas of rubber rafts. They often look like gladiators preparing to do battle with the river gods.

Owners of land along these rivers also complain about occasional trespassing by the rafters and object to litter sometimes left on the shore.

On the other hand, most river outfitters who provide the rafts understand that keeping the river and beach areas clean is essential for their success.

When we rode the New River rapids, a member of the tour, despite stern advance warnings about not littering, threw a cigarette overboard. The guide provided by Wildwater Expeditions Unlimited immediately spun the craft around in a vain attempt to retrieve the butt.

One advantage of whitewater rafting is that it helps introduce many city residents to the beauty and charm of river life.

At day's end after the hurly burly of the rapids, visitors can enjoy the peace and calm of the flatwater, notice trees reflected in the shimmering water surface, and listen to the song of a water thrush as dusk falls.

River rafting provides many sights and sounds that, in the words of an old Irish saying, "brush the cobwebs from your heart."—C.D.P.

Timber cutting can lead to serious erosion of the land unless carefully managed.

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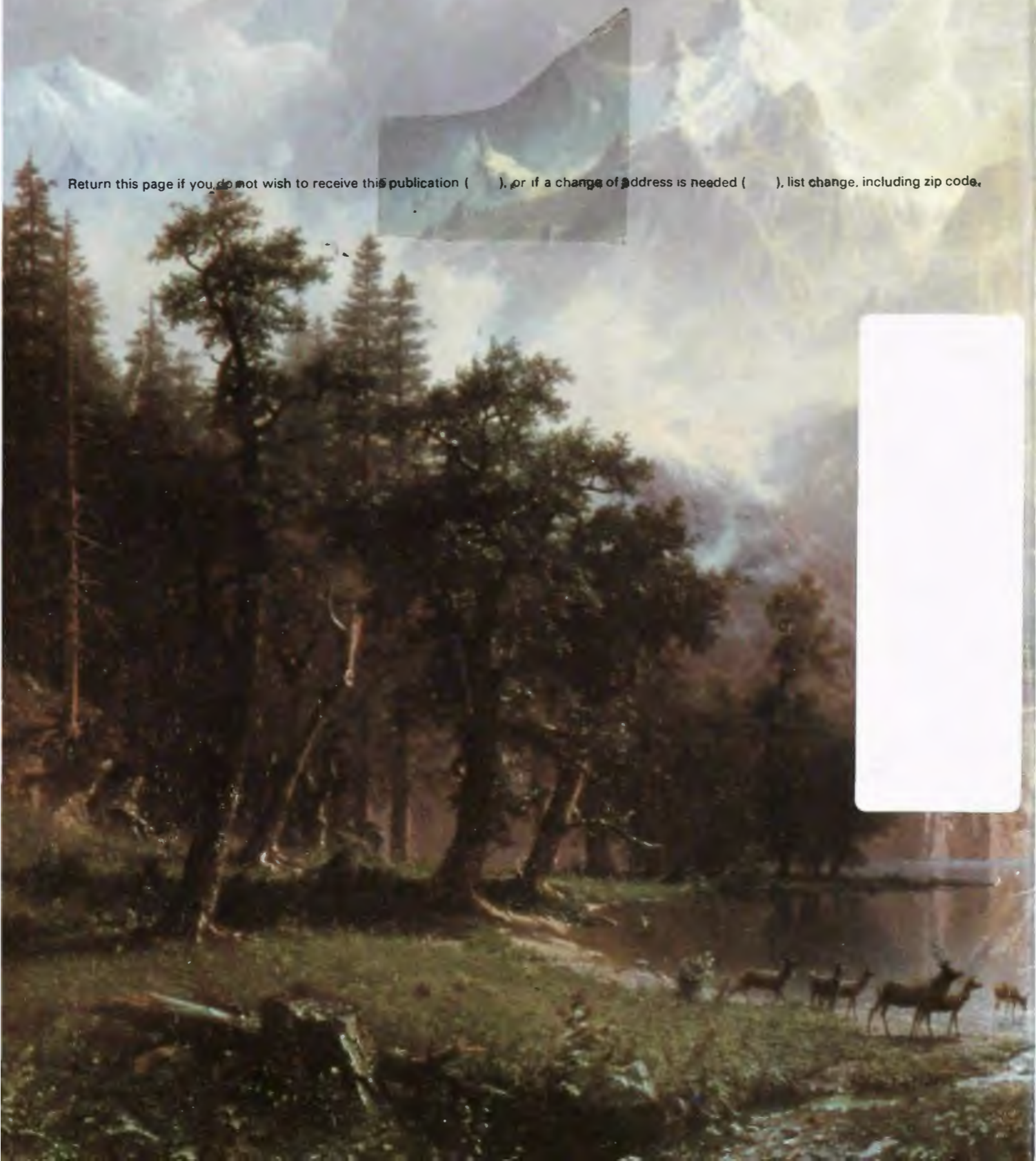

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