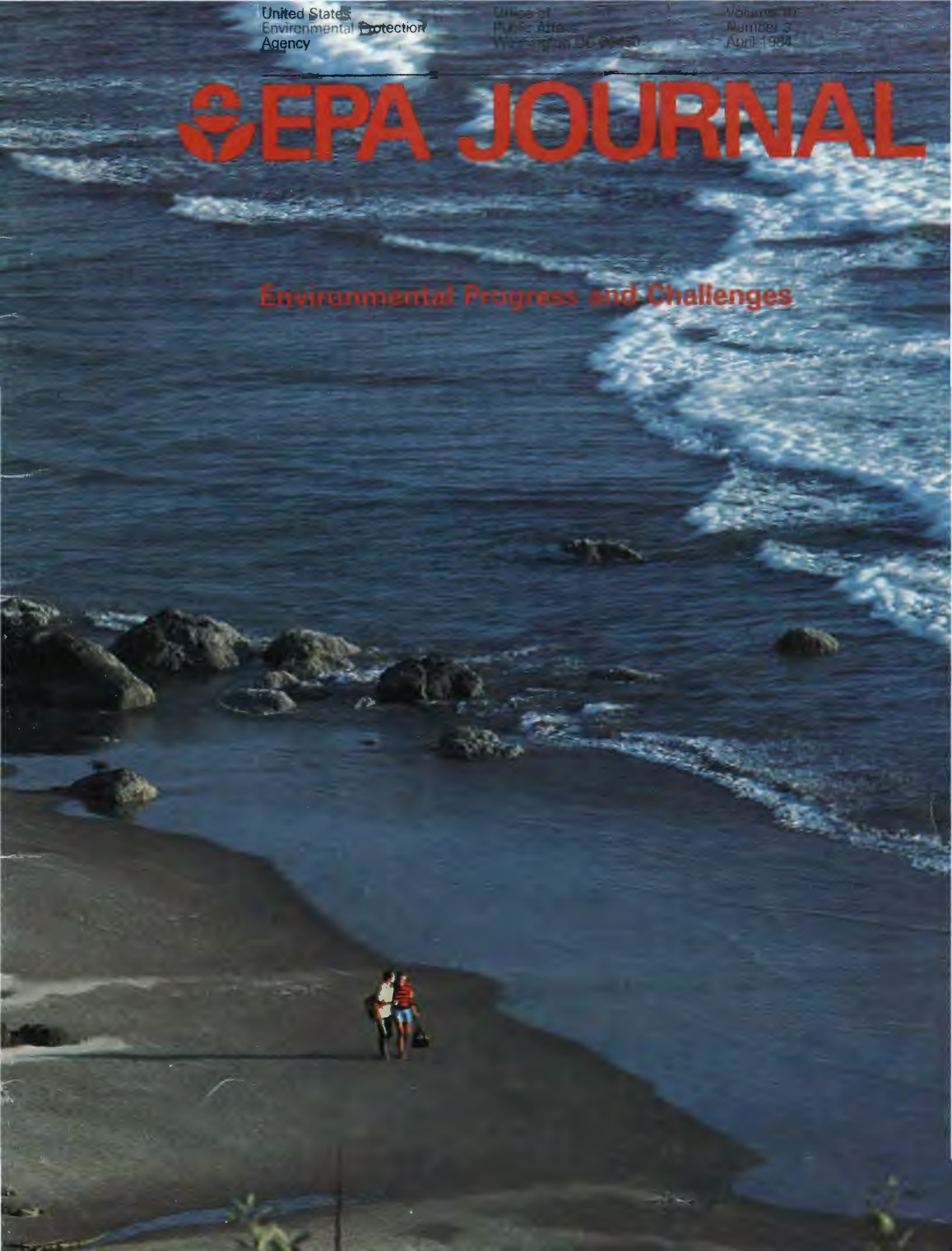
United States
Environmental Protection
Agency

Office of
Public Affairs
Washington, DC 20460

Volume 10
Number 3
April 1984

EPA JOURNAL

Environmental Progress and Challenges



A Review of Environmental Progress

Youngsters paddle their rubber raft on lake near Ely, Minn., an adventure helped by clean water.

What gains has the country made since 1970 in dealing with its environmental problems? That was the year marking the surge of public environmental concern and the establishment of EPA.

What does the remaining environmental agenda look like? What kind of problems will we face and will they be easier for the country to solve?

In a comprehensive assessment of environmental progress since EPA was created, the agency discusses these questions, basing its comments and conclusions on the best data and expertise available. This issue of EPA Journal previews a draft of this major report which will be published soon.

Including another topic of broad public concern, the Journal publishes excerpts from a recent speech by Administrator William Ruckelshaus on the agency's experience and policy with regard to risk assessment and risk management. These are basic tools the agency is using as decisions are made on difficult environmental matters.

Other subjects covered are the most recent major actions being taken to deal with environmental problems the country faces. Included are articles on EPA's phaseout of the pesticide EDB in citrus fruit, steps by the agency to curb asbestos contamination in schools and other public buildings, a proposed update of air quality standards for pollution particles in air and a suit by the Justice Department to compel cleanup of PCB pollution from a Chicago area electric utility's equipment.

A new EPA policy encouraging more pollution tests using biological techniques such as measuring the effects of wastewater on fish is explained. Findings from a nationwide assessment of water quality conditions for fish are reported. Another article reports on a battle the agency is waging against the rigging of bids in the wastewater construction grants program.

Pollution from nonpoint sources around the country and solutions to the problem are explained in excerpts from an EPA report on the subject.

New appointments and a new mission by an EPA scientist are reported along with summaries in the regular feature, Update, of other recent developments at the agency. Environmental Almanac concludes the issue with a focus on a special spot in nature—Fern Valley. □

United States
Environmental Protection
Agency

Office of
Public Affairs (A107)
Washington DC 20460

Volume 10
Number 3
April 1984

EPA JOURNAL

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

The EPA Journal is published by the U.S. Environmental Protection Agency. The Administrator of EPA has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget. Views expressed by authors do not necessarily reflect EPA policy. Contributions and inquiries should be addressed to the Editor (A-107), Waterside Mall, 401 M St., S.W., Washington, D. C. 20460. No permission necessary to reproduce contents except copyrighted photos and other materials.

Cover: Young couple strolling amid the splendor of a beach on Oregon's rugged coast. Photo by C. Biedel of Photri.

Photo Credits: Steve Delaney; C. Biedel of Photri; U.S. Soil Conservation Service; E. James White; U.S. Department of Agriculture; Rex Gary Schmidt from painting by Bob Hines; Library of Congress Collections; Thomas R. Chittenden; and U.S. Forest Service.

Design Credits. Robert Flanagan; Ron Farrah

EPA JOURNAL Subscriptions

The annual rate for subscribers in the U. S for the EPA Journal is $20.00. The charge to subscribers in foreign countries is $25 00 a year The price of a single copy of the Journal is $2 00 in this country and $2.50 if sent to a foreign country. Prices include mail costs. Subscriptions to EPA Journal as well as to other Federal Government magazines are handled only by the U. S. Government Printing Office. Anyone wishing to subscribe to the Journal should fill in the form at right and enclose a check or money order payable to the Superintendent of Documents. The requests should be mailed to: Superintendent of Documents, GPO, Washington, D C. 20402

Name-First, Last — Please Print

Company Name or Additional Address Line

Street Address

City | State | Zip Code

☐ Payment enclosed
(Make check payable to Superintendent of Documents)
☐ Charge to my Deposit Account No

Airborne test for pollution

Environmental Progress and Challenges

Over the past 13 years a State-Federal partnership has made substantial advances in controlling pollution in this country, yet increasingly complex and costly new challenges loom ahead in the Nation's quest for a cleaner environment.

This assessment is contained in a soon-to-be released report on environmental progress made since EPA was established in 1970 and the most significant environmental challenges ahead.

The report, entitled "Progress and Challenges: An EPA Perspective on the Nation's Environment," traces the results of early environmental control measures, examines the nature of current and emerging problems, and describes EPA's strategy for dealing with these problems.

Intended as an educational document for the public, the report is designed to foster a better public understanding of the complex nature of environmental control and decision-making. Another purpose of the report is to focus attention on the Agency's effectiveness in achieving real environmental gains.

An important reason for the massive effort made by the Agency to assemble the information in the report was the recognition by EPA's leadership of the need to establish a baseline for measurement of future environmental effectiveness and to anticipate emerging problems.

EPA Administrator William D. Ruckelshaus said the report will provide an accounting to the American public of the Agency's stewardship of the Nation's air, land and water during the past 13 years.

"The environmental challenges of the 1980s are much more complex than the

Water

ones we tried to address in the 1970s and they will not yield quickly to our efforts," Ruckelshaus said.

"In setting out to find solutions to the environmental issues of the eighties and nineties, we start with a keen appreciation of the difficulties involved. Finding the evidence of contamination, assessing the threat, correcting the damage, setting up preventive measures, and paying the price of protection—all raise questions of science, technology, and public policy that are as difficult as they are important.

"In a number of cases, we must decide whether the very fear of risk is sufficient cause to act, or whether we must await more certain evidence that the risk is real. In these and other cases, we lack both certainty as to the degree of risk and proven technology to remove it. In nearly every case the cost of protection gives pause to any public servant who must weigh the investment of public funds against the value of the protection to be purchased. We must make judgments with whatever information we have and expect to learn more as we go.

"I believe that EPA's highest priorities in the years ahead are to maintain progress, improve our understanding and knowledge, and anticipate new challenges. All this must be done while strengthening our partnership with State and local governments and maintaining public support and trust."

The new report explores the pollution problems and corrective efforts.

The report was prepared by the EPA Office of Management Systems and Evaluation, with the cooperation of the Agency's program offices.

This article reviews highlights of the report's findings on the progress and challenges in four major environmental areas: water, air, land, and control of pesticides and toxic substances. Key findings in the report follow:

When EPA was established in 1970, the Nation was painfully aware of the pollution of its public waters. For example:

- The Izaak Walton League described the Willamette River in Oregon as a "stinking slimy mess, a menace to public health, esthetically offensive, and a biological cesspool."
- In the Nation's capital, huge mats of smelly, floating algae clogged the Potomac River.
- Escambia Bay, East Bay, Pensacola Bay, and Santa Rosa Sound, Florida, were so polluted that frequent fish kills were measured in terms of square miles of dead fish.

During the years since, individual citizens, businesses, industries, and governments have achieved important successes in restoring water quality. Sport fishermen again line the banks of the Willamette, the Potomac has raft races, fishing derbies and waterfront festivals, and rather than massive fish kills, shrimp and oysters are back in Pensacola Bay.

These are not isolated instances of improvement. The best available State and Federal data indicate that the quality of most of the Nation's streams has held constant or improved over the last 13 years despite increases in pollution discharges as a result of the Nation's population and industrial growth.

A 1983 assessment of water quality improvements from 1972-1982 conducted by the Assocation of State and Interstate Water Pollution Control Administrators and the States showed that of 444,000 miles of rivers and streams surveyed, water quality of 47,000 miles of streams, measured against conventional pollutants, improved; 11,000 miles declined, and 297,000 miles showed no major change. Information on 90,000 miles of streams surveyed was not available.

Similar trends were reported for lakes. These water quality improvements reflect the success of the approaches to pollution control prescribed under the Clean Water Act. Increases in pollution from industries and municipalities as a result of industrial and population growth have been offset in most places by improved treatment of wastewater.

Ground Water

Ground water is a major source of water for agriculture and industry. In addition, about half of all Americans, and up to 95 percent of those in rural areas, rely on ground water as their principal source of drinking water.

Once contaminated, ground water may be impossible to clean up. It moves slowly—typically only 5 to 50 feet a year—through porous aquifers that may be several hundred feet underground. Plumes of highly concentrated contamination may remain in ground-water aquifers for years. Little is known at this time about the extent of ground water contamination or the health effects associated with its contamination.

States have identified the following sources of ground-water contamination problems:

Major problems: Industrial and municipal landfills and lagoons; leaking underground storage tanks; and chemical, oil and brine spills.

Intermediate problems: well injection; pesticides; fertilizers; and septic tanks.

Minor problems: salt water and brackish water intrusion; road salts and feedlots.

Variable problems by site: wastewater treatment; land application of municipal sewage; and mining.

Of all these problems, those caused by leaking storage tanks have been drawing the most attention recently. These tanks are used to store various types of liquids, including gasoline, hazardous and toxic chemicals, domestic fuels, process chemicals and wastes.

The waste from such leakage is tremendous. For example, in just one State, Maine, it is estimated that as many as 25 percent of the underground gasoline storage tanks at the 10,000 or more retail gasoline outlets in the State may be leaking. The estimated waste discharged each year from these leaking tanks in Maine is 11 million gallons.

Drinking Water

When the Safe Drinking Water Act became law, there was public uncertainty, not only about purity, but in some cases about who provided the water and was responsible for its quality.

The Federal Government knew of about 19,200 public water systems in 1969. At present more than 59,000 systems provide water on a daily basis. In addition, more than 164,000 other systems operate seasonally or serve the traveling public. Almost two-thirds of the 59,000 community water systems in the

country serve 500 or fewer persons. Many such systems are privately owned.

The number of water supply systems meeting monitoring requirements has risen steadily. In 1969, only 15 percent of community systems routinely monitored drinking water for microbial contamination. This is the main indicator of organisms that cause water-borne disease in humans. By 1982, 85 percent of the systems were doing regular microbial analyses and meeting the national standard.

State efforts to protect drinking water quality have increased significantly. All but five States and the District of Columbia now take primary responsibility for enforcing Federal safe-water rules. Under the law, EPA must enforce the rules if States do not. Increased State participation has been accomplished by an increase in State capability to measure and analyze low concentrations of contaminants. System operators now are better trained and more attention is being paid to helping small systems that produce most of the continuing violations.

While most water systems currently provide high quality drinking water in conformance with national standards, greater compliance with existing standards is needed, particularly in small systems.

Water Pollution Challenges

In the 1970s, EPA sought to control major sources of "conventional" pollutants, such as organic wastes, sediments, bacteria and viruses, oil, grease, and excessive heat from man-made causes. Those efforts focused on obvious sources of very large volumes of pollution, including primarily "point sources" of municipal sewage and industrial waste. Many gains have been made, but this work is not complete.

Progress in controlling conventional pollutants from point sources has meant that nonpoint sources and other pollutants, such as toxic contaminants, contribute a greater proportion of the Nation's water pollution problem. EPA and the States also are looking more carefully at problems in ground water, in estuaries, and at the destruction of inland and coastal waters.

Enjoying one of the benefits of a clean environment

The following are six of the most significant long-run water quality challenges where EPA will place high priority in years to come:

- Toxic pollution: Although industry has made great strides in controlling conventional pollutants, the problem of toxics contamination and the degree to which industrial sources can achieve further clean-up requires continued attention.

- Ground water contamination: This is potentially the most serious water problem due to the variety of possible sources and to the difficulty of detecting contaminants and of remedying ground water pollution after it has occurred.

- Contamination of drinking water: Public health problems related to water supply still persist, particularly in small systems. Contamination by synthetic chemicals may require new techniques to treat and monitor drinking water.

- Wetlands: Many of these important local ecosystems have been destroyed for farming and forestry, disposal of waste and other land development activities. Although the economic, environmental, and esthetic value of wetlands is better understood, losses of these valuable lands still continue.

- Pollution from sewage: Problems remain in assuring continuous adequate treatment at existing treatment plants and in providing plants to ensure adequate capacity to handle population and economic growth.

- Non-point sources: The challenge of restoring and protecting streams degraded by pollution from agriculture and other non-point sources can be met only by a major Federal, State and local effort.

The effects of air pollution are sometimes overshadowed today by other environmental threats that seem not to be as well controlled. However, it does not take much effort to remember what air pollution problems existed before the strenuous efforts of the last thirteen years were made:

- There were areas in the late 1940s and early 1950s, both in the United States and other countries, where air pollution levels were so bad that many people were hospitalized and several died.
- Many cities were perpetually enveloped in a smoky haze, as industries emitted thousands of tons of pollutants into the air with few or no controls.
- Dirt and grime from the air were commonplace in homes, on laundry left outside, and on buildings, cars, and vegetation.

Dramatic progress has been made over the last 13 years. Levels of pollution in the air are lower, and unhealthful days from the standpoint of air pollution are far less frequent. In addition, most industries have put pollution controls in place, and practices like open burning that were common are no longer permitted in many areas. However, many air quality problems still remain and others are emerging.

Many areas of the country still have air quality that is far below national standards. We now know that our strategy of allowing facilities to emit pollutants high into the atmosphere from tall stacks has contributed to the formation of depositions that could cause damage in many parts of the country.

