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Protecting Our Drinking Water

Protecting Our Drinking Water

In a major environmental action, Congress recently passed sweeping amendments to the Safe Drinking Water Act of 1974. This issue of *EPA Journal* examines the dramatically changed statute and the cooperative national effort to protect our drinking water.

The magazine begins with an interview with Lawrence J. Jensen, EPA's Assistant Administrator for Water, who gives a perspective for the Agency on issues involved in protecting our drinking water. U. S. Senator Dave Durenberger (R-MN), who was instrumental in the passage of the recent amendments, explains the how and why behind the Congressional action.

Closeups of efforts to ensure safe drinking water are provided in articles from New York City, Utah, and rural America.

An article explains a preventive strategy to protect drinking water supplies in the ground before they can be contaminated.

An *EPA Journal* special supplement presents an overview of the job of protecting drinking water, milestones in the effort, accomplishments under the previous drinking water safety law, and highlights of the amended Act.

Other articles feature comments by EPA Administrator Lee M. Thomas spelling out the Agency's approach in dealing with urban ozone pollution, and an environmental internship program for minorities at EPA.

A regular feature—Appointments—concludes the issue. □

Steve Delaney

United States Environmental Protection Agency

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

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Front cover: Stopping for a quick drink of water. Photo by Steve Delaney, EPA.

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Protecting Drinking Water: An EPA Perspective

An Interview with
Lawrence J. Jensen

To get an overview of EPA's drinking water protection program and policy, EPA Journal interviewed Lawrence J. Jensen, the Agency's Assistant Administrator for Water. His office includes drinking water protection responsibilities. The interview follows:

Q What are the key elements of EPA's drinking water program?

A The program basically consists of two elements. First, to insure that tap water is of good quality, EPA sets water purity standards and then, in conjunction with the states and local utilities, monitors water supplies to make sure the standards are being met. Second, to protect ground water as a drinking water source, EPA regulates the disposal of hazardous wastes in deep wells and, under the new amendments, will substantially increase its efforts to work with states through grant programs to bolster state ground-water protection programs.

Q But most drinking water in the United States is pristine compared with that in some other countries. Why do we need a special program?

A To the extent that we *have* good, clean water, the obvious answer is that we want to keep it that way, and that requires a special program. On the other hand, there are significant new concerns about water quality in some parts of the country. For example, we've found well over 700 different chemicals in ground water, some of which may be toxic, some of which may be carcinogenic. We need to mount an effort to determine just what the presence of those chemicals in our water supplies means. An industrial society like ours requires a great deal of effort to maintain a good water supply, and I think that realization is reflected in the new drinking water amendments.

Q What sorts of health threats do we face from contaminated drinking water?

A Well, I think we sometimes overlook the fact that there are still significant numbers of cases of disease that result from contaminated drinking water in this country. We've made enormous progress from the time 100 years ago when they were the number one health problem in the country. But, within the last decade, we still had some 85,000 reported cases of disease from bacteriological contamination of drinking water. That's a significant number. It suggests that we need to continue our efforts to educate people about the threats to drinking water and to ensure that good systems are in place and being operated correctly.

But bacteriological contaminants are not even the major source of concern. People are also worried about industrial chemicals in their drinking water, chemicals that might cause cancer or other long-term health effects. This concern is particularly strong in the case of ground water which is often drunk straight from a well without being treated and which is, in any event, very expensive once it becomes contaminated.

Q Consumers still seem very concerned about the quality of their drinking water, as evidenced by the growth of the bottled water industry. Are they being overly anxious?

A The answer to that question obviously depends very much on the local circumstances. Generally speaking, we still have so much to learn about the health effects of chemicals showing up in our water supplies that I think it's premature to judge whether our current level of concern is appropriate. I think the answer to your question will emerge in the next couple of years as we develop new information and go through the process of setting standards.

Q How can the public be sure that standards are not being violated?

A The utility that delivers the drinking water is required by law to meet certain standards, and then to monitor and make sure those standards are being maintained. If monitoring shows that the standards are not being met, the statute states that the public must be notified. So we depend on the utilities to monitor, to notify the public if there is a problem, and to take steps to fix it. But, if that breaks down, the next line of defense is a concerned citizenry. There ought to be sufficient public interest in drinking water supplies to prevent a utility from hiding problems in the water supply. Of course, the Agency, like the states, does gather some data on its own and does have enforcement powers, so that when a problem comes to our attention we can correct it.