Air pollution of some sort is found in nearly every area of the United States and is particularly severe in urban areas. It causes both health and environmental damage. Some of the health problems brought on or aggravated by air pollution include lung diseases, such as chronic bronchitis and pulmonary emphysema; cancer, particularly lung cancer; neural disorders, including brain damage; bronchial asthma and the common cold, which are more persistent in places with highly polluted air; and eye irritation, particularly caused by smog. Adverse environmental effects also damage crops and vegetation.

Two major types of air pollutants are regulated under the Clean Air Act: criteria pollutants and hazardous air pollutants.

Darkness at noon in Pittsburgh during the 1940s helped alert city officials to the problem of air pollution.

- The Clean Air Act Amendments required EPA to set National Ambient Air Quality Standards for the most common air pollutants which endanger human health. EPA has set standards for six such pollutants—called "*criteria pollutants*." For each criteria pollutant, standards are set to protect both human health and what the Act refers to as "welfare," primarily crops and vegetation, buildings, and visibility. The six criteria pollutants for which National Ambient Air Quality Standards have been set are: ozone, suspended particulates, carbon monoxide, sulfur dioxide, lead, and nitrogen dioxide.
- The Clean Air Act Amendments also require EPA to review and regulate hazardous air pollutants. These pollutants are defined as those pollutants not already regulated as criteria pollutants but that can contribute to an increase in mortality or in serious illness. EPA has set hazardous air pollutant standards for asbestos, beryllium, mercury, and vinyl chloride.

Both criteria and hazardous air pollutants come from two major categories of sources, *mobile sources* and *stationary sources*. Mobile sources include passenger cars, trucks, motorcycles, boats and aircraft. Stationary sources include a wide range of large industries such as iron and steel plants and oil refineries; small businesses like dry cleaners and gas stations; and residences.

Mobile Sources

Mobile sources of air pollution produce more than half of all air pollution emissions. Principal pollutants generated by mobile sources are carbon monoxide, volatile organic compounds, nitrogen oxides, and lead. Volatile organic compounds and nitrogen oxides, when ex-

posed to sunlight, can form another criteria pollutant, ozone.

These pollutants are formed as a result of the burning of gasoline. Carbon monoxide and volatile organic compounds are formed when engines burn fuel inefficiently; nitrogen oxides are formed when fuel is burned efficiently, causing high temperatures.

EPA has controlled the emission of these pollutants through the Federal Motor Vehicle Control Program (FMVCP). Under this program, EPA sets national emission levels for each pollutant type, and requires manufacturers of new cars to design their cars to meet them. EPA and the States also support and operate inspection and maintenance programs to test operation and emission levels of cars in use. In addition States and local governments develop transportation control measures such as carpooling programs and express lanes for buses to reduce mobile source emissions.

Stationary Sources

Stationary sources generate air pollutants as a by-product of industrial processes or as a result of burning fuel. These two types of activity generate about equal amounts of air pollution, although the types and amounts of specific pollutants they generate are quite different. Electric utilities, industrial facilities, and residential and commercial buildings are the primary sources of pollution from fuel combustion. Sulfur dioxide, nitrogen oxides, and particulates are generated from the burning of coal, fuel oil, natural gas, wood, and other fuels. Industrial processes produce sulfur dioxide, nitrogen oxides, and particulates, but also generate carbon monoxide and volatile organic compounds.

Stationary sources that generate hazardous air pollutants are numerous: industrial processes, particularly those of the chemical industry; fuel oils contaminated with toxic chemicals; hazardous waste handling and disposal facilities; municipal incinerators; and electric utilities, among others.

EPA's approach to controlling air pollution from stationary sources relies heavily on the States. Each State must draw up, for EPA review and approval, a State Implementation Plan (SIP) describing how it intends to control emissions from stationary and mobile sources in order to meet National Ambient Air Quality Standards in each of its counties.

In addition to setting National Ambient Air Quality Standards, EPA also sets standards that limit the pollutant emissions a source may generate. Once emission standards are set, EPA and the States write specific permits, monitor the facility to ensure that it complies with permit limits, and take enforcement action when necessary.

Dusk over Manhattan

Progress to Date

EPA and State and local governments have taken many of the necessary steps to control air pollution. Motor vehicle design has been modified to reduce pollution emissions. Because the principal design changes made to reduce emissions require use of unleaded gasoline, a side effect of design changes has been significant reductions in lead emissions. Most industries also now have air pollution control equipment in place.

EPA and the states measure levels of criteria pollutants in the outdoor air by using a network of monitors across the country.

Data from this network for the period from 1975 to 1982 show that ambient levels of all criteria pollutants are down nationwide.

Particulate levels decreased 15 percent between 1975 and 1982. The difference in the emissions trend (27 percent during this period) and the ambient trend can be accounted for by the large amount of natural wind-blown dust.

Sulfur dioxide levels, primarily from fuel combustion and industrial processes, decreased 33 percent.

Nitrogen dioxide levels increased between 1975 and 1979, but dropped between then and 1982. The 1982 level was the same as the level in 1975, and well below the ambient standard.

Ozone levels decreased 18 percent, and exceedances of the ambient standard during the ozone season (July-September) during these years dropped even more dramatically: 49 percent.

Carbon monoxide levels dropped 31 percent between 1975 and 1982. Even more noteworthy is the fact that exceedances of the ambient standard dropped 87 percent during this period.

Lead levels decreased nationally 64 percent between 1975 and 1982, primarily because of a drop in the use of leaded gasoline.

Air Quality Challenges

Though progress has been made in controlling air pollution from both mobile and stationary sources, much still needs to be done. Five of the six criteria pollutants, all except nitrogen dioxide, are currently of major concern in many areas of the country. There are many counties where health related standards were not met in 1982 for one or more of the criteria pollutants. In addition, certain areas still have levels of pollution on some days above levels considered safe.

Another problem that needs to be better controlled is air toxics, a pollution source of growing importance.

As EPA and the States grapple with these continuing problems, they will also need to cope with emerging problems like acid deposition and indoor air pollution.

Eight of the most significant air quality challenges that now face EPA and the States are:

Land

Ozone: Ozone is the Nation's most serious criteria pollutant problem. The pollutants which form it, nitrogen dioxide and volatile organic compounds, are emitted approximately equally by mobile and stationary sources.

Particulates: Though not as serious a problem as ozone, the particulate problem is quite widespread and, in some areas, quite severe. Much of the problem is due to large amounts of wind-blown dust.

Carbon Monoxide: Like ozone, the carbon monoxide problem is most severe in large urban areas. This is due to the large number of cars in cities, which are the primary source of this pollutant.

Lead: While the national levels of lead are well below the ambient standard, this pollutant is still a great concern in certain areas, especially around lead smelters.

Sulfur Dioxide: Sulfur dioxide is a concern both because of its effects on human health and because of its role in acid rain. The primary source is electric utilities.

Air Toxics: There is increasing evidence of human exposure to toxic chemicals in the air and concern that some of these chemicals may pose immediate and long-term health problems, including cancer and birth defects. In many cases, EPA lacks adequate information on what toxic chemicals are being released into the air and what quantities of chemicals are being generated. Information is also lacking on what health effects they have in the concentrations found in outdoor air.

Acid Deposition: State programs under the Clean Air Act emphasize the local effects of pollution, and not environmental effects hundreds of miles away. Now greater attention is being focused on the transport of sulfur and nitrogen dioxides that contribute to acid deposition, and there is concern about the long-range transport of ozone from large industries.

Indoor Air Pollution: The quality of indoor air is affected by individuals who smoke, by fumes given off by some building materials, by fumes from heating and cooking devices, and by a variety of other activities and sources. Levels of criteria and other air pollutants inside buildings are in some cases much higher than levels at which standards are set for pollution outdoors. EPA is focusing its efforts on carefully assessing whether indoor air pollution presents health risks, a potentially serious concern because Americans spend an average of 70 to 90 percent of their time indoors.

Environmental protection has focused historically on air and water pollution. While the Federal government has been involved in protecting wildlife and other special areas from development since the turn of the century, it was not until the 1970s that there was much public concern about pollution of the land. Now it is apparent that contamination of the land not only threatens to restrict future uses of the land but also affects the quality of the surrounding air and water. Love Canal in New York State, the Valley of the Drums in Kentucky, and Times Beach in Missouri are notorious examples of this. All have been severely damaged by careless disposal of hazardous waste.

While these sites are among the worst, similar situations across the country have raised public awareness of the environmental and health hazards that can be caused by hazardous waste problems. One of the Nation's top environmental priorities is to clean up these problems and to regulate hazardous waste handling to prevent similar problems in the future.

Most of the six billion tons of wastes dumped onto the land each year are relatively non-hazardous. Half of these wastes, for example, are agricultural wastes, including the unharvested portions of crops. However, a significant portion of the non-agricultural wastes, particularly those from industrial sources, can pose significant hazards to public health and the environment when they are carelessly disposed of. An estimated 165 million tons per year of these wastes are subject to regulation as hazardous waste under current law.

Hazardous wastes can cause fires and explosions, corrosion and acid burns. Health effects range from headaches, nausea, and rashes to serious impairment of kidney and liver functions, cancer, and genetic damage.

Recognizing problems in the generation and disposal of such wastes, Congress enacted several laws to protect health and the environment. These laws are aimed at two basic objectives:

- Proper management and disposal of wastes being generated now and that will be generated in the future.
- Cleanup of sites where the results of past disposal practices now threaten surrounding communities and the environment.

Wastes are seemingly inevitable by-products of virtually all activities people pursue in their daily lives. Every major sector of the economy contributes.

The kinds of wastes produced and their effects vary greatly. As a result, they need different levels and types of control. These wastes are primarily from five sources: agriculture (50 percent of total), mining and milling (39 percent), industry (7 percent), municipalities (3 percent), and utilities (1 percent).

Agriculture and Forestry

Of the six billion tons of waste each year, half is from farming and forestry. The threat posed by most of this waste is relatively small. Much forestry waste is now burned for energy and agricultural waste is mostly plowed back into fields or burned. Some wastes, like unused pesticides and empty pesticide containers, do present special hazards. EPA sets requirements for the disposal of pesticide containers and unused pesticides.

Mining Wastes

Another 39 percent of the total waste generated is from mining. These wastes consist primarily of "overburden," the soil and rock cleared away before mining, and "tailings," material discarded during ore processing. Mining wastes are generally classified as a low hazard waste, but are a problem because of the large volumes generated. Federal law limits EPA to identifying potential health, safety and environmental hazards of mining wastes and determining the need for further regulation.

Industrial Wastes

Industries are the major source of hazardous wastes. While it is not yet known what portion of the 400-million-ton annual total of industrial wastes is hazardous, a recent EPA survey estimated that roughly about 165 million tons of hazardous waste subject to current Federal requirements are generated by industry each year. Although this hazardous waste is generated by the full range of major American industries, the chemical industry accounts for over 70 percent of the total.

EPA and the States share responsibility for managment of newly generated hazardous wastes under the Resource Conservation and Recovery Act — a "cradle to grave" effort covering the generation, transportation, storage, treatment and disposal of today's hazardous wastes.

The Comprehensive Environmental Response, Compensation and Liability Act, known as the Superfund program, authorizes EPA to act directly to clean up those sites where hazardous wastes from abandoned or inactive waste sites endanger public health or welfare. It provides a special fund for cleanup of abandoned or inactive hazardous waste sites. A total of $1.6 billion has been made available for that work.

Municipal Wastes

Municipal wastes include household and commercial wastes, demolition materials, and sewage sludge. Some household and commercial wastes, such as household cleaners and pesticides, are clearly hazardous. They are so intermingled with other wastes that specific control of such materials is virtually impossible. Also, "leachate" resulting from rain water seeping through municipal landfills may contaminate underlying ground water. Although the degree of hazard presented by this leachate is relatively low, such a volume of it is produced that it may be a significant contributor to ground-water contamination.

Sewage sludge is a solid, semisolid, or liquid material that remains after sewage has been treated by municipal water treatment plants. Nearly seven million dry tons of sludge are generated each year. Improper on-land disposal of some present-day sludges can transfer a pollution problem from water to land.

Utility Wastes

The principal wastes produced by electric power plants are sludges from air and water pollution treatment processes. Some of these plants also produce high-level radioactive wastes. RCRA assigns EPA the responsibility for determining whether there is a need to regulate the sludges from air pollution control methods at these plants.

Progress to Date

Stringent controls are now in place to regulate the treatment, storage and disposal of currently generated hazardous wastes to ensure that they do not create problems in the future. EPA has also moved forward in addressing the problems posed by inactive hazardous sites. In the three years since the Superfund program was established, EPA and the States have worked to inventory the extent of the problem across the country and to establish procedures for cleaning up these sites. More than 540 sites are currently included for action on the National Priority List, and the necessary steps to clean up the worst of these sites are now underway.

Aerial view of a coal strip mine in the Western U.S.

Abandoned and Inactive Hazardous Sites

EPA and the States have identified over 16,000 abandoned or otherwise inactive sites that may contain hazardous waste. The total number of identified sites is expected to reach 22,000 by the end of 1985. EPA is now carrying out a multi-step assessment procedure to determine which of these sites actually pose a danger to public health or the environment and, if so, what clean-up actions are appropriate.

Since December 1981, Federal and State authorities have reached settlements under which responsible parties will spend $177.6 million in clean-up at such sites. To date, Federal and State authorities have also sued responsible parties to recover $16.7 million in clean-up costs paid from Superfund. Recovered funds are returned to the Superfund for use at other sites.

EPA has issued orders for clean-up at 72 uncontrolled or inactive sites, 110 cases have been referred to the Department of Justice, and 91 of these have been filed in the courts.

Industrial Hazardous Wastes

The basic approach to managing hazardous wastes under the Resource Conservation and Recovery Act is to track such wastes through a system of records called "manifests." The system of manifests for tracking the processing of hazardous wastes from "cradle to grave" is now in place. What remains to be done is to continue improving the operations of the existing treatment, storage, and disposal facilities to decrease the possibility that improper waste handling at these facilities might present a hazard to public health or the environment.

Hazardous waste cleanup challenge of the 80s

EPA and the States are taking steps to ensure that currently generated waste will not result in additional multi-million-dollar clean-up problems. Specifically:

- EPA has taken steps to identify every active hazardous waste facility.
- Regulations setting standards for industries generating hazardous waste and for facilities treating, storing or disposing of such wastes are now in place. All treatment, storage, and disposal facilities are subject to these "interim status" requirements until they can be issued final permits.
- EPA has begun to issue site-specific permits with priority given to land disposal facilities and incinerators which present the greatest environmental risks. These permits include more stringent requirements.

Land Protection Challenges

The most important achievement involving land contamination is that there is now widespread recognition of the health and environmental problems that may result from indiscriminate dumping of wastes on the land. Such practices in the past have left a legacy of air, groundwater and surface water contamination as well as land contamination. Cooperative efforts by the States and industry are bringing about a dramatic improvement in the management of hazardous waste.

The actual clean-up of past problems, however, has only begun, and many problems will remain as long-term challenges. The four most significant current land pollution challenges are:

- Cleaning Up Abandoned Hazardous Sites. One of EPA's highest priorities is the cleanup of the many abandoned or inactive hazardous sites across the country. EPA's attention is now focused on how to speed up the rate at which these sites are cleaned up without compromising the quality or permanence of these cleanups.
- Controlling Newly Generated Hazardous Wastes. EPA and States are taking steps to ensure the proper management of these wastes. They are focusing on major hazardous waste generators and major treatment, storage and disposal facilities.
- Safe Disposal of Radioactive Wastes. The safe disposal of high-level radioactive wastes and the management of uranium mill tailings are difficult long-term problems. Working with other Federal agencies and with the States, EPA has a major role in meeting these environmental challenges.
- Managing Municipal Sludge. Although sewage sludge is not an environmental threat as serious as industrial wastes and radioactive materials, this sludge often contains hazardous pollutants. Furthermore, it is generated in the greatest quantities in cities and communities with the fewest economically and environmentally acceptable alternatives for its safe use or disposal. As a result, it constitutes a serious environmental management problem.

Pesticides and Toxic Substances

The extensive use of chemicals has become a way of life in the United States. Chemical sales currently exceed $182 billion a year and involve over 60,000 different substances used in an almost limitless number of products including:

- the fiber and dyes in our clothes;
- the glues, plastics and paints in our furniture, houses and cars;
- the various solvents, oils and cleaners we use in our households and industry;
- the paper and inks we use in books, newspapers and many other reading materials; and
- the fertilizers, pesticides and preservatives used to produce and distribute our food supplies.