Q You mentioned the recent legislation which strengthens EPA's drinking water protection program. Wasn't EPA doing its job?

A There's no question that many in Congress felt that drinking water standards were not being set quickly enough under the old law. That was one source of dissatisfaction. Consequently, in the amendments, Congress has taken steps to streamline the standard-setting process considerably.

But, having said that, I don't think the new amendments reflect on the past quality of the drinking water program at all. In fact, in many ways, the

Steve Delaney

In the bottled water section of a supermarket, a shopper ponders her choices. The growth of the bottled water industry reflects, in part, consumer worry over water quality.

amendments are a vindication of the program in that it was through the efforts of the program that Congress became aware of new chemical concerns and better ways of administering the law. Congress responded by giving us a much improved statute.

Q The 1986 law also added new provisions regarding ground water. Why the new interest?

A Fifty percent of the drinking water in this country comes from underground sources; in rural areas, the percentage is 95 percent. So ground water is a very significant source of supply, and there are significant numbers of people drinking it. We are discovering that many chemicals from our industrial society are getting into it. As recently as 10 or 15 years ago, the public felt these toxic substances just couldn't get into ground-water supplies. We thought that the soil would filter the chemicals out, that this natural filter would keep ground water uncontaminated. We've found that's not the case. I think I mentioned that over 700 chemicals have been discovered in ground-water supplies, and we're experiencing the first Congressional reaction to that in the new amendments.

Q Do you think you're going to have any special problems implementing the new ground-water provisions?

A There are two new ground-water protection programs in the amendments: the wellhead protection program and the sole source aquifer demonstration program. How well they function and the degree to which they contribute to the protection of our ground-water supplies depends, I think, on the monies made available to support them by Congress. Both of them are grant programs for the states to develop specific protection programs geared toward particular ground-water resources. If significant money is available, I would expect the programs to inspire a good deal of state and local attention to ground-water issues; if not, then I don't expect a lot to come of them. Unlike some of our other programs, these don't have a "we'll step in and do it if you don't" clause. In other words, if the states don't pursue these programs EPA will not step in and take over.

Q We've always had relatively cheap water in the United States. Will it always be affordable?

A I heard someone say the other day, "It'll always be affordable, it just won't be inexpensive." Something essential to life like water is something for which we will pay a great deal if we have to, and, in that sense, it will be affordable because we can't afford *not* to have it. But I don't expect it to remain inexpensive. I think that water has been one of the great bargains for a long time. As the cost of pollution control increases, as our population increases and the demand goes up, as enthusiasm for subsidized water costs wanes, there are going to be adjustments in the price of water. I think all of these things are going to drive the price up in the next decade.

Q I suppose this drought we're having in the southeastern United States is a good illustration of water problems we could face.

A Indeed it is. Our dependence on water, the difficulties of managing it, the necessity of keeping supplies uncontaminated so they're usable—I think all of these things have been brought to the forefront of the public mind by the drought.

Q You're from the West. Does that give you a special perspective on the whole subject of water?

A The scarcity of water in the Mountain West certainly made me very aware of water issues. Also, in the West you're generally apt to find a much stronger feeling that "the water is on my land, in my well, it belongs to me," and, consequently, more of a resistance to controls or regulations on that water.

Q A final question: Will EPA do a better job of protecting drinking water under the new law?

A The new law gives us better tools. Our ability to enforce our standards has been strengthened considerably, the process by which we develop standards has been streamlined, and we have significant new programs aimed at preventing the contamination of ground water. With better tools, I would expect EPA to do a better job. □

Revising the Drinking Water Law

by Dave Durenberger

The need for a national statute to protect public health from drinking water contaminants was first recognized by the Congress in 1974 only after surveys by the Environmental Protection Agency had shown that public water supplies were widely contaminated with synthetic organic chemicals, the new man-made compounds that have revolutionized every facet of American life in the last half of the 20th Century. Whatever miracles these new chemical substances have produced at home or in the workplace, their presence in drinking water supplies was suddenly recognized as a substantial threat to the nation's health.

The theory of the Safe Drinking Water Act is quite simple. The program has two parts. First, EPA is to establish national standards for drinking water quality. These standards are numerical criteria for each contaminant that may be found in a drinking water supply and that has or may have an adverse effect on health. The EPA standard is the maximum concentration of the contaminant allowable. At the time the Safe Drinking Water Act was adopted, more than a dozen such standards, principally for metals and other inorganic elements, had been established by the Public Health Service. EPA was to fill out this list rapidly with Maximum Contaminant Levels (MCLs) for a wide range of other pollutants.