The benefits of our "chemical society" have not been without costs. Certain toxic chemicals have caused serious public health and environmental damage. In some cases the effects of toxic substances have been extreme and highly visible with immediate death and severe illnesses, primarily a result of accidents or gross misuses of chemicals. Perhaps of greater concern, however, are the more subtle impacts from very low-level contamination of food supplies and drinking waters by certain chemical substances that persist in the environment for long periods of time. Some of these substances have been found to accumulate in people, animals and plants. A number of chemical substances have been found capable of causing cancers and genetic damage at high doses in laboratory animal studies. The possible impacts of these chemicals at the usually much lower levels found in the environment are mostly uncertain.

Scientific knowledge does allow for estimating the potential risks at these lower levels, and efforts are made to calculate these risks in a manner that leans towards the extensive use of safety factors in public health and environmental protection efforts. The basic challenge for sound environmental management is to limit the risks posed by these toxic chemicals but to do so in a reasonable manner that allows society to continue to enjoy the many benefits of today's chemical products and technologies. Pesticides and other toxic chemicals have posed major problems in air, water and land and, in some cases, serious health problems. EPA, under the authority of several laws, has attempted to handle toxic chemical problems but largely through pollution abatement efforts, i.e., reducing air emissions, water discharges or the dumping of chemical wastes. However, simply addressing the toxic chemical problem through pollution abatement efforts leaves major gaps including:

- Cross-Media Pollution Transfer. By attempting to control separately toxic pollution in each environmental medium under three different major laws, transfer of pollution problems from one medium to another can occur. The best example of this is the long practice of dumping air and water pollution treatment sludge residues onto the land.
- Lack of Control Over Other Exposures. With the pervasive use of chemicals in our society, there are many opportunities for exposures to toxic chemicals other than from the discharges of by-products by industry. The best example here is the use of pesticides which results in much more widespread environmental contamination than manufacture.
- Lost Opportunities for Most Effective Control. In many cases, the best approach to controlling toxic chemicals is by limiting the production or uses of a chemical product so as to reduce the risk posed by the product or its wastes released during production.

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Toxic Substances Control Act (TSCA) have provided EPA with a different approach that adds to the Agency's pollution abatement efforts. These laws give EPA the authority to collect information about chemical products and, based on that information, safeguard public health and the environment by controlling, when necessary, a chemical product at the most appropriate stage in its life cycle — whether that involves banning it completely, controlling its initial manufacture, or putting conditions on its use or disposal. These laws authorize EPA to consider all exposure routes and potential impact in all environmental media.

Health care for an emphysema victim.

Pesticides

Currently, there are about 600 active ingredients used in about 35,000 registered pesticide products. These products are registered for control of 2,500 unique pest species. Nearly 1.2 billion pounds of pesticides (on active ingredient basis) are used in the United States each year at a cost of about $6.5 billion in 1982.

Farmers are the biggest users of pesticides, accounting for 60 percent of total U.S. expenditures. The value of pesticides to the farmer is indicated by the estimated losses from insects alone — a 13 percent reduction in U.S. crop yields. Agricultural scientists and economists place the cost of insect control and losses due to insects in excess of $23 billion per year.

Since the early 1960s, total pesticide usage in the U.S. has about doubled. Most of the increase is due to expanded agricultural use, which nearly tripled since 1964. Non-agricultural usage has shown no consistent tendency to increase in absolute or percentage terms since the mid-1960s. During the last few years, the growth rate for agricultural pesticide use has slowed somewhat due to economic conditions and the influence of improved pest management programs which resulted in more efficient application of pesticides and the use of alternative non-chemical pest controls. The year 1982 was the first in recent times when total U.S. agricultural pesticide use declined.

Toxic Substances

The chemical industry, a large and important part of the U.S. economy, consists of 12,000 firms employing over one million people.

Nearly 90 percent of the chemical industry is based on petrochemicals—chemicals derived from oil or natural gas. The remainder of the industry consists of

An osprey, one of the predator bird species now increasing in numbers because of pesticide restrictions.

inorganic chemicals, such as alkalides and chlorine, industrial gases, and miscellaneous chemicals, including those derived from natural products.

There are about 60,000 chemicals currently being used in a wide range of products with over 1,000 new chemicals introduced for commercial use each year.

Under the Toxic Substances Control Act, EPA gathers information about the benefits as well as risks posed by both new and existing chemicals. Where a chemical is found to pose unreasonable risks to health or the environment, EPA acts to limit those risks by banning the chemical or placing restrictions on either its production, usage or disposal.

Progress to Date

EPA has cancelled many or all of the uses of a number of pesticides such as DDT, aldrin, dieldrin and toxaphene. As a result, the levels of these pesticides have declined in a number of wildlife species in the U.S. and once threatened populations of predatory birds, such as eagles and hawks, are now increasing in numbers.

Major reductions have also occurred in the levels of these pesticides in food. As a result of these declines, the levels of these pesticides in people have been diminishing.

TSCA programs, while relatively new, have made significant progress in both limiting the risks posed by new chemicals and reducing unwarranted risks from existing chemicals, including PCBs, dioxins and other critical toxic substances.

New Chemicals

EPA has screened more than 3,300 new chemicals. The majority of these chemicals were not found to present an unreasonable risk to human health or the environment under the conditions of manufacture and use proposed by the manufacturer. As a result of these reviews, however, exposures to 37 chemicals have been banned or stringently controlled by EPA pending the development of data.

Another 61 new chemicals are now undergoing extensive health and environmental testing for possible re-submission to EPA's new chemical review process.

Many of the 60,000 commercial chemicals now used in the U.S. are known to be hazardous and may require some degree of control. The risks posed by others are poorly characterized or unknown. EPA is now reviewing the risks posed by 63 chemicals or chemical classes that appear the most likely to cause either human health or environmental problems.

Under the Asbestos-in-School Rule, a compliance monitoring program was initiated in June 1983. Over 200 local education agencies and 653 schools were inspected in 1983, resulting in the discovery of 127 violations. For 1984, EPA has begun efforts to inspect 1,047 school districts.

PCBs

According to several monitoring efforts, EPA restrictions on the use and disposal of PCBs have resulted in significant reductions in the levels of this persistent chemical both in the environment and in people. The decline in PCBs is following the similar pattern established by DDT earlier in the 1970s. While trace levels of PCB are now present throughout the U.S. population, the number of individuals with high PCB levels, i.e. greater than 3 parts per million, has declined dramatically to less than 1 percent of the population.

Pesticide and Toxic Substances Control Challenges

EPA has sought to control environmental contamination by toxic chemicals by reducing pollutants in air emissions, water discharges and chemical waste dumping. While these important pollution abatement efforts continue, EPA also employs major programs, authorized under both TSCA and FIFRA, to reduce the unreasonable risks from chemical products (including pesticides) now in use and from any new chemicals that may come onto the market. The task of balancing the risks against the benefits of chemicals will always be difficult. The major challenges EPA faces today in controlling toxic chemicals are:

Protecting Against Unwarranted Risks from Pesticide Contamination. Significant efforts to avoid unwarranted public health and environmental risks from these valuable chemicals continue to be a difficult but necessary challenge for EPA. A number of pesticides are now on the market that have not been tested against today's public health and environment standards. The contamination of ground water by pesticides and the drift of pesticides during aerial application are capable of posing serious risks to public health and the environment. EPA will be subjecting "older" pesticides to new testing requirements and improving its efforts to reduce contamination of ground water and the problems of drift.

Controlling Critical Toxic Substances. Several toxic substances require extraordinary regulatory effort by EPA. Their control is complicated by either their pervasiveness in the environment or by the extremely low-level contamination that can still pose threats to human health. These substances include asbestos, PCBs, and dioxin. EPA has put in place major inspection and enforcement programs to further control, or where necessary, cleanup these toxic chemicals

Screening for Toxic Chemicals. It is highly improbable that complete risk assessments can be done for each of the existing 60,000 commercial chemicals or for the over 1,000 new commercial chemicals developed each year. The challenge for EPA is to improve its ability to assess which chemicals should be selected for more intensive review so as to reduce major health and environmental risks without needless overtaxing of government as well as industry resources. □

Risk in a Free Society

In a speech at Princeton University February 18, EPA Administrator William Ruckelshaus discussed the subject, "Risk in a Free Society," as it involves the chemical products and byproducts of modern technology. He was speaking to 1,000 Princeton alumni at Alumni Day at the University.

Later in the day, Ruckelshaus received the highest honor that Princeton can bestow on an alumnus—the Woodrow Wilson Award. The award is presented annually on Alumni Day "to the alumnus of the undergraduate college whose activities exemplify Woodrow Wilson's ideal of Princeton in the Nation's service."

Here are excerpts of the Administrator's remarks on the issue of risks from chemicals today:

"When I began my current, and second, tenure as Administrator of EPA, my first goal was the restoration of public confidence in the Agency, and it was impressed upon me that straightening out the way we handled health risk was central to achieving it. Needless to say, EPA's primary mission is the reduction of risk, whether to public health or the environment. Some in America were afraid. They were afraid that toxic chemicals in the environment were affecting their health, and more important, they suspected that the facts about the risks from such chemicals were not being accurately reported to them, that policy considerations were being inappropriately used in such reports, so as to make the risks seem less than they were and excuse the Agency from taking action. Even worse, some people thought that the processes we had established to protect public health were being abused for crass political gain.

"Whether this was true or not is almost beside the point; a substantial number of people believed it. Now in a society such as ours, where the people ultimately decide policy—what they want done about a particular situation—the fair exposition of policy choices is the job of public agencies. The public agency is the repository of the facts; you can't operate a democratic society, particularly a complex technological one, unless you have such a repository. Above all, the factual guardian must be trusted: a failure of trust courts chaos. Chaos, in turn, creates its own thirst for order, which craving in its more extreme forms threatens the very foundation of democratic freedom. So in a democracy a public agency that is not trusted, especially where the protection of public health is concerned, might as well close its doors.

"I described a possible solution to this problem last June in a speech to the National Academy of Sciences. The Academy had stated in a recent report that Federal agencies had often confused the assessment of risk with the management of risk. Risk assessment is the use of a base of scientific research to define the probability of some harm coming to an individual or a population as a result of exposure to a substance or situation. Risk management, in contrast, is the public process of deciding what to do where risk has been determined to exist. It includes integrating risk assessment with considerations of engineering feasibility and figuring out how to exercise our imperative to reduce risk in the light of social, economic and political factors.

"The report proposed that these two functions be formally separated within regulatory agencies. I said that this appeared to be a workable idea and that we would try to make it happen at EPA. This notion was attractive because the statutes administered by many Federal regulatory agencies typically force some action when scientific inquiry establishes the presence of a risk, as, for example, when a substance present in the environment, or the workplace or the food chain, is found to cause cancer in animals. The statutes may require the agency to act according to some protective formula: to establish 'margins of safety' or 'prevent significant risk' or 'eliminate the risk.'

"When the action so forced has dire economic or social consequences, the person who must make the decision may be sorely tempted to ask for a 'reinterpretation' of the data. We should remember that risk assessment data can be like the captured spy: if you torture it long enough, it will tell you anything you want to know. So it is good public policy to so structure an agency that such temptation is avoided.

"But we have found that separating the assessment of risk from its management is rather more difficult to accomplish in practice. In the first place, values, which are supposed to be safely sequestered in risk management, also appear as important influences on the outcomes of risk assessments. For example, let us suppose that a chemical in common use is tested on laboratory animals with the object of determining whether it can cause cancer. At the end of the test a proportion of the animals that have been exposed to the substance show evidence of tumor formation.

"Now the problems begin. First, in tests like these, the doses given are extremely high, often close to the level the animal can tolerate for a lifetime without dying from toxic non-cancer effects. Environmental exposures are typically much lower, so in order to determine what the risk of cancer is at such lower exposures—that is, to determine the curve that relates a certain dose to a certain response—we must extrapolate down from the high-dose laboratory data. There are a number of statistical models for doing this, all of which fit the data, and all of which are open to debate. We simply do not *know* what the shape of the dose-response curve is at low doses, in the sense that we know, let's say, what the orbit of a satellite will be when we shoot it off.

"Next, we must deal with the uncertainty of extrapolating cancer data from animals to man, for example, determining which of the many different kinds of lesions that may appear in animals are actually indicative of a probability that the substance in question may be a human carcinogen. Cancer is cancer to the public, but not to the pathologist.

"Finally, we must deal with uncertainty about exposure. We have to determine, usually on the basis of very scant data, and very elaborate mathematical models, how much of the stuff is being produced, how it is being dispersed, changed or destroyed by natural processes, and how the actual dose that people get is changed by behavioral or population characteristics.

"These uncertainties inherent in risk assessment combine to produce an enormously wide range of risk estimates in most cases. For example, the National Academy of Sciences report on saccharin concluded that over the next 70 years the expected number of cases of human bladder cancer resulting from daily exposure to 120 mg of saccharin might range from 0.22 to 1,144,000. This sort of range is of limited use to the policy maker and risk assessment scientists are at some pains to make choices among possibilities so as to produce conclusions that are both scientifically supportable and usable.

"Such choices are influenced by values, which may be affected by professional training, or by ideas about what constitutes 'good science,' and, of course by the same complex of experience and individual traits that gives rise to personal values in all of us. An oncologist,

R. Manning Brown, chairman of the executive committee of Princeton University's board of trustees, presents the Woodrow Wilson award to EPA Administrator William D. Ruckelshaus for "distinguished achievement in the Nation's service."

for example, who values highly the ability to distinguish between different sorts of lesions, may discount certain test results as being irrelevant to decisions about human carcinogenicity. A public health epidemiologist may look at the same data and come to quite different conclusions.

"Historically at EPA it has been thought prudent to make what have been called conservative assumptions; that is, *our* values lead us, in a situation of unavoidable uncertainty, to couch our conclusions in terms of a plausible upper bound. This means that when we generate a number that expresses the potency of some substances in causing disease, we can state that it is unlikely that the risk projected is any greater.

"This is fine when the risks projected are vanishingly small: it's always nice to hear that some chemical is *not* a national crisis. But when the risks estimated through such assessments are substantial, so that some action may be in the offing, the stacking of conservative assumptions one on top of another, becomes a problem for the policymaker. If I am going to propose controls that may have serious economic and social effects, I need to have some idea how much confidence should be placed in the estimates of risk that prompted those controls. I need to know how likely *real* damage is to occur in the uncontrolled and partially controlled and fully controlled cases. Only then can I apply the balancing judgments that are the essence of my job. This, of course, tends to insert the policymaker back into the guts of risk assessment, which we've agreed is less than wise.

"This is a real quandary. I now believe that the main road out of it lies through a marked improvement in the way we communicate the realities of risk analysis to the public. The goal is public understanding. We will only retain the administrative flexibility we need to effectively protect the public health and welfare if the public believes we are trying to act in the public interest. There is an argument, in contradiction, that the best way to protection lies in increased legislative specificity, in closely directing the Agency as to what to control and how much to control it. If we fail to command public confidence, this argument will prevail, and in my opinion it would be a bad thing if it did. You can't squeeze the complexity inherent in managing environmental risks between the pages of a statute book.

"How then do we encourage confidence? Generally speaking there are two ways to do it. First, we could assign guardianship of the Agency's integrity—its risk assessment task—to a panel of disinterested experts who are above reproach in the public eye. This is the quasi-judicial, blue-ribbon approach, which has a strong tradition in our society. If we have a complex issue, we don't have to think about it very much, just give it to the experts, who deliberate and provide the answer, which most will accept because of the inherent prestige of the panel.

"The discomfort associated with imagining, in 1984, a conclave of Big Brothers to watch over us only strengthens my conviction that such panels cannot serve the general purpose of restoring and maintaining confidence. It turns out that the experts don't agree, so instead of an unimpeachable and disinterested consensus you get dissenting advocacy. Once again, experts have values too.

"Alternatively, we could all become a lot smarter about risk. The Agency could put much more effort into explaining what it is doing and what it does, and does not, know. Here I do not mean "public involvement" in the usual and

formal sense. This is embodied in administrative law and has always been part of our ordinary procedure in promulgating rules. Nor do I mean a mere public relations campaign to popularize Agency decisions. Public relations smoothes over; I think we need to dig up. We have to expose the assumptions that go into risk assessments. We have to admit our uncertainties and confront the public with the complex nature of decisions about risk.

"Living in a technological society is like riding a bucking bronco. I don't believe we can afford to get off, and I doubt that someone will magically appear who can lead it about on a leash. The question is: how do we become better bronco busters? I think a great part of the answer is to bring about a major improvement in the quality of public debate on environmental risk.

"This will not be easy. Risk assessment is a probabilistic calculation, but people don't respond to risks "as they should" if such calculations were the sole criterion of rationality. Most people are not comfortable with mathematical probability as a guide to living and the risk assessment lingo we throw at them does not increase their comfort. Tell somebody that their risk of cancer from a 70-year exposure to a carcinogen at ambient levels ranges between 10^{-5} and 10^{-7}, and they are likely to come back at you with, 'Yeah, but will I get cancer if I drink the water?' Also, attitudes toward risk are subjective and highly colored by personal experience and other factors not fully captured by risk assessments.