The second part of the theory of the drinking water program is that water suppliers, the operators of the 60,000 public water systems in this country, will monitor the quality of the water delivered to consumers and treat that water if necessary to assure that the concentration of each contaminant remains below the acceptable levels established by EPA.

The theory of the Safe Drinking Water Act is appropriate to our federal system of government. The central, national government conducts the research on health effects and treatment technologies necessary to set standards that will provide adequate protection of public health. And local governments, which most often own and operate the water supply systems, put the standards into practice by applying them to the water they deliver to the American people.

While the number of chemicals used in daily life has exploded, there has been no comparable revolution in the capacity of small communities to protect their water supplies.

The Safe Drinking Water Act is, indeed, simple in theory. In fact, Congress expected the program to fall quickly into place. The original statute is replete with deadlines stated in mere days from enactment . . . 60 days . . . 90 days . . . 180 days.

But it is now 12 years later and most of the original promise of the law remains unfulfilled. In all of the time that has elapsed since enactment, the EPA has set standards for only a handful of contaminants.

Seven hundred different organic, inorganic, biological, and radiological contaminants have been detected in the drinking water supplies of the United States. And yet today after 12 years

(Durenberger is a U.S. Senator, (R-MN). He is Chairman of the Subcommittee on Toxic Substances and Environmental Oversight of the Senate Committee on Environment and Public Works and was Chairman of the House-Senate Conference Committee for the Safe Drinking Water Act Amendments of 1986.)

Autumn foliage surrounds a rural water pump. Changes in the Safe Drinking Water Act will mean strengthened protection efforts from water treatment standards to ground-water resources.

under the Safe Drinking Water Act we have standards for only 22 contaminants.

Because EPA set few standards, water systems at the local level have not monitored for the broad range of contaminants likely to be found in water supplies. Even for those standards that are in place, it was soon discovered that most public water systems were woefully unprepared to implement the

The 1986 Amendments go beyond the simple two-part program of the original law and include a series of protection strategies.

measures required of them by the drinking water law. In 1981, the General Accounting Office (GAO) conducted a study of compliance by local systems with the requirements of the Act. The requirements are principally of three types: to monitor supplies for the contaminants for which EPA has set standards, to report to the consumer if the standard is exceeded, and to take steps to come into compliance with the law—to treat contaminated water—if existing quality does not meet the national standard. GAO had a great deal to report.

The record of the drinking water program at the local level is a match for our experience at the national level of government. It is not a happy record. Violations are not in the hundreds. Violations are not in the thousands. GAO found that each year violations of the Safe Drinking Water Act by local public water suppliers number in the tens of thousands.

The failure of the program at the local level is in large part understandable. The operation of water supply systems in most small towns is not a space-age science. While the number of chemicals used in daily life has exploded, there has been no comparable revolution in the capacity of small communities to protect their water supplies from these new chemical contaminants. Water supply is public works. Many towns still don't charge consumers for water. Few small towns can afford to pay a water engineer full-time to run the system. Management is quite often done by a volunteer who is not by training or inclination part of the theory of the Safe Drinking Water Act.

So the job did not get done in 90 days in 1974.

On June 19, 1986, the President signed into law a new drinking water program which passed both houses of the Congress by overwhelming margins, but only after three long years of study and debate. The 1986 Amendments go beyond the simple two-part program of the original law and include a series of protection strategies. The Amendments do *not* depend *only* on swiftly established federal standards and technically sophisticated local water systems. Instead, the Amendments build multiple layers of protection which can be seen in the following four-part summary of the new law.

Standard-Setting. First, EPA is required to establish standards for a list of 83 named contaminants within a three-year period. The Agency is already well along in the standard-setting process for these contaminants. The Congressional mandate is intended to assure that the drinking water office will get the resources and support that it needs to complete the task as soon as possible. The 1986 Amendments are also designed to simplify the standard-setting process in the future by establishing a technology-based benchmark for MCLs. One specific treatment technology, granular-activated carbon, is identified as an available and appropriate treatment technique to be used in setting MCLs for synthetic organic chemicals.

Hundreds of small towns will be surprised to learn that their drinking water wells have been contaminated by unpronounceable chemicals that they had never been warned about.

Monitoring for Unregulated Contaminants. Even with the new standard-setting process, it will be difficult for the regulatory process to keep up with the chemical revolution. To assure adequate protection of our drinking water supplies, the 1986 Amendments will require local water supply systems to monitor periodically not only for contaminants with MCLs, but for a broad range of other contaminants as well. Over the next two or three years, hundreds of small towns will be surprised to learn that their drinking water wells have been contaminated by unpronounceable chemicals that they had never been warned about. Armed for the first time with adequate information, these communities will, without heavy-handed federal regulation, take the steps necessary to protect their drinking water supplies. We are confident of this result because programs to monitor for unregulated contaminants have been conducted in a few states already and with great success.

Treatment and Protection. The third part of the new provisions includes steps to protect water supplies from contamination and to treat all supplies before distribution. EPA will mandate filtration and disinfection, or steps equally protective, for all systems to remove contaminants. And the legislation includes two new grant programs directed to state and local governments prepared to take steps to protect ground-water resources.

Technical Assistance. The 1986 Amendments include significant programs of technical and financial assistance for small systems that would otherwise not be able to fulfill their role in the drinking water program. For instance, EPA is authorized to spend $30 million aiding small systems with monitoring requirements for unregulated contaminants. EPA will pay for the analysis for systems serving under 150 connections and may even provide technical aid in drawing the samples. The Amendments also include grants for states to manage the water supply and ground-water protection programs, grants for small systems and technical assistance to implement the disinfection requirement.

Although the 1986 Amendments to the Safe Drinking Water Act are modest in scope, we in the Congress believe they contain the elements to bring the theory of the Safe Drinking Water Act closer to the reality of the human institutions that must deliver, day-to-day, the important public health protection it promises . . . safe drinking water for all Americans. □

THE CHALLENGE OF SAFE DRINKING WATER:

What is involved in insuring safe drinking water in a large city? A state? A rural area? Here are articles on three examples: New York City, Utah, and parts of rural America.

New York City

By Joseph T. McGough, Jr.

These are turbulent times for water supply planners in our nation's largest cities. What needs to be done, when should we do it, and what will it cost are typical questions planners have to deal with. But big city planners are finding it more and more difficult to come up with the answers.

New York City is a case in point. Most of the problems facing Gotham's water suppliers as they try to improve and expand the city's water services are technically solvable. But, as in other major metropolitan areas, it has become harder than ever to decide which solutions to implement, and in what sequence. The array of issues faced by water suppliers has been further complicated by the ambitious timetables—worthy though they may be—in the recently amended Safe Drinking Water Act.

For years, New York City has been aware of the need for large-scale, costly improvements in its water supply system. Everything from the major systems bringing over 1.5 billion gallons of water a day into the city's five boroughs to the aging waterpipes under thousands of miles of streets needed improving or upgrading. Some projects had begun, but not nearly enough. For years the city struggled with fiscal problems that blocked aggressive new action.

But by 1984 the city had surmounted its fiscal crisis and once more began making major investments in a well-planned renewal of its vital infrastructures. The ambitious 10-year capital budget included $3.7 billion for water supply projects.

(McGough is vice-president for Corporate Operations for Parsons Brinckerhoff, Inc. He is the former Commissioner of the New York City Department of Environmental Protection.)

With the exception of one private company which supplies 600,000 residents in the borough of Queens, New York gets all of its drinking water from surface water sources outside the city. Some comes from nearby Westchester County, immediately to the north. But most of it flows from the Catskill Mountains in upstate New York or from the Delaware River Watershed in the mountains along the New York-Pennsylvania border.

These are turbulent times for water supply planners in our nation's largest cities.

The plan adopted in 1984 called for a number of major projects:

- Accelerated completion of the $4 billion Third Water Tunnel, a 24-foot diameter installation that is to join two similar conduits in bringing water into the city from holding reservoirs in Westchester County. Water from the Catskills and the Delaware Basin is stored there on its way to New York's millions of water-users. Work on this third tunnel was begun in 1968 to improve delivery capacity and provide back-up to the two existing tunnels. New funding will accelerate the pace of completion; a 14-mile stretch is expected to go on line in 1990. This is just the first of three phases. Total completion is now expected to be achieved by 2020.
- Construction of the city's first water treatment plant, for the 10 percent of the New York water supply that originates in the Croton watershed, the city's oldest, located in Westchester County. This $320 million project will be built at the Jerome Reservoir in the Bronx.
- Upgrading the city-owned reservoir dams to meet recently revised federal dam safety standards.
- $865 million for replacing and rehabilitating the city's aging water mains, of which there are some 6,000 miles under the city streets.
- System extension, including feasibility studies for the possible expansion of the Hudson River pumping station to augment supplies during drought.