"We have some research on this, which points out that people tend to overestimate the probability of unfamiliar, catastrophic and well-publicized events and underestimate the probability of unspectacular or familiar events that claim one victim at a time. Many people are afraid to fly commercial airlines, but practically nobody is afraid of driving in cars, a victory of subjectivity over actuarial statistics.

"In general, response to risks is most negative when the degree of risk is unknown and the consequences are particularly dreaded. Expert assessment does not seem to help here. People will fight like fury to keep a hazardous waste facility out of their neighborhood, despite expert assurances that it is safe, while people living under high dams located on earthquake faults pay scant attention to expert warnings.

"Other hazard characteristics influence public perceptions of risk. For example, the voluntary or involuntary nature of the risk is important. People will accept far greater risks from driving an automobile than they will from breathing the emissions that come out of its tailpipe; the former is voluntary, the latter, involuntary. People also take into consideration whether the risk is distributed generally throughout the population or affects only a small identifiable group. Public response to the discovery of a toxicant that may result in 200 additional cancers nationwide is liable to be quite different from public response to the same number of cases in one county with a population of say, 3000.

"The way risks and options are presented also influences perceptions. You might be worried if you heard that occupational exposure at your job doubled your risk of some serious disease; you might be less worried if you heard that it had increased from one in a million to two in a million. Surveys using physicians as subjects found that their preferences for treatment options changed markedly when the risks of these options were expressed in terms of lives saved rather than in terms of deaths occuring, even though the two forms of expression that were compared were mathematically identical. Finally, research has shown that beliefs about risk are slow to change, and show extraordinary persistence in the face of contrary evidence.

"Many people interested in environmental protection, having observed this mess, conclude that considerations of risk lead to nothing useful. After all, if the numbers are no good and the whole issue is so confusing, why not just eliminate all exposure to toxics to the extent that technology allows? The problem with such thinking is that, even setting aside what I have just said about the necessity for improving the national debate on the subject, risk estimates are the only way we have of directing the attention of risk management agencies toward significant problems.

"There are thousands of substances in the environment that show toxicity in animals; we can't work on all of them at once, even with an EPA ten times its current size. More important, technology doesn't make the bad stuff 'go away;' in most cases it just changes its form and location. We have to start keeping track of the flow of toxics through the environment, to what happens *after* they are 'controlled.' Risk management is the only way I know to do this.

"In confused situations one must try to be guided by basic principles. One of my basic principles is reflected in a quotation from Thomas Jefferson: 'If we think (the people) not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion.' Easy for *him* to say. As we have seen, informing discretion about risk has itself a high risk of failure.

"However, we do have some recent experience that supports the belief that better information inclines people to act more sensibly. In Tacoma, Washington, we have a situation where a copper smelter employing around 600 people is emitting substantial amounts of arsenic, which is a human carcinogen. We found that the best available technology did not reduce the risk of cancer to levels the public might find acceptable. In fact, it looked as if reducing to acceptable levels of risk might only be possible if the plant closed. I felt very strongly that the people in Tacoma whose lives were to be affected by my decision ought to have a deeper understanding of the case than they could get from the usual public hearing process.

"Accordingly, we organized an extraordinary campaign of public eduction in Tacoma. Besides the required public hearing, we provided immense quantities of information to all communications media, arranged meetings between community leaders and senior EPA officials, including myself, and held three workshops at which we laid out our view of the facts. I think most people appreciated this opportunity, and we certainly raised the level of discussion about risk. So unusual was this kind of event that some inferred that I was abdicating my responsibility for this decision, or that somehow the Tacoma people were going to vote on whether they wanted jobs or health. After some initial confusion on this score we made it clear that it was entirely my decision, and that while I wanted to hear, I was not committed to heed.

"Although I suppose some would have been happier continuing in their fond belief that we could provide absolute safety with absolute certainty, and were disturbed by these proceedings, in all I would call it a qualified success. Those who participated came away with a better understanding of the anatomy of environmental decisions, and local groups were able to come up with options that increased protection while allowing the plant to remain open, options that are well worth considering as we put together our final decision.

"What are the lessons of Tacoma? Shortly after we began the workshops, people started sporting buttons that said, 'BOTH,' meaning they were for both jobs and health. I took this as a good sign, that people were attending to the balance between economic realities and environmental protection. 'Both' is a

good idea, and in most cases we can have it, if we're smart. Another lesson is that we must improve the way we present risk calculations to the public. There was too much tendency to translate risks of cancer into cases, with no regard to qualifying assumptions and uncertainties. Cancer threats make great headlines and the inclination to infer certainty where none exists is very powerful. We must take seriously our obligation to generate lucid and unambiguous statements about risk. Finally, Tacoma shows that we have to prepare ourselves for the other Tacomas. Environmental stress falls unevenly across the land and we have a special responsibility to people in communities that suffer more than their share. We are prepared to make the extra effort in such communities, as we did in Tacoma.

"We must also improve debate on the national level. This may prove more difficult, as Washington is a most contentious place. Also, at the national level things tend to polarize perhaps more than they should, given how much we know about environmental health questions. Typically, where we obtain evidence of an environmental threat, opinion divides between those who want to eliminate the risk as quickly as possible, with little concern about cost, and those who deny the threat exists. Fights between these groups can go on for a long time, time during which the object of the battle, the pollutant, remains in the environment. Acid rain threatens to become this kind of dispute.

"And so too was the case of ethylene dibromide. As you may know, we recently banned the major uses of EDB, a grain and fruit fumigant that has been identified as a carcinogen, and which enters the human diet through residues in food and via ground water contamination. By means of that ban, which applied to grain fumigation, we insured that EDB would immediately begin to diminish in the human food supply. Since there is still EDB in the grain products already in storage or on grocers' shelves, we set maximum acceptable residue levels for different products, the levels getting lower in products closer to the point of consumption. We will act soon on the use of EDB as a citrus fruit fumigant, its only remaining use in connection with the human food chain. *(see story on p. 18)*

"Needless to say, we were criticized both for going too far and for not going far enough. But in cases such as this, my personal predilection is to avoid the extremes and act to reduce, as quickly as possible, environmental exposure to substances that appear unacceptably risky, and to do so with as little social or economic disruption as possible. This generally satisfies no one, but I am convinced it is in the long term public interest.

"What *was* dissatisfying about the EDB case was the substantial confusion surrounding the risk issues involved. Some say that we stir up cans of worms when we expose the risk judgments we make. I think we must do better than we have done, and let the worms crawl where they may. Let me now propose some principles for more reasonable discussions about risk.

"First, we must insist on risk calculations being expressed as distributions of estimates and not as magic numbers that can be manipulated without regard to what they really mean. We must try to display more realistic estimates of risk to show a range of probabilities. To help do this we need new tools for quantifying and ordering sources of uncertainty and for putting them in perspective.

"Second, we must expose to public scrutiny the assumptions that underlie our analysis and management of risk. If we have made a series of conservative assumptions within the risk assessment, so that it represents an upper bound estimate of risk, we should try to communicate this and explain why we did it. Although public health protection is our primary value, any particular action to control a pollutant may have effects on other values, such as community stability, employment, natural resources or the integrity of the ecosystem. We have to get away from the idea that we do quantitative analysis to find the 'right' decision, which we will then be obliged to make if we want to call ourselves rational beings. But we are not clockwork mandarins. The point of such analysis is, in fact, the orderly exposition of the values we hold, and the reasoning that travels from some set of values and measurements to a decision.

"Third, we must demonstrate that reduction of risk is our main concern and that we are not driven by narrow cost-benefit considerations. Of course cost is a factor, because we are obliged to be efficient with our resources and those of society in general. Where we decline to control some risk at present, we should do so only because there are better targets; we are really balancing risk against risk, aiming to get at the greatest first.

"Finally, we should understand the limits of quantification; there are some cherished values that will resist being squeezed into a benefits column, but are no less real because of it. Walter Lippmann once pointed out that in a democracy 'the people' as in 'We the People,' refers not only to the working majority that actually makes current decisions, and not only to the whole living population, but to those who came before us, who provided our traditions and our physical patrimony as a nation, and to those who will come after us, and inherit. Many of the major decisions we make on environmental affairs touch on this broader sense of public responsibility.

"I suppose that the ultimate goal of this effort is to get the American people to understand the difference between a safe world and a zero-risk world with respect to environmental pollutants. We have to define what safe means in light of our increasing ability to detect minute quantities of substances in the environment and to associate carcinogenesis with an enormous variety of substances in common use. According to Bruce Ames, the biochemist and cancer expert, the human diet is loaded with toxics of all kinds, including many carcinogens, mutagens and teratogens. Among them are such foodstuffs as black pepper, mushrooms, celery, parsnips, peanut butter, figs, parsley, potatoes, rhubarb, coffee, tea, fats, browned meat and alfalfa sprouts. The list goes on; my point is that it would be hard to find a diet that would support life and at the same time impose no risk on the consumer.

"So what is safe? Are we all safe at this instant? Most of us would agree that we are, although we are subjected to calculable risks of various sorts of catastrophes that can happen to people listening to lectures in buildings. We might be able to reduce some of them by additional effort, but in general we consider that we have (to coin a phrase) an 'adequate margin of safety' sitting in a structure that is, for example, protected against lightning bolts but exposed to meteorites.

"I think we can get people to start making those judgments of safety about the arcane products of modern technology. I don't think we are ever going to get agreement about values; a continuing debate is the essence of a democratic policy. But I think we must do better in showing how different values lead rationally to different policy outcomes. And we can only do that if we are able to build up a reservoir of trust, if people believe that we have presented what facts we have fairly, that we have exposed our values to their view, and that we have respected their values, whether or not such values can be incorporated finally in our decisions. We have, I hope, begun to build that sort of trust at EPA." □

Public Meeting Set on Asbestos in Buildings

A public meeting will be held in Washington, D.C. on May 7 to gather information on asbestos contamination in schools and other public buildings.

EPA recently granted, in substantial part, a petition from the Service Employees International Union to begin proceedings to deal with the asbestos problem in schools.

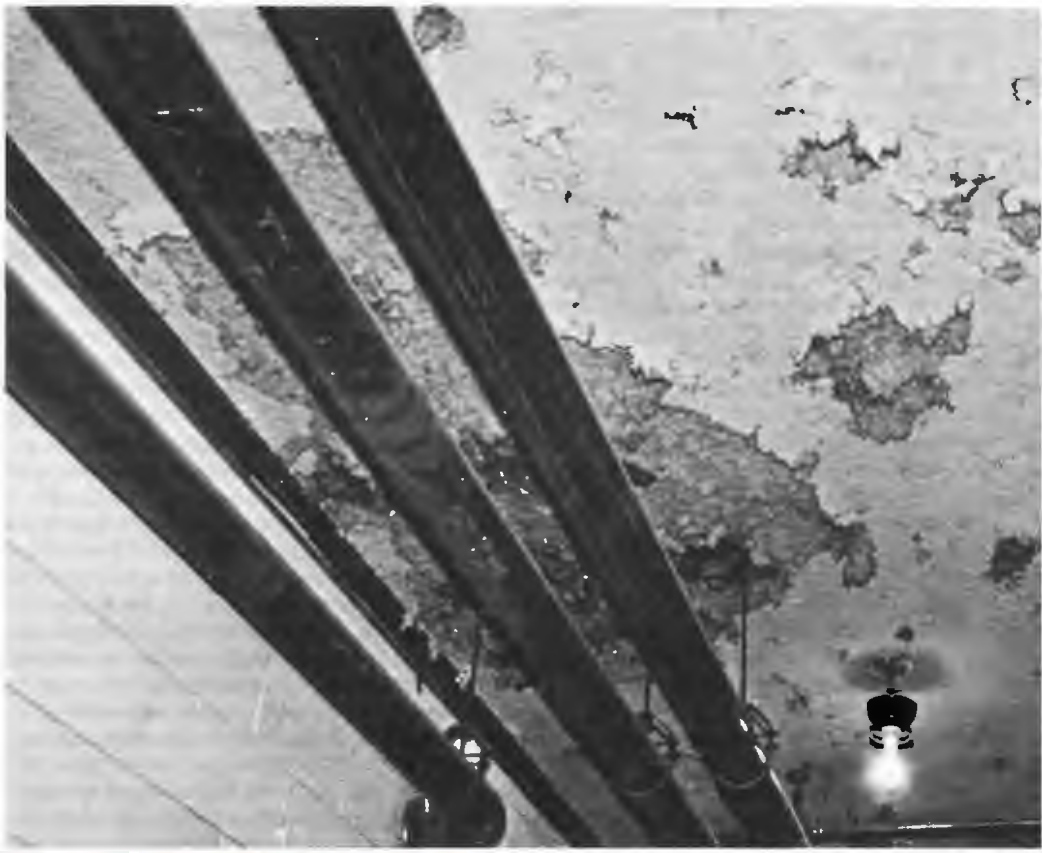
The union specifically asked in its petition that the agency 1) establish standards for determining when friable (easily crumbled) asbestos-containing materials in schools are hazardous; 2) establish requirements for corrective action when friable asbestos-containing materials are determined to be hazardous; 3) establish requirements for inspections and abatement of friable asbestos-containing materials in public and commercial buildings; 4) establish standards for the performance of abatement activities, including standards for the protection of persons performing such activities.

The petition was submitted under Section 21 of the Toxic Substances Control Act. Section 21 allows citizens to petition EPA to initiate rulemaking. EPA Administrator William D. Ruckelshaus granted most provisions in the petition.

Ruckelshaus said that "EPA is in full agreement with the goals of the petition and intends to ensure that human health is protected to the fullest extent possible where asbestos is concerned."

EPA intends to assure that friable asbestos-containing materials in schools and public buildings which present unreasonable risks are identified and properly abated. Earlier EPA attempts to develop a general rule for all situations where friable asbestos-containing materials are present in schools have not been possible because of technical limitations and site variations. However, EPA will be reexamining this issue and seeking new information.

Accordingly, the agency has granted the union's request to initiate a proceeding under section 6 of the Toxic Substances Control Act. Under this Act, any person may petition EPA to commence an appropriate proceeding in accordance with section 6.



An asbestos ceiling with sections torn open

Regarding the petitioner's request that EPA set standards to protect persons performing asbestos control activities, the agency said both EPA and the Occupational Safety and Health Administration (OSHA) have issued regulations to reduce exposure to asbestos. EPA first issued regulations in 1973 which specified methods for removing asbestos-containing materials from buildings during demolition. OSHA's regulations were first issued in 1972 and modified in 1976. They specify airborne exposure standards for asbestos workers, engineering and administrative contracts, work practices, medical surveillance and worker protection requirements. In addition, both agencies have prepared further regulations.

Since there are existing and/or proposed regulations under the Clean Air Act and Occupational Safety and Health Act to protect workers during removal of asbestos-containing materials from buildings the agency finds that additional workplace regulation by EPA under TSCA is not necessary to protect health or the environment against unreasonable risk.

The agency is continuing to gather information on the extent of compliance with EPA's asbestos-in-schools rule and on what subsequent actions are being taken by schools. The agency is in the process of increasing resources expended on technical assistance and enforcement of existing regulations.

Under EPA's asbestos-in-schools rule published in 1982, all public and private schools were to inspect their facilities for friable asbestos by June 28, 1983. Those schools that found asbestos were required to keep records, inform employees and Parent-Teacher Associations, post notices, and distribute a guide for reducing asbestos exposure to custodial and maintenance personnel.

Through its technical assistance program, the agency is also continuing to assist building owners in the detection

and correction of hazards posed by asbestos in schools and public and commercial buildings.

EPA is currently conducting a compliance monitoring program. Approximately 2,500 compliance inspections will be conducted during a two-year effort. By June, the agency will have available information from a national survey of schools to provide reliable estimates of compliance as well as the level of abatement activities. The result of these activities will also be a guide in developing an appropriate protection program.

In addition to the public meeting, EPA is soliciting written comments, due by April 23. For further information, contact:

Jack P. McCarthy, Director
TSCA Assistance Office (TS-799)
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
Toll-free: 800-424-9065
In Washington, D.C.: 554-1404. □

EPA Assesses Penalty for Asbestos Violations

In the first administrative civil complaint ever issued under EPA's school asbestos rule, the agency is assessing a $24,000 penalty against New Hampshire Administrative Unit No. 19 for violations at three of the schools under its jurisdiction. EPA is also taking similar actions in some other parts of the country.

The New Hampshire Unit No. 19 operates ten schools in the towns of Weare, Goffstown, Bow, Dunbarton, and New Boston.

The complaint, issued recently under authority of the Toxic Substances Control Act, alleges that Unit No. 19 has failed to meet the requirements of EPA's asbestos rules for three of its schools. All these schools are in Goffstown: Goffstown High School, Bartlett Elementary School, and Upper Goffstown Elementary School.

"This action shows that EPA will not hesitate to fine school officials anywhere in this country who are negligent in telling parents about any asbestos danger faced by their children," said EPA Deputy Administrator Alvin Alm.

Scientific evidence points to asbestos as a cause of lung cancer and of mesothelioma, a cancer of the membranes that line the chest and abdomen.

Under EPA's school asbestos rules, issued May 27, 1982, all public and private elementary and secondary school administrators were required, by June 28, 1983, to have inspected their buildings, sampled and analyzed any friable materials for asbestos, notified employees and parents of any asbestos detected, and maintained records certifying compliance with the regulation. (Friable materials are those that when dry may be crumbled, pulverized, or reduced to powder by hand pressure.)

"On-site EPA inspections of the three schools as recently as November 30, 1983 showed them all having friable asbestos-containing materials; yet Unit No. 19 never performed proper inspections on the three schools or any sampling, analysis or public notification as required by the law," Alm added.

Under TSCA, Unit 19 had 20 days from the receipt date of the EPA penalty notice to request a hearing on the issues.

Elsewhere nationally, EPA is taking other actions over and above its May 1982 federal rules to reduce school asbestos threats.

Since 1979 EPA has operated a technical assistance program which includes the following:

- In all 10 EPA regional offices, Regional Asbestos Coordinators, assisted by technical advisors hired under an American Association of Retired Persons grant. This team responds to public questions, distributes guidance documents, conducts training seminars, and gives guidance on different alternatives in reducing asbestos exposure.

- A quality assurance program in which 175 laboratories participate. The program includes a toll-free number where callers can get guidance on analyzing asbestos samples (800-334-8571, Ext. 6741).

- A toll-free number where the general public can direct requests for technical assistance (800-424-9065).

- A guidance document which summarizes information on the identification and abatement of asbestos-containing materials. This document outlines a systematic process for building owners to follow in selecting a course of action ("Guidance for Controlling Friable Asbestos-Containing Materials in Buildings," March 1983, EPA Report No. 560/5-83-002).

In addition to the technical assistance program, EPA has also taken the following action:

- Last fall, EPA began a representative sample survey of local education agencies to determine the effectiveness of the federal school asbestos rule.

- A comprehensive two-year compliance monitoring program has been under way since June 1983, targeting approximately 2400 school districts for inspections. In some cases, EPA will work directly with states to monitor for compliance with the federal rule.

EPA recently got authorization to hire 16 new full-time employees in its regional offices in order to strengthen the technical assistance and compliance monitoring programs for asbestos. □

Further Steps Taken to Eliminate EDB

Administrator William D. Ruckelshaus recently announced a rapid reduction in residue levels of the pesticide ethylene dibromide (EDB) in citrus fruits and papayas that will eliminate all EDB in such fruit by September 1.

Ruckelshaus said the lesson that can be learned from the experience with EDB is that while some pesticides can prove on balance to be beneficial to society, "we need to be very careful about understanding what we are doing when we introduce, in a massive way, pesticides into the environment,..."

In the phased reduction in EDB residue levels in citrus fruits, Ruckelshaus proposed interim maximum tolerances of 250 parts per billion for the whole fruit, which equates to 30 ppb for the edible portions of the fruit.

The phasedown in residue levels will apply to both domestic and imported fruits. Once these tolerances are established by rulemaking, fruit exceeding these levels will not be allowed into the country or in interstate commerce and will be subject to enforcement action by the federal government.

After September 1, any detectable residues of EDB in citrus fruit or papayas will render the commodities adulterated and subject to enforcement action under the Federal Food, Drug and Cosmetic Act.

"This latest action moves us closer to my goal of getting EDB out of the American diet in as orderly a way as possible," Ruckelshaus said.

He added that he was not issuing an immediate emergency suspension order to ban EDB as a quarantine fumigant on citrus for two reasons. "First, the use of EDB on citrus in the U.S. has essentially ceased," he said. "Second, the agency has reached an agreement in principle with the parties in the EDB cancellation hearing under which all domestic use of EDB on citrus for the U.S. market would end by September I of this year. Based upon this understanding, those parties would withdraw their cancellation hearing requests."

Ruckelshaus said that EPA estimates only two percent of all fresh citrus fruit consumed in this country is fumigated. Domestically produced fruit was only fumigated when going to one citrus-producing state from another; these states are Florida, Texas, Hawaii, Arizona, New Mexico, and California. EDB currently is not being used for this purpose except for a small amount of fruit being treated in Florida before its shipment to Hawaii. Papayas from Hawaii as well as imported fruit are currently being treated with EDB.

Ruckelshaus pointed out that in virtually all cases citrus processed into orange juice is not fumigated. The fruit is harvested and transported to the nearest processing establishment as quickly as possible.

He said the recent EPA action does not include tolerance levels for mangoes because of a lack of sufficient data. "We intend to make this tolerance consistent with those for other ready-to-eat foods," he commented, saying, "The mango growing and shipping season is just now starting and we simply do not have enough residue data to take final action. I will take appropriate action when I do have adequate information."

The EPA Administrator said there are a number of alternatives to EDB fumigation, which is used on fresh fruit to prevent the spread of tropical fruit flies. Among them are gamma irradiation, certification of fruit fly free zones, heat treatment for papayas, and fumigation with methyl bromide and phosphine gas. EPA, however, is concerned with the potential risks of methyl bromide and will consider the conclusions of several health studies nearing completion. In addition, imported and exported fruit have also been quarantined in extended cold storage, which is another alternative being considered.

All alternative treatment methods for citrus imports need the approval of the U.S. Department of Agriculture (USDA) as being effective in preventing importation of various species of fruit fly.

Ruckelshaus added that the agency is working closely with USDA, the State Department, the Food and Drug Administration (FDA), the Agency for International Development and the U.S. Trade Representative's office so that "they will aid affected domestic industries as well as importing countries in finding suitable alternatives to EDB."

Concerning U.S. export markets, Ruckelshaus said, "By far the most important market is in Japan. The Japanese government requires quarantine treatment of imported citrus, the most common of which is EDB fumigation to protect against citrus pests, although it has allowed several test shipments of cold treated fruit....The continued use of EDB

Papaya fruit, one of the products protected by EPA's recent action on the pesticide EDB.

on citrus exported from this country is intended to provide flexibility for...countries to meet their own quarantine requirements and to make their own decisions on acceptable pesticide residues....

"We will ensure that the treatment of fruit leaving this country will satisfy the requirements of Japan and other countries as long as the U.S. workers treating the fruit are adequately protected," Ruckelshaus said.

Under the Food, Drug and Cosmetic Act, EPA establishes pesticide tolerances on food products, with these levels enforced by FDA or, in the case of meat and poultry, by USDA. These agencies sample both domestic and imported products and may seize shipments which exceed residue levels.

On February 3, Ruckelshaus suspended the use of EDB as a fumigant for stored grain and grain milling machinery. This action followed the suspension on September 30 of last year of the use of EDB as a soil fumigant for crops, which accounted for some 90 percent of its agricultural uses.

The 30 ppb level for edible portions of fruit is the same as EPA's recommended level for ready-to-eat grain-based products, recommended February 3 as a maximum permissible residue level. That grain residue level, and two others recommended as guidelines for raw grain and intermediate level products, have now been proposed as federally enforceable levels. The agency has also moved to revoke an exemption to setting EDB residue levels that had been granted grain products. The exemption had prevented EPA from setting tolerance or action levels enforceable by FDA.

EPA's proposed tolerance levels for citrus fruit and papayas were subject to a 30-day public comment period.

Commenting on EPA's actions on EDB, Ruckelshaus said, "Again, I want to remind everyone that the risks associated with exposure to EDB are chronic risks that accrue over a long period of time. EDB does not present an acute short-term health risk." □

New Air Rules Proposed for Particulate Matter

The EPA has proposed major revisions of the national clean air standards for particulate matter, changing the focus from larger total particles to smaller, inhalable particles that are more damaging to human health.

"We're defining the health standards for particulate matter in a more careful way so we're getting at the problems that are really a concern to us," Administrator William Ruckelshaus said.

The Administrator explained that the smaller particulates that penetrate farther into the human lung "pose the greatest risk and those are the ones we are trying to control with the new standards. They will provide more effective protection of public health."

The proposal calls for replacing the current primary (health-related) standards for total suspended particulate matter (TSP) with a new indicator that includes only those particles that are 10 micrometers or smaller (PM_{10}). The new 24-hour primary standard would be a number selected from a range of 150-250 micrograms per cubic meter of air. In addition, the annual primary standard would be a number selected from a range of 50-65 micrograms per cubic meter of air.

The new secondary (welfare-related) standard would replace the current 24-hour secondary standard with an annual standard selected from a range of 70-90 micrograms per cubic meter of air.

A thorough three-year review of thousands of health and welfare studies contained in the criteria document for particulate matter led to significant agreement among scientists in a number of areas, including the decision to change the measurement.

However, the issue of the numerical stringency of the 24-hour and annual standards was a particularly difficult one, and led the Clean Air Scientific Advisory Committee, a Congressionally-mandated committee of scientists and engineers outside of government which advises the EPA Administrator on air quality issues, to agree with EPA staff that the available scientific information was sufficient to produce only relatively broad ranges of possible standard levels.

"There is no clear statutory guide to determine what constitutes an adequate margin of safety within this range," Ruckelshaus said. "Our standards are set to protect the most vulnerable portions of the population, and so I am proposing the range that the EPA staff and the scientific community have given to me, and am asking for public participation in the final decision by inviting public comment not only on the most appropriate or reasonable number within each range but also on the factors that EPA may ultimately take into account in setting primary standards with an adequate margin of safety."

Particulate matter is the general term for a broad class of chemically and physically diverse substances consisting largely of dust, dirt, soot and smoke. Human activities and natural sources are estimated to generate a hundred million tons or more of particulate matter each year. These pollutants may be emitted directly or formed in the atmosphere by transformations of gaseous emissions. At elevated concentrations, particulate matter can be harmful to human health, visibility, climate, vegetation, and may soil materials and otherwise become a nuisance.

In 1971, EPA set national ambient standards for total suspended particulate matter (TSP) under the Clean Air Act. The current primary standards for TSP are 260 micrograms cubic meter, averaged over 24 hours, and 75 micrograms cubic meter, annual geometric mean. [A microgram (ug), or one-millionth of a gram, is equal to 1 28,000,000 of an ounce.] The current secondary standard for TSP is 150 micrograms cubic meter for the 24-

hour average, with one allowed exceedance per year.

The 1977 amendments to the Clean Air Act require EPA to review all national ambient air quality standards every five years. The new proposal has been the subject of numerous public meetings held over the last several years.

The proposal for revising the particulate matter standards involves several changes. First, EPA is soliciting comment on its decision to measure only particles of 10 micrometers or smaller for the primary standards, rather than all sizes of particles currently measured. These smaller particles are likely to be responsible for most of the adverse health effects because of their ability to reach the thoracic or lower regions of the respiratory tract. This standard for particulate matter of 10 micrometers or smaller is thus known as a PM_{10} standard. [One micrometer (um) is one-millionth of a meter, or 1/25,000 of an inch. For comparison, the thickness of a human hair is about 100 or 200 um, and common bacteria are about one to two um in length.]

A second aspect of the proposal, and one that is unique in proposals of ambient air quality standards, is Ruckelshaus's decision not to select a specific number for the proposed standards but rather to propose a range from which to select that standard. These ranges were refined following the advice of the Clean Air Scientific Advisory Committee to incorporate a wider margin of safety for particulate matter.

The purpose in using this approach is to inform the public of the uncertainties in the scientific data and to solicit increased public participation in the process of selecting the final standards. Ruckelshaus has indicated that, after considering public comments, he will select specific numbers for the standards within those ranges.

EPA is soliciting comment and information from the public to be considered in formulating a final regulation which will identify a specific level for both the pri-

Sources of Particulate Matter

Fuel Combustion

- Coal
- Oil
- Wood
- Gasoline

Automatic Transformations

- Sulfur Dioxide
- Organics
- Water Vapor

Dust Generators

- Highway Traffic
- Industrial Processes
- Storage Silos
- Construction
- Agriculture

Natural Resources

- Volcanos
- Dust Storms
- Sea Salt
- Pollen
- Forest Fires

mary and secondary standards. Ruckelshaus said he is asking the public to "look at what I look at" and help in the process of deciding where that level ought to be.

Given the precautionary nature of the Clean Air Act, Ruckelshaus indicated that he is inclined to select the levels of the primary standard from the lower portions of the proposed ranges. This would allow a greater margin of safety to public health than those numbers at the high ends of the ranges.

Based on studies of human populations exposed to historically high concentrations of particles, and laboratory studies of animals and humans, the major health effects are those on breathing and the respiratory system, aggravation of existing respiratory and cardiovascular disease, alterations in the body's defense systems against foreign materials, damage to lung tissues, carcinogenesis, and premature mortality. It is difficult to evaluate the extent to which any or all of these effects might occur in populations exposed to the much lower concentrations prevalent in U.S. cities today.

The major subgroups of the population that appear likely to be most sensitive to the effects of particulate matter include individuals with chronic obstructive pulmonary or cardiovascular disease, those with influenza, asthmatics, the elderly, children, and mouth-breathers.

While available evidence clearly supports continuing regulation of particulate matter, selecting a standard level that provides an adequate margin of safety involves a number of uncertainties. Quantitative assessments have been based on a small number of epidemiological studies (largely done in London during the period 1958-1972) conducted in times and places where particulate composition and levels may have varied considerably from those currently found in the United States. Available epidemiological studies on particulate matter are subject to difficulties inherent in all studies of this type, such as confounding variables and somewhat limited sensitivity. Although some consensus has been reached on effects, there is a wide range of views among scientists as to the levels at which effects are likely to occur when assessing current exposure conditions in the U.S.

Ruckelshaus pointed out that EPA has spent well over a million dollars to examine the potential impact that these standards will have on our national economy, as well as the practical problems that particular localities and industries may have in meeting the standards. But the agency's interpretations of the current statute, as well as several court cases, preclude him from using such information in setting the standards, he said. Consequently, Ruckelshaus has avoided reading such studies or being briefed on their findings by his staff.

Noting practical difficulties in meeting the new standards, Ruckelshaus said a substantial number of areas of the country are not in attainment with the existing primary standards for total suspended particulates. In line with the new proposal, EPA has sent letters to the state governors indicating that the agency will soon be providing detailed guidance on how to address the attainment of particulate standards in light of the new PM10 proposal. The letters also indicate that the states are still expected to continue their on-going control programs for particulate matter.

Ruckelshaus also mentioned other aspects of the standard-setting process that create difficulties. "Based on the risk assessment information already gathered, reasonable persons might choose any of several numbers within the ranges we are proposing. Once a numerical standard is finally established, however, a domino effect occurs, triggering revisions in State Implementation Plans, forcing EPA, states, localities and industries into potentially dramatic confrontations. The inability of the Administrator to take into consideration the practical problems of implementation when setting the health standards poses potentially grave problems," he said.

Attainment deadlines for the health standards are dictated in the Act. Thus, once a level is selected, EPA has limited flexibility in implementation. This crucial limitation on the agency's ability to carry out responsible risk management can result in undesirable consequences, he said.

"Moreover," Ruckelshaus noted, "the statute provides for a single deadline for the primary standard, although the data suggest that both the health effects and the problems of implementation may vary enormously depending upon the makeup and the source of the particulate matter."

An example of this point would be a control strategy that might be much more readily implemented if the particulate matter came from a single source such as a factory than if it were a complex mix emanating from many sources. Moreover, some areas of the country, such as arid rural counties, may find their problems of implementation aggravated by windblown dust and dirt.

Ruckelshaus explained that "these dilemmas are very real and may underscore the need for some greater factoring into the Clean Air Act of realistic considerations to supplement what should be the paramount consideration of these standards — protection of public health and welfare." He called for public comment on what, if any, considerations EPA should take into account in setting the primary standards.

In addition, the agency is proposing to defer a decision on secondary standards for even finer particles, i.e., those less than 2.5 micrometers, so that it can consider such a standard as part of a more detailed look at regional air pollution problems such as visibility degradation and acid rain. EPA expects to issue an advance notice of proposed rulemaking on this matter in the near future.

The proposal on the national ambient air quality standards for particulate matter is to appear in the Federal Register. Public meetings on this proposal will also be announced in the Federal Register, with a public comment period of 90 days. □

Government Files PCB Cleanup Suit

Pole-mounted transformers are involved in a recent Justice Department suit against alleged PCB pollution by a Chicago area electric utility.

The U.S. Department of Justice recently filed a civil suit at the request of EPA against the Commonwealth Edison Company, a Chicago area electric utility. The suit seeks to compel the cleanup of numerous Northern Illinois sites contaminated by toxic polychlorinated biphenyl (PCB) fluids discharged from the company's pole-mounted electrical equipment.

PCBs can cause liver damage, adverse skin effects and changes in other biological functions in human beings and are suspected human carcinogens, according to the government complaint. The suit, a major enforcement action under the Toxic Substances Control Act, was filed in U.S. District Court in Chicago.

The case could have nationwide significance for utilities' cleanup practices, government legal officials noted, since ruptures of electrical equipment containing PCBs occur throughout the United States. Because of their insulating qualities, PCBs are used in electric capacitors and transformers and other equipment in electric utilities' distribution systems.

The government's complaint states that Commonwealth Edison has routinely failed to take prompt and thorough action to remove PCB contamination caused by failures of the company's electric equipment. The complaint contends that PCB levels found on several residential properties affected by Commonwealth Edison's discharges pose an unreasonable risk to health or the environment.

Commonwealth Edison currently operates many PCB capacitors, transformers and other items of electrical equipment which are in residential areas and other locations where human exposure to PCBs is likely to result from equipment failures, according to the government suit. The government said the utility has more than 40,000 capacitors and perhaps 27,000 transformers mounted on poles.

As many as 100 of Commonwealth Edison's PCB capacitors are alleged to rupture every year, the government complaint said. In some instances, especially where transformers are mounted high on utility poles, bursting capacitors have sprayed PCBs onto people and into homes.

The complaint cites several examples. In one, Mrs. Anna Schumacher of Tinley Park, Ill., allegedly was directly hit in 1978 by PCBs discharging from a capacitor close to her home. The chemicals sprayed into her house through an open window, and onto a truck, car and house trailer on her property, the suit alleged. The suit charges that she developed rashes on her back, neck and scalp and that her dog developed skin problems and cancer. The complaint alleges that the utility didn't remove contaminated materials from the Schumacher home until February, 1982, and that it still hasn't completed its cleanup of PCBs on the property.

Because the company's cleanup record has been poor, government officials said, the complaint asks the court to compel Commonwealth Edison to go back and do a much more extensive and thorough job of removing PCB contamination at sites, possibly numbering in the hundreds, where a spill has occurred. It also asks the court to order Commonwealth Edison to accept responsibility for thorough cleanups of future spills.

The suit said laboratory analyses of samples of post-cleanup debris have sometimes revealed PCB contamination levels of hundreds or even thousands of parts per million.

Commonwealth Edison, the complaint said, must act to protect health or the environment from unreasonable risk associated with disposal of the PCBs. "Unless ordered to do so by this court," the complaint said, "Edison will not take further action necessary to protect health or the environment from such risk." □

Biological Tests Okayed for Toxics Control

Fish swimming in aquariums at EPA laboratories are helping in the scientific field of toxicity testing. Based in part on results of field studies involving the fish, EPA has announced a new policy on assessing and controlling toxics in rivers and lakes.

The policy encourages use of biological as well as chemical testing methods in controlling toxics in these waters. Previous efforts had relied almost exclusively on chemical analytical methods.

Biological methods include a variety of field and laboratory techniques. Toxicity testing involves pumping effluent and water samples into aquariums containing fish and other aquatic animals, then observing the effects on the animals to calculate the toxicity of the wastewater. Chemical methods involve measuring the concentrations of individual pollutants in water samples.

The new policy recognizes that chemical methods may be inadequate, and biological methods more useful, in certain situations. A policy integrating both methods should increase the ability of EPA and the states to regulate toxic pollutants under existing laws, agency officials believe.

Background

The Clean Water Act calls for technology-based controls (best available technology economically achievable and secondary treatment), as well as water quality-based controls as needed to achieve water quality standards. Historically, permits issued under the National Pollutant Discharge Elimination System (NPDES) program have been based on technology requirements and on correcting the more traditional water quality problems such as violations of water quality standards for biochemical oxygen demand, total suspended solids, and some heavy metals.

Technology-based permit limits help insure that appropriate treatment systems are installed and operated properly. But they do not provide adequate protection of water quality in every case. That is because technology-based controls are developed nationally, whereas water quality protection depends on local circumstances. Thus far, water quality based controls for toxics have been centered on individual chemicals.

Where toxics are concerned, there are several problems associated with a strictly chemical approach to controlling water pollution. One is sheer numbers: it is difficult to analyze all the many toxic chemicals that may be discharged into receiving waters. In addition, effects of toxic chemicals, which are reactive, often vary, depending on the constituents of the effluent and receiving water. Finally, aquatic organisms are usually exposed to many toxic pollutants rather than a single one, and scientists cannot predict the effects of combined exposures.

Recognizing the limitations of chemical analysis in controlling by itself the toxic pollutant problem, EPA in 1978 and 1979 began holding workshops with representatives of industry and federal and state agencies to discuss use of toxicological techniques. Over the next three years, the agency circulated issue papers and draft policy guidance and held briefings and workshops to examine methods for toxics control. These efforts culminated in September 1983, with issuance of a draft policy on development of water quality based permit limitations for toxic pollutants. The new policy, issued on February 3, 1984, is a final version of that draft.

The policy states that, "in addition to enforcing specific numerical criteria, EPA and the states will use biological techniques and available data on chemical effects to assess toxicity impacts and human health hazards, based on the general standard of 'no toxic materials in toxic amounts.'"

In this toxicity test, a toxicologist at EPA's Environmental Research Lab in Duluth, Minn., exposes minnows to pollutants

Redirection

Toxicity tests measure, not amounts, but effects of toxic chemicals. According to Jack Ravan, EPA Assistant Administrator for Water, the new emphasis on a biology-based approach represents "a significant redirection for all involved in water quality control. These methods will enable the states and EPA to address problems that previously were not detectable, and they provide a means to tailor controls to the actual effects on the receiving water."

Rebecca Hanmer, Director of the Office of Water Enforcement and Permits, spearheaded the effort to develop the new policy. According to Hanmer, the policy's most significant aspect is its reliance on general narrative criteria in state standards. "We used to believe," Hanmer explains, "that specific numerical criteria were needed in state water quality standards in order to have an effective enforcement tool. Although specific criteria will be adopted for some toxic pollutants, the states obviously cannot adopt criteria for all toxic pollutants. This policy, therefore, encourages regulation based on the existing general standards protecting the designated water use and the public health, and carried out using available data on chemical effects and biological testing."

EPA and some states have been using aquatic organisms to test the purity of water on a limited basis. In recent years, says Bruce Newton of EPA's Permits Division, several states have begun using the tests to define discharge requirements in NPDES permits. Their experiences, plus requests for a national policy from other states, prompted EPA to take a firmer stand on the use of these methods.

EPA's policy is also based on results of studies conducted at agency research and development facilities, primarily the Environmental Research Laboratory in Duluth, Minn. There Dr. Don Mount pioneered methods for investigating effluent toxicity, and continues work on refining the methods and their application.

In a joint project with the Permits Division, the Duluth lab runs the Complex Effluent Toxicity Testing Program. Under this program, scientists have carried out toxicity evaluations of 10 municipal and 50 industrial discharge points at six sites in four states—Connecticut, Ohio, Oklahoma, and Alabama. The next site slated for testing, according to Permits Division project manager Rick Brandes, is Baltimore Harbor.

The basic thrust of this program is to determine, through use of ecological surveys and toxicological testing, if toxicity measured in an effluent translates into toxic impact in the receiving waters. Results, according to Brandes, show a strong correlation between measured toxicity and ecological effects.

"Office of Research and Development labs often develop the scientific basis for our regulatory programs," Newton explains. In this case, the findings of the scientists in Duluth helped form the basis for EPA's new policy. The Office of Research and Development will continue to play a significant role, developing better toxicity tests and methods to solve pollution problems.

The policy states cases in which different techniques should be used: "Pollutant-specific chemical analysis should be used where discharges contain a few, well-quantified pollutants and the interactions and effects of the pollutants are known...Biological techniques should be used where effluents are complex or where the combined effects of multiple discharges are of concern. EPA recognizes that in many cases both types of analysis must be used."

The nation has made substantial progress towards achieving the goals of the Clean Water Act, but much remains to be done. "There is a tendency to think," says Ravan, "that water pollution control is largely in place. This is not true. Research shows that there still are significant water pollution problems. But the nature of water pollution has changed."

As treatment of "traditional" pollutants becomes sufficient to protect water quality, attention is shifting to pollutants that affect water quality through toxic effects. Compared to the traditional pollutants, less is known about the effects of pollutants that are toxic to aquatic life. EPA's new policy on biological testing should help change that situation. □

Report Surveys Water Quality for Fish

An estimated 73 percent of the Nation's waters are clean enough to support populations of sport fish such as largemouth bass and rainbow trout.

At the same time, fish are being widely affected to some extent by pollution and by problems with the quantity of water, primarily low flow levels. These effects range from outright fish kills to stunted growth.

These are key findings from the National Fisheries Survey, which EPA conducted in 1982-1983 in cooperation with the U.S. Fish and Wildlife Service. The survey is an assessment of the biological condition of the Nation's waters as indicated by the ability to support fish life.

The survey found that nonpoint sources of pollution are the cause of harmful effects to the fish community in 38 percent of the Nation's waters and are ranked as a major concern in 19 percent of waters. Agricultural sources alone affect 30 percent of all waters.

Point sources of pollution are also a problem. Although municipal and industrial dischargers are on or have the potential to affect only an estimated 20 percent of the waterbodies in the country, the survey found that fish communities in more than 10 percent of all stream miles are being adversely affected by these point sources. In half of these waters, point sources are considered to be a major concern.

According to the survey, the ability of the Nation's waters to support sport fish or other fish of special concern, such as endangered species, has not changed appreciably during the past five years, even though human population and development pressures with a potential to worsen water quality conditions have increased. EPA officials explain that wastes are generally being treated more efficiently.

Other highlights of the survey findings include the following:

- In about 80 percent of the Nation's waters, the survival, productivity or use of fish populations is being harmed to some degree by at least one type of man-caused or natural condition involving the quality or quantity of water, the habitat or other factors such as overfishing or disease.

A painting of Lake Trout, a fish found in deep, cold lakes of some northern states and Canada

- Water quality factors such as pollution in general are causing harmful effects to fish communities in 56 percent of the Nation's waters. The predominant water quality factors are turbidity, adversely affecting fish communities in 34 percent of all waters; high water temperature, affecting fish communities in 26 percent of all waters; surpluses of nutrients, affecting fish populations in 12 percent of all waters; toxic substances, affecting fish in 10 percent of all waters; and low concentrations of dissolved oxygen, also in 10 percent of all waters.

- Poor water quality conditions caused by natural factors are adversely affecting fish communities in 22 percent of all waters. These include sediment stirred up by flood waters and high concentrations of certain minerals.

- Water quantity factors such as low water levels are adversely affecting the fish communities in 68 percent of the Nation's waters. Natural conditions are a major source of these effects.

- The two most prevalent sport fish species are largemouth bass and rainbow trout which occur in about half of the Nation's waters. Anadromous fish species—fish that migrate from the ocean to fresh water to spawn—are found in an estimated 11 percent of the Nation's waters. These include salmon and steelhead trout.

- Twenty-one percent of the Nation's waters contain no fish. Most of these reaches, however, are dry during part or all of the year.

The survey was based on existing information gathered from knowledgeable biologists in state fish and wildlife agencies for a statistically selected sample of the Nation's waters. These persons were asked to provide information on four basic concerns: the fish species occurring in a stream segment or impoundment (reach); the time of year during which the reach is usable as fish habitat; water quality, quantity, habitat and fish community conditions which are adversely affecting the fish in the reach; and trends in water body conditions with regard to the fish community.

Fish species used as indicators in the survey included sport fish, federally-designated threatened and endangered fish, and state-designated fish of special concern. The survey assessed flowing waters in the lower 48 states, including impoundments but excluding the Great Lakes, estuaries, coastal waters and wetlands.

Copies of the National Fisheries Survey will be available from EPA's Monitoring and Data Support Division (WH-553), Office of Water, 401 M St., S.W., Washington, D.C. 20460, or the U.S. Fish and Wildlife Service's Western Energy and Land Use Team, 2627 Redwing Road, Fort Collins, Colo. 80526. □

EPA Battles Bid Riggers

"Price fixing, bid rigging and other typical antitrust violations have a more devastating effect on the American public than any other type of economic crime. Such illegal activity contributes to inflation, destroys public confidence in the country's economy, and undermines our system of free enterprise. In the case of federal procurement, such crimes increase the costs of government, increase taxes, and undermine the public's confidence in its government."

So begins a U.S. Department of Justice guideline on antitrust enforcement in federal procurement. According to this document, federal procurement in fiscal year 1981 amounted to over $134 billion. "Without doubt," the guideline states, "some contracts are the subjects of collusion like bid rigging."

The EPA wastewater construction grants program represents one of the largest expenditures of public funds. According to EPA Deputy Administrator Al Alm, more than $22 billion has been obligated in this program on almost 10,000 active projects. On any given construction project, 85 to 90 percent of the total cost goes to private construction contractors. They are supposed to bid "freely and openly" in a "competitive marketplace," with the award going to the "lowest, responsive, responsible bidder" under the formal advertisement method of procurement.

But when bids are rigged, the method doesn't work as it is supposed to.

Bid rigging is a conspiracy of two or more contractors to determine, before bidding on a public contract, which one will receive the contract. An EPA guide calls bid rigging "a blatant corruption of the competitive bidding process." It is also illegal, a violation of the Sherman Act punishable by a fine of up to $1 million for corporations, and up to $100,000 or three years imprisonment, or both, for individuals.

According to EPA Inspector General John C. Martin, the agency is going after bid riggers on a national basis. In a November 1983 memo to senior management, Deputy Administrator Alm announced briefings on the Sherman Act and on detection of bid rigging in the construction grants program. The briefings are to be conducted by Justice Department attorneys in all regions. "The limited antitrust projects already initiated have resulted in indictments and convictions, and demonstrate the need for greater attention to protect the integrity of EPA's largest program," Alm said. "The Office of the Inspector General has commited substantial resources in fiscal year 1984 to audits and investigations of possible bid rigging activities."

Between 1977 and 1979, numerous corporations had been indicted for bid rigging on highway and airport construction contracts that had been funded by the U.S. Department of Transportation (DOT). But the business of many of these corporations was not limited to DOT contracts. At the direction of the Inspector General, the Office of Investigation's Southern Division meticulously matched the list of indicted contractors against lists of current EPA construction contractors and unsuccessful bidders. The records showed that a large number of the indicted contractors had either been awarded contracts by EPA grantees or were on the EPA bidders list.

Investigators from the Office of the Inspector General then analyzed wastewater treatment facility contracts for North and South Carolina and found a pattern indicating bid rigging. They worked with the Justice Department's Antitrust Division on a grand jury probe in the two states.

Their work began paying off in May 1982, when the first firm and officers of two corporations were indicted for bid rigging under an EPA grant. In August 1982, these individuals were convicted and sentenced to prison terms and fines totaling $300,000. To date, results in this bid rigging probe add up to 14 indictments and 12 convictions, each involving a jail sentence and most also involving a substantial fine and numerous suspensions and debarments from further government contract bidding. Several more cases are still under grand jury investigation.

In the course of its probe, the Inspector General's Office identified certain bid rigging patterns. Low bids on many EPA projects were elevated by $1 million or more over engineering cost estimates through bid rigging. Each convicted corporate official stated that bid rigging on

EPA projects was very important to his firm since there were more risk factors in wastewater plant construction than on federal highway construction. Bid rigging had become a way of life in the states under investigation and the convicted contractors, prior to the investigation, did not consider their bid rigging activities as criminal. When they finally did accept the criminality of their behavior, they cooperated with federal investigators.

The Southern Division's experience in bid rigging investigations forms the basis for the nationwide initiative now under way. The Inspector General's action plan calls for the four IG Divisions to analyze all contracts and subcontracts awarded under the construction grant program. They will look for data on potential bid rigging cases, refer appropriate cases to the Department of Justice, and work with Justice on documenting evidence.

Audit and investigative personnel will work together on this initiative, using a new EPA guide on bid rigging analysis in the construction grants program. Included in the guide is a 14-item list of documents required for successful prosecutions of Sherman Act violations, and a 15-item list of indicators of bid rigging. The indicators include previous charges of bid rigging, a low number of bidders, joint bids when one competitor could have filed its own bid, identical bids, and a persistent pattern of low bidding.

The goal of the Inspector General's nationwide attack on bid rigging is threefold: to obtain jail sentences for convicted violators, to recoup financial losses through successful civil suits, and to discourage other contractors from rigging bids.

Between April 1 and September 30, 1983, the Office of the Inspector General opened 93 new investigations, including 31 cases of fraud against the government and nine cases of antitrust violations. Two hundred twenty-three cases were under investigation, including 120 fraud cases and 32 antitrust cases. Six indictments and nine convictions were obtained during the six month period. □

Nonpoint Source Pollution in the U.S.

A new EPA report to Congress reviews the major contributions made by nonpoint sources to water pollution in this country.

These sources such as drainage from farm lands, runoff from city streets and parking areas, and waste from abandoned mines are considered by many EPA and state officials to be the principal remaining cause of water pollution now that treatment facilities have been provided for most pollutants discharged from point sources such as a pipeline.

Excerpts from the EPA report to Congress on nonpoint source pollution follow:

"The principal sources of nonpoint pollution vary between EPA regions and between states, but agricultural sources are identified as the most *pervasive* nonpoint source in every region. Pollutant loadings caused by runoff from urban lands and by mining activities are the next most commonly reported nonpoint source problems. Urban runoff contributes to localized water quality problems and is a source of concern because it may contain toxic heavy metals. Where they occur, water quality problems from abandoned mines can cause particularly severe impacts, in some cases resulting in the devastation of stream life. For abandoned mines and densely developed urban areas, cost-effective remedial measures may be hard to implement.

"Additional nonpoint sources of localized concern include silvicultural activities and construction erosion. The water quality impacts from both of these sources are not as pervasive on a national level as the other sources described in this report.

"For most water quality problems caused by nonpoint sources, substantial water quality improvements can be—and have been —achieved cost effectively through careful targeting of control activities. Targeting high-payoff areas requires identifying both the priority water bodies for which the adoption of a nonpoint source control program will have significant benefits and the best management practices that will lead to the greatest improvements for the least cost.

"While general statements about problems and potential solutions are possible at the national level, the analysis and decision-making required for effective implementation of targeted controls must take place on a local level.

"The key to careful targeting of control activities to maximize water quality benefits is a watershed-based analysis. A thorough watershed analysis will: (1) identify those use impairment problems that are caused specifically by nonpoint sources, (2) rank priority water bodies for concentrated attention, (3) pinpoint the specific land management practices giving rise to the problems, and (4) design a system of cost-effective management practices that can reduce the nonpoint source pollutant load to the watershed.

"The basic approach taken by the Clean Water Act for managing point sources—that is, the application of uniform technological controls to classes of dischargers—is not appropriate for the management of nonpoint sources. Flexible, site-specific, and source-specific decision-making is the key to effective control of nonpoint sources.

"Site-specific decisions must consider the nature of the watershed, the nature of the waterbody, the nature of the nonpoint source(s), the use impairment caused by the nonpoint source(s), and the range of management practices available to control nonpoint source pollution.

"The actual site-specific selection of particular management practices to control nonpoint source pollution (called Best Management Practices [BMPs]) will involve local environmental and economic considerations, as well as considerations of effectiveness and acceptability of the practice.

Erosion on unprotected corn field after a rain storm.

Agricultural Nonpoint Sources

"As is the case with most types of nonpoint source pollution, the nature and extent of the agricultural nonpoint source problem is directly related to the way in which the land is used. The agricultural sector generally manages land resources very intensively. Row cropping, for example, usually involves not only a good deal of land disruption, but also the application of chemicals such as fertilizers and pesticides. About 63 percent of the non-Federal land in the United States is used for agricultural purposes, including crop and livestock production. It is not surprising, therefore, that agricultural activities constitute the most pervasive cause of water quality problems from nonpoint sources. Indeed, it is considered *the* most serious cause in most of the EPA regions. National studies suggest that agricultural nonpoint source pollution adversely affects portions of over two-thirds of the nation's river basins. Nonpoint source pollution from agriculture actually has several different sources with different associated impacts. These sources are:

- Nonirrigated croplands, both row (e.g., corn and soybeans) and field (e.g., wheat),
- Irrigated croplands,
- Animal production on rangeland and pasture, and
- Livestock facilities

"This range of sources indicates that the agricultural nonpoint source problem is not only pervasive, but also multifaceted. The primary pollutants from nonirrigated cropland are sediment, nutrients, and pesticides. While irrigated farming is a source of these pollutants, too, it is also the major agricultural source of polluting salts and other minerals. Runoff from barnyards and feedlots primarily contributes nutrients, organic matter, ammonia, fecal bacteria, and other micro-organisms to receiving water bodies.

"Over-grazing of rangelands and pasturelands often contributes sediment and nutrient pollution through runoff. The related surface disruption and reduction in natural cover increases the erodibility of these lands. Livestock grazing freely along streambanks compact and damage them, thus increasing erosion and sedimentation problems. Livestock wastes also contribute to stream pollution.

Sediment from Cropland

"The most obvious cause of surface water contamination from cropland is sediment, which is carried off eroding lands via rainfall, snowmelt, or heavy wind. Research suggests that 25 percent to 40 percent of the soil that runs off a field reaches a water body.

"Conservation practices such as less plowing help retain crop residues on the land to reduce runoff of sediment. These practices are considered to be very effective and of direct benefit to farmers, but may require specialized equipment and additional costs.

"Some agriculture water quality problems can be controlled by best management techniques beyond the economic self-interest or means of many farmers. For example, reduction of some severe erosion problems may require terracing—a costly technique that breaks up a long slope into a series of shorter ones and reduces erosion by interrupting downhill water flow. Control of animal waste problems may require the fencing of streambanks to keep out animals.

Reduction of Agricultural Sources

"Although agriculture presents the most pervasive nonpoint source pollution

Hauling logs in Colorado forest. Construction of logging roads is a significant source of soil runoff in timber cutting.

problems, the best management techniques available for addressing agricultural nonpoint sources are generally well known.

"In addition, many—but not all—of the problems in this nonpoint source category can be ameliorated by adoption of techniques within the economic self-interest of the landowner or farmer. In fact, management practices designed to stop erosion may increase the long-term productivity of the land.

"Substantial achievements in water quality can be made by targeting resources, education, and training programs to the land areas and activities that are the source of agriculturally-generated pollution problems.

"Effective delivery systems for many of these programs are already in place as a result of the excellent outreach agencies developed by the U.S. Department of Agriculture. The Experimental Rural Clean Water Program, for example, has demonstrated the effectiveness of targeting and training in a number of watersheds throughout the country.

"Barriers to widespread adoption of agricultural best management techniques, in general, are not technical. These barriers include: educational ones (farmers lack knowledge about best management techniques); economic ones (adoption of certain techniques is beyond the farmer's economic interest); and programmatic ones (programs that specifically address nonpoint sources and that provide technical and financial assistance and/or an appropriate regulatory framework are often lacking at the state and local levels).

Silvicultural Nonpoint Sources

"The smaller area and extent of forest management activities, less intensive site preparation, infrequent harvest, and lower frequency of pesticide and nutrient applications in a given year all result in silviculture generating a smaller volume of total nonpoint source pollutants than agriculture nationwide. However, 38 states cited forestry impacts in their water quality management plans, and silvicultural management activities can generate major localized nonpoint source pollution problems.

"One factor in understanding the nature of the silvicultural nonpoint problem is the frequency with which land disturbance takes place and the nature of that disturbance. The time intervals at which forests are cut is an important factor in the potential for nonpoint source pollution. Rotation periods vary from 20 to more than 100 years for different species of trees. Thus, harvest sites in the pulp and paper producing areas with shorter (20-year) cutting cycles have more frequent opportunties for contributing to nonpoint source pollution.

"Silvicultural activities are actually comprised of a number of different operations, each of which has a different potential for nonpoint source pollution. These activities include road building, pesticide and herbicide application, harvesting and logging operations, removal of trees from the harvesting site, and preparation of the site for revegetation.

"Poorly planned road building and poorly managed site preparation activities offer the greatest potential for pollution impacts. The likelihood of such impacts is dependent upon such factors as road design, extent of soil disturbance, and time required until cover is reestablished (generally 2 to 5 years, and, in certain terrains substantially longer).

"A mature forest may experience extremely low soil erosion rates when undisturbed by the activities of people (0.5 tons per acre per year or less). While average erosion rates from carefully managed logging activities may be fairly low (less than an additional ton per acre) erosion rates from 10 to 15 tons per acre

per year are not uncommon. Losses due to intensive site preparation (preparing soil for replanting) can exceed 100 tons per acre per year.

"Nonpoint source impacts on water quality from silviculture depend on the characteristics of the forest land (e.g., soil type and slope), on climatic conditions, and on the type of forest practices and the care with which they are undertaken.

"As is the case with agriculture, sediment is the major pollutant by volume, and the soil type, slope, and climate markedly alter the rates of erosion and sediment delivery to water courses. Although fertilizers and pesticides have been increasingly used in silviculture, they are typically applied only once or twice during a 20- to 35-year period, as compared to annual agricultural applications.

Control of Forestry Nonpoint Pollution

"Although silvicultural activities do not appear to cause nonpoint source pollution problems as pervasive as those caused by agriculture, or as severe as those related to mining, they can still lead to localized water quality problems in places where they are not well managed. The main nonpoint source pollutants from silvicultural activities are sediment, chemicals (from pesticides and herbicides), and organic debris. Principal sources are roads, logging activities, preparation of sites for revegetation, and aerial spraying of pesticides. Management practices to control these pollutants are well known and well understood. Major implementation concerns are institutional in nature.

"As in agriculture, adoption of some best management plan will be within both the means and self-interest of the owner or operator. For example, proper construction of logging roads intended for long-term use may lower operation and maintenance costs. Needs for specialized equipment may put some best management practices beyond the means of the small landowner or operator. Finally, certain management practices may be unattractive because they result in lost timber sales (e.g., streambank management zones that leave a buffer strip in both sides of the stream).

"In cases where the self-interest of the landowner or operator has not been enough to cause adoption of best management practices, many states have effectively encouraged compliance with regulatory or quasi-regulatory programs. In other states, educational and training programs are used.

Mining Nonpoint Sources

"Mining cannot be viewed as a homogeneous source of nonpoint pollution. Many different minerals are mined, each with its own set of nonpoint source problems. Coal and metal mining are the sources discussed here, because both are associated with serious water quality problems in large geographic regions.

"Although mining is not as widespread as agriculture, its water quality effects are normally much more harmful. Sedimentation rates from mining can be extraordinarily high. Furthermore, whole streams may be biologically dead as a result of acid mine drainage. Other pollutants with potentially serious effects include heavy metals and radioactive materials.

"The main nonpoint source problems at mining sites are:

- Runoff of sediment from haul roads at both active and inactive mine sites;
- Drainage of pollutants including acid, sediment, salts and metals from inactive mines; and
- Drainage and leachate containing acid, metals, and sediment from the spoil and tailings piles generated both by active and inactive mines.

Abandoned Mine Problems

"Mining-related nonpoint source water quality problems are found in many parts of the country. Because mining activities are typically concentrated in a limited area, water quality impacts are also localized in nature. Where they occur, however, the resulting impact can be quite serious.

"Techniques for controlling pollution from operating mines are widely available. Proper site planning of a new mining operation is the key to preventing pollution, and is required by law for all new mines. In many parts of the country, however, it is the inactive and abandoned mines, the design and operation of which were completed a number of years ago, that pose serious water quality problems.

"Techniques are available for solving many of the water quality problems associated with surface mining. In some instances, significant costs may be associated with regrading land areas and adding topsoil for revegetation in abandoned mines where improper planning for reclamation makes after-the- fact problem solving difficult. Correction of drainage problems from deep mines is both more technically difficult and more costly. In addition, correction of these drainage problems may not last, and will usually require long-term monitoring and maintenance.

"Although techniques are available to arrest many abandoned surface mine problems, institutional issues and costs continue to present barriers to effective control. Mine owners are sometimes reluctant to cap or bury tailings piles, and to take other steps that might make future recovery of mineral values more difficult. Furthermore, ownership and responsibility for abandoned mines is often difficult or impossible to establish.

Construction Nonpoint Sources

"On a national basis, the water quality degradation caused by nonpoint source pollution from construction activities is not nearly as great as the amount caused by other major nonpoint sources. Sediment is the main construction site pollutant, but it represents only about 4 to 5 percent of nationwide sediment loads in receiving waters. Other pollutants from these sites can include chemical fertilizers, pesticides, paint and debris.

"Where construction activities are intensive, however, the localized impacts on water quality may be severe because of the high unit loads involved. Erosion rates from construction sites typically are 10 to 20 times that of agricultural lands, and runoff rates can be as high as 100 times that of agricultural lands. Thus, even a small amount of construction may have a significant negative impact on water quality in localized areas.

"Construction site erosion rates are highly variable because site characteristics are many and varied. Climate, soil type, slope, and the type of construction activity conducted are all involved. Severe erosion problems can occur locally anywhere in the country.

"Usually, a combination of structural and nonstructural controls produces the most cost-effective answers to construction nonpoint source problems. For example, highway construction nonpoint source pollution can be decreased significantly by utilizing diversion and filter structures, mulches, and well planned excavation work. Total costs are estimated at more than $1,000 per acre, but these costs are more than recaptured by the reduced expenditures for cleaning up sediment damage.

Nonpoint Source Pollution Controls

"The major nonpoint source pollutant from construction sites is sediment. Although pollutant loads are small nationally, the volume of runoff from a particular construction activity—and its impact on a local water body—can be significant. Best management practices are well understood technically. They are also recognized to be beyond the economic interest of the builder. Practices are typically instituted as a result of regulatory action on the part of the state and/or local government, and costs are passed on to the consumer.

"The failures in existing implementation programs need to be better understood so that appropriate steps can be taken to reduce this source of nonpoint pollution. Although precise data are not available, one of the apparent problems in many construction erosion control programs is the difficulty of inspecting and enforcing control measures at numerous sites scattered throughout a local jurisdiction. Weak inspection and enforcement point to the need for more emphasis on training and education to complement regulatory programs.

Urban Nonpoint Sources

"Rainwater running off roofs, lawns, streets, industrial sites, and other pervious and impervious areas washes a number of pollutants into urban lakes and streams. A large volume of the constituents in urban runoff is comprised of sediment and debris from decaying pavements and buildings that can clog sewers and waterways, reducing flow (and thus increasing the chance of flooding) and degrading aquatic habitat. Heavy metals and inorganic chemicals (including copper, lead, zinc, and cyanides) from transportation activities, building materials, and other sources are also significant pollutants.

"Nutrients are added to urban runoff from fertilizers applied around homes and in parks. Petroleum products from spills and leaks, particularly from service station storage tanks, and fecal bacteria from animal wastes and ineffective septic tanks are other important contaminants and may affect ground water as well as surface water. In short, many of the wastes from urban living make their way into urban runoff.

"Of equal importance is the volume of stormwater runoff leaving urban areas. When natural ground cover is present over an entire site, approximately 10 percent of the stormwater runs off the land into nearby creeks, rivers, and lakes. When paved surfaces account for 10 to 20 percent of the area of the site, 20 percent of all stormwater becomes surface runoff. As the percentage of paved surfaces increase, the volume and rate of runoff and the corresponding pollutant loads also increase.

"Metals and inorganics are the urban runoff contaminants having the greatest potential for long-term impacts on aquatic life, although they appear not to cause the immediately observable acute impacts of pesticides (e.g., fish kills). Some of these pollutants accumulate in the tissues of fish and other aquatic organisms. They also accumulate in the environment through continuing sedimentation and or are resuspended in the water column during high flows associated with storm events.

"These constituents may also have important effects on ground water, the extent of which is dependent on hydrologic and geologic conditions that determine the amount of runoff which percolates through to underground aquifers. Aquifers in limestone areas are particularly vulnerable because runoff flowing into sink holes and surface water is thus transmitted to ground water rapidly.

Control of Urban Runoff

"Water quality problems caused by urban nonpoint sources will be most acute in heavily populated, built-up areas such as the Northeast. The most effective control measures are structural, however, and opportunities for implementation of these measures will be very limited in such situations. Developing urban areas offer the greatest potential for utilizing the full range of structural and nonstructural controls. Adoption of these measures is an important means of reducing future urban nonpoint source pollutant loads. □

New Appointments, New Missions at EPA

Rebecca Hanmer

Marian Mlay

Recent appointments at EPA include the filling of high ranking posts in the Office of Water and the Office of Inspector General. Meanwhile, it was announced that an EPA scientist will be one of the astronauts in a space flight scheduled for lift-off in December, 1985.

The EPA appointments are:

Rebecca Hanmer, Director of the Office of Water Enforcement and Permits.

Marian Mlay, Director of the new Office of Ground Water Protection.

Kenneth Alfred Konz, Deputy Assistant Inspector General for Audits.

Hanmer, who has been with EPA since its inception, served as Acting Assistant Administrator for Water from May to November 1983. In this position she was responsible for administering the Clean Water Act, as well as the Safe Drinking Water Act and the Marine Protection Research and Sanctuaries (Ocean Dumping) Act. She served as Deputy Assistant Administrator for Water during the previous year.

Hanmer was EPA's Region 4 Administrator in Atlanta, Ga., from January 1980 to July 1981 and was Deputy Regional Administrator for EPA's Region 1 in Boston from 1977 to 1980. Prior to that she served as assistant director of the agency's Office of Federal Activities from 1972 to 1976 and as director from then until October 1977. She joined the office when EPA was created in 1970 as Federal Activities coordinator for public land management.

She began her government career in the Department of Health, Education and Welfare in 1964, and was a staff assistant in the Interior Department's Federal Water Quality Administration at the time it was transferred to EPA in 1970.

Hanmer was honored as a Presidential Meritorious Executive in 1980 after receiving EPA's gold medal for exceptional service in 1977 and the silver medal for superior service in 1975.

She received a Bachelor of Arts from the College of William and Mary in 1963 and a Master's degree in political science from American University in 1965.

Mlay has been Deputy Director of the Office of Drinking Water since 1979. The new Office of Ground Water Protection, which she will head, is part of EPA's Office of Water. The ground-water office will coordinate all EPA ground-water activities, develop policies and guidelines and provide guidance to regional ground-water programs. It also will provide staff support to a ground-water oversight committee chaired by Jack Ravan, EPA Assistant Administrator for Water, and will manage a ground-water steering committee which will review policy and make recommendations on budget requests for this program.

Mlay brings more than two decades of experience in federal government service to her new post. For the past five years as Deputy Director of the Office of Drinking Water she supervised development of the ground-water protection strategy. From 1978-79 she was Director of the program evaluation division in the EPA Office of Planning and Management. She served as Deputy Director, Office of Policy Development and Planning, Assistant Secretary for Health, in the Department of Health, Education and Welfare from 1973 to 1977 where she managed a multi-million-dollar program involving several Public Health Service agencies.

She was Director of the Division of Consolidated Funding, Office of the Comptroller at HEW from 1972 to 1973, and developed a recruitment program for executive level women at that agency in 1972. Earlier she held a variety of positions including Acting Regional Director of HEW in Chicago.

Mlay received a B.A. degree in political science from the University of Pittsburgh and a law degree from American University. She has received numerous honors in government service including the National Institute of Public Affairs Career Education Award in 1969, Public Health Service Superior Performance Award, and the HEW Executive Management Award in 1977. She was a Princeton Fellow in Public Affairs at the Woodrow Wilson School of Public and International Affairs from 1969 to 1970.

Konz was Special Assistant to the Assistant Inspector General for Audits at EPA beginning in 1981 where he was involved in all aspects of Office of Inspector General audit operations. From 1976 to 1980, he was Director of the Eastern Audit Division of the Office of Inspector General.

Previously, Konz was on special assignment from EPA as Special Assistant to the Commissioner of the New Jersey Department of Environmental Protection from 1975 to 1976. He was Supervisory Auditor of EPA's Mid-Atlantic Audit Division from 1973 to 1975 and began his experience of 13 years at EPA as an auditor in the Office of Audit about one month after it was organized in 1971.

In other jobs, Konz was Auditor-In-Charge and Supervisory Auditor for HEW in Colorado and Virgina, 1968 to 1971, and was with the Army Audit Agency from 1965 to 1968.

Konz graduated from the University of Denver with a Bachelor of Science-Bachelor of Arts degree in 1965 and did graduate work in public administration at the University of Oklahoma.

speaks *servanc* *in* *y*

Dr.Bill Williams, head of EPA's Wildlife and Toxicology Research Group in Corvallis, Ore., was nominated for the seven-day Spacelab-4 flight. The experiments he will be conducting aloft involve monitoring changes in the bones and blood vessels of rats and squirrel monkeys during periods of weightlessness and the possibility of an egg developing in zero gravity. These experiments are designed to help advance the treatment of cancer and diabetes in humans.

Williams is a specialist in thermal regulation, the control of the body's temperature by the brain and other systems. After 14 years as a scientist at NASA he came to EPA on a sabbatical in May 1982 to work on wildlife toxicology, especially the effects of pesticides on wildlife.

While still with the space agency, in 1977, Williams participated in a simulated flight of the Spacelab during which he and the other participating astronauts were totally isolated and otherwise treated exactly as if they were in orbit. Now that he has been selected for the Spacelab-4 flight his training will intensify. He has recently begun alternating one week working with EPA and the next with NASA. Sometime early this summer he will take a sabbatical from EPA to train full time.

Once the flight (or flights—he may fly two missions) is completed, Williams plans to return to EPA's Corvallis lab. □

EPA astronaut Bill Williams in simulation chamber preparing for Spacelab flight

Update

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

AIR

Clean Air Week, May 7-13

The annual Clean Air Week will be held May 7-13 this year and will focus on transportation problems which adversely affect air quality.

The event is being sponsored by the American Lung Association in conjunction with the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials.

EPA will be cooperating in the activity which will help reinforce the campaign EPA is conducting to stop tampering with auto emissions control equipment and use of leaded fuel in cars designed for unleaded gas.

Fuel Blending Violations

EPA recently issued notices of violation against seven gasoline blenders and two fuel additive manufacturers selling alcohol gasoline blends in the State of Ohio in violation of federal limits. The agency has proposed that civil penalties totalling $140,000 be levied against the alleged offenders.

This action closely follows the agency's recent actions against the use of illegal amounts of alcohol in unleaded gasoline in the State of Michigan and signifies the EPA's increased investigation of alcohol blending practices nationwide.

EPA said samples of unleaded gasoline obtained from retail service stations predominately in the Columbus, Ohio, area contained high levels of methanol without other required fuel additives. Laboratory analysis showed as much as 11.4 percent methanol and 15.3 percent ethanol in the samples taken. EPA has granted waivers of a Clean Air Act statutory ban for certain fuels and fuel additives of 10 percent by volume of anhydrous ethanol in unleaded gasoline and several other blends of methanol with cosolvent alcohols in unleaded gasoline.

Air Proposal

EPA recently proposed not to regulate polycyclic organic matter (POM) compounds as a general class under the Clean Air Act. POM is a generic term which covers a large class of chemical substances usually emitted as particulate matter from various stationary and mobile sources.

POM emissions to the atmosphere are generally produced by combustion processes, especially where combustion is incomplete. Because POM encompasses a large class of compounds from diverse sources and because these pollutants are not generally quantified, national estimates of POM emissions are very unreliable. However, one study in 1980 estimated national POM emissions to be nearly 18,000 tons. The major source categories of POM include residential use of wood and coal in stoves (44 percent) and fireplaces (three percent); mobile sources such as automobiles, trucks and aircraft (40 percent); forest fires (five percent); commercial and industrial incineration (three percent); and coke oven emissions (two percent).

The major human health concern over airborne exposure to POM stems from its carcinogenic (cancer-causing) potential. It is well established that extracts of particular air pollutants which contain POM are carcinogenic when painted on the skin of rodents or injected into newborn mice. A variety of POM and POM mixtures are mutagenic (causing changes in genes) in various tests. However, not all POMs have been tested.

The extent to which people are exposed to these pollutants in the ambient air, and hence the need to regulate them as a class under the Clean Air Act are very unclear. Many of these compounds are currently controlled under other environmental programs, especially the national ambient air quality standards for particulate matter. EPA intends to continue investigating various POM compounds and sources to determine the magnitude of their emissions, the public health risks they pose, and applicable control techniques. Results of this work will be made available to the public as they are completed, and EPA will take what action is needed to protect the public health.

ENFORCEMENT

Suit on PCBs

The Department of Justice, on behalf of EPA, has filed an amended civil suit against six companies for contaminating New Bedford Harbor, Mass., with polychlorinated biphenyls (PCBs).

The original suit on behalf of the U.S. Departments of Commerce and Transportation, filed December 1983 in U.S. District Court in Boston, seeks to hold the defendant companies liable for damages to natural resources from release of PCBs in the harbor and the Acushnet River estuary. In addition, it asks for recovery of past and future costs incurred by the government in identifying and assessing those damages. EPA now seeks injunctive relief and asks the defendants to plan and undertake removal and remedial actions in the harbor.

The current action charges that the defendants created the threat of imminent and substantial endangerment to public health or the environment, alleges each is jointly and severally liable for environmental and natural resources damages caused by release of PCBs, and seeks recovery of the government's costs in connection with the site.

"The overall action is particularly significant because it addresses damages to natural resources. New Bedford Harbor is a vital habitat and feeding area for lobster, shellfish and other organisms, and historically has been a major commercial and sport fishing area," said Assistant Attorney General F. Henry Habicht II, head of the Justice Department's Land and Natural Resource Division.

HAZARDOUS WASTES

Delaware Receives Award

Delaware Governor Pierre DuPont was presented by Administrator William Ruckelshaus with a "Certificate of Achievement" in recognition of that state's becoming the first to achieve final authorization under the federal Resource Conservation and Recovery Act (RCRA) to manage its own hazardous waste program.

"Delaware's authorization signals a new era for this country as the states and federal government move jointly to assure that the hazardous wastes our society produces are effectively controlled," Ruckelshaus stated.

"I commend Governor DuPont and Delaware's Department of Natural Resources and Environmental Control for recognizing the state's role in regulating hazardous wastes," said Ruckelshaus.

Delaware, by achieving final authorization, will have primary responsibility for enforcing regulations to control the generation, transportation, storage, and disposal of hazardous wastes.

Currently, more than 40 states and territories have received interim authorization to administer the RCRA program, which permits them to manage one or more aspects of hazardous waste management at the state level. Under RCRA, the program developed by the states must be "substantially equivalent" to the federal program to receive final authorization. Delaware is the first state to receive final authorization.

Superfund Contracts

Two contracts totalling more than $100 million to provide immediate emergency response capabilities at hazardous waste sites in the Northeast and Midwestern states were recently awarded by EPA.

The contracts are with O.H. Materials Co. of Findlay, Ohio, and PEDCO Environmental, Inc., of Cincinnati, Ohio.

Each firm will provide all cleanup personnel, equipment, and materials needed to conduct Superfund emergency activities. Each contractor is also responsible for maintaining a management organization to support a standby network of cleanup resources and to provide on-scene deployment of these resources in accordance with the EPA On-Scene Coordinator's instructions.

O.H. Materials Co. will stand by to handle Superfund emergencies for EPA's Region 1 — Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island; Region 2 — New York, New Jersey, Puerto Rico, and the Virgin Islands, and Region 3 — Pennsylvania, Delaware, the District of Columbia, Maryland, Virginia, and West Virginia.

PEDCO Environmental, Inc., will handle Superfund emergency actions for EPA's Region 5 covering Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.

Similar contracts for Superfund emergency actions in the Southern, Western and Northwestern states were awarded in December 1983.

Expediting Waste Rules

In a precedent-setting action, EPA is listing certain hazardous wastes as a group, rather than individually, in order to speed up the process of controlling them. Pollutants to be listed are chlorinated hydrocarbon-contaminated wastes that result from the manufacture of such products as drycleaning liquids, degreasing solvents, and other chemicals.

"We're cutting the time and effort to deal with these hazardous wastes without cutting corners," said Lee M. Thomas, EPA's Assistant Administrator for Solid Waste and Emergency Response.

"One regulation, rather than 25 individual regulations, will cover the wastes of 25 major commercial products," Thomas added.

"As part of EPA's overall mission to protect public health and the environment, we must determine which wastes are hazardous and therefore legally subject to control. Expediting the listing process for hazardous wastes also expedites their control," he explained.

This new listing of wastes resulting from the manufacture of chlorinated aliphatic hydrocarbons means they now will be subject to controls in storage, treatment, shipment and disposal.

Remedy at Superfund Site

EPA Assistant Administrator Lee M. Thomas has decided that excavation and off-site disposal of wastes will remedy surface contamination at the 40-acre Berlin & Farro Liquid Incineration Co., site near Swartz Creek, Mich.

The estimated $6 million needed for the project will come from the trust fund administered by EPA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as Superfund.

The Berlin & Farro site, which was operated as a hazardous waste and disposal facility from 1972 to 1981, includes two dumps filled with drums, metal hydroxide settling ponds, a paint-sludge trench, agricultural drains, the foundation of a liquid incinerator, contaminated soil, and numerous pockets of liquids, sludges, and solvents.

Among contaminants found at the site are a number of organic chemicals and various polychlorinated biphenyls (PCBs).

INTERNATIONAL

Japan Meetings

Administrator William D. Ruckelshaus attended a series of meetings in Japan February 7 and 8 dealing with joint environmental projects of Japan and the United States.

Ruckelshaus said the visit afforded him the opportunity to "see first-hand some of the innovative technology the Japanese are applying to the problems of pollution control."

The meetings, held in Tokyo, were a result of a bilateral U.S.-Japanese agreement on environmental cooperation signed in 1975, which established 14 joint projects in such areas as sewage treatment technology, solid waste management and the control of air pollution from vehicles and industrial and commercial sites. Oversight for the projects is provided by the Joint U.S.-Japanese Planning and Coordinating Committee of which Ruckelshaus is co-chairman with Minoru Ueda, Japan's environmental agency minister.

Exploring Fern Valley

In a green sanctuary in Northeast Washington the notes of a woodthrush floated down from a towering beech tree while an ambulance siren wailed in the distant background, adding poignancy to the melancholy birdsong.

These sounds were heard recently in Fern Valley, one of the more secluded nooks in the U. S. National Arboretum. The arboretum is an oasis of trees, shrubs and flowers which graces an urban neighborhood dominated by warehouses, motels, fast food restaurants and the endless car and truck traffic on New York Avenue, one of the main entrances to the Nation's Capital.

Fern Valley is a natural woodland where thousands of ferns, shrubs, and wildflowers have been planted since 1959 as part of a joint educational project of the National Arboretum and the National Capital Area Federation of Garden Clubs.

Most of the ferns native to the Eastern United States can be seen in this peaceful four-acre retreat hidden away from the hurly-burly of a huge metropolis.

At this time of year many of the ferns are beginning to rise from the ground with their leaves or fronds in tightly curled shapes known as fiddleheads, curved like the scroll at the head of a violin.

Among the ferns growing here are Christmas ferns, which have leaflets shaped like stockings hung on the mantle at Yule time; Cinammon ferns, named for the brownish wool which grows on their fiddleheads and which are used as nest material by many small birds; and New York ferns, recognized by the lacy fronds which taper at both ends. Students are taught to remember the name of this plant by recalling that New Yorkers are reputed to burn the candle at both ends.

Some of the more exotic plants include the Royal fern, an imposing species which often grows in swampy locations or shallow waters; Ostrich ferns, named because of the supposed resemblance of its fronds to an ostrich feather; and the remarkable walking fern. When the tips of this plant's spear-like fronds touch the ground, they take root and produce clusters of similar fronds, thus advancing this species across the ground.

Tree-like ancestors of modern ferns formed some of the world's great coal deposits. Today ferns generally have no economic value, but they do bring grace and beauty wherever they are found.

They carpet the forest floor in parts of Fern Valley where they live in communities of plants with similar requirements for climate, soil, moisture and sunlight.

One of these communities demonstrates the plant life of a northern forest. Here in addition to ferns are many shrubs and small trees which have been planted including azaleas, laurel, rhododendron, blueberry, hobblebush, nannyberry, witchhazel, bay berry, mountain holly, shadbush, dogwood, and striped and mountain maple.

In the acid soil under the pine trees are found pink ladyslippers, orchids, wintergreen, partridgeberry, and Canada mayflower.

In less acid locations under deciduous trees such as oak and beech many spring wildflowers bloom before the new tree leaves shade the sunlight. These flowers include trillium, hepatica, spring beauty, dutchman's breeches, bloodroot, foam flower and wood violets.

Near the end of the marked trail that winds through Fern Valley is a wall of historic limestone rocks, built to prevent erosion and to provide a habitat for such plants as the walking fern that need a "sweet" or neutral soil.

Standing by this wall and reflecting on the interrelationships of these plants to each other and to the larger world around them, one can recall the words of a poem by Tennyson about a flower in a crannied wall:

"Little flower, but if I could
understand
What you are, root and all,
and all in all,
I should know what God
and man is."

—C. D. P.

Shore birds feeding on the beach.

United States
Environmental Protection
Agency
Washington DC 20460

Official Business
Penalty for Private Use
$300

Third-Class Bulk
Postage and Fees Paid
EPA
Permit No. G-35