The 1984 plan seemed to address every major issue which the water system then faced and would face during the next decade. Yet, this past May, the city recast its long-range capital budget, raising water projects to $4.4 billion. Even so, the major difference between 1984 and 1986 was not the amount of money involved but the number of existing water issues not addressed because of the uncertainty that surrounds them.

The first issue is sufficiency of supply. In 1985, New York City suffered its second-worst drought on record. A mayoral task force concluded that the city should move ahead immediately to expand the Hudson River pumping station. The 1986 long-range budget added $400 million for this purpose, but whether this is adequate in the face of growing demand is uncertain. The task force raised the possibility that, droughts notwithstanding, the city might need somewhere between 400 and 1200 million additional gallons per day by the year 2030. How much, and where it will come from, are issues that need to be faced and resolved soon.

The drought also provided the final impetus for universal water metering in New York City. Metering of industrial and commercial customers began in the 1860's, but residential water users have been charged a flat rate. Now, in an effort to reduce waste and consumption, the city has embarked on a ten-year program to meter 630,000 private homes and apartment houses, but the ultimate impact on consumption will not be known until all the meters and new

A worker inspecting a segment of New York City's Third Water Tunnel appears dwarfed by the conduit, which is 24 feet in diameter.

pricing structures are in place. Estimates of savings from metering range from 10 to 30 percent.

The second issue concerns the takeover of the last private water supplier in the city, a firm that provides well water to 600,000 customers in Queens, at the very end of the municipal distribution system. Because of questions about the quality of the water being supplied and state-approved rate increases, the city has been forced to take over the system, and now faces questions of rate equalizaion, and the quantity of city water it will have to supply.

The third issue stems from the 1986 Safe Drinking Water Act amendments. While New York City is blessed with high-quality water, all of it flows from surface supplies. Several provisions of the new law could lead to a requirement that the city, in addition to chlorinating for microbiological contamination, filter the remaining 90 percent of its supply that will not flow through the plant being constructed in the Bronx.

The first of these provisions is the surface water supply filtration section itself. The second is the standard-setting provisions for microbiological contaminants, notably *giardia lamblia*, a bacterium found in animals that live in the wilds in areas such as those from which the city's drinking water comes. The third is the Act's provision for an assessment of the health effects of water treatment chemicals and their by-products, and a comparison to the effects of water supply contaminants.

These uncertainties faced by New York City may be larger in scale than elsewhere, but they are not unique.

This could lead to a lower turbidity standard and requirements for filtration or changes in disinfection methods for surface supplies.

Given the great volume of water involved, the cost of installing the needed filtration plant would be between two and three billion dollars over a 20-year period; it would cost $250 million a year to operate. The city has set aside land in Westchester County for construction of a plant if absolutely necessary, but is hoping that further definition of the filtration requirements will remove this issue from the already crowded agenda of its water planners.

The uncertainties attached to all of these issues are further compounded by their mutual connections. Continued construction of the Third Water Tunnel, the biggest part of the capital budget, can't be delayed to make room for other projects (a filtration system, for example) because it is directly related to the city's ability to deliver sufficient water to replace that now supplied by the private water company. The city's need for increased supplies is directly related to the effectiveness of its metering program, which won't be completed for 10 years. And the specification of a treatment technique in lieu of a standard for *giardia* or other microbiological contaminants could mean changes in the treatment system for the Croton filtration plant, which is now being designed primarily to reduce turbidity and discoloration of otherwise high-quality water.

These uncertainties faced by New York City may be larger in scale than elsewhere, but they are not unique. Many other cities and towns face similar local planning issues; to those they must now add issues raised by higher water quality standards and tougher enforcement under the Safe Drinking Water Act amendments. The time-frames for compliance may be realistic if compliance is the only issue a system faces. But this will rarely be the case, and it remains to be seen whether the variance provisions of the Act are sufficient to permit an orderly resolution of all the issues all city water suppliers confront. □

THE CHALLENGE OF SAFE DRINKING WATER:

Utah

by Kenneth H. Bousfield

Out here in the nation's dry country, many people still think of drinking water as a resource that flows pure and sweet from pristine mountain streams, and that its purity and sweetness can be taken for granted. Their confidence in the quality of most of Utah's drinking water is well founded, but its continued purity and safety is in large measure due to the increasingly important role the state's government has played in protecting the public health through expanded drinking water regulatory programs.

The Safe Drinking Water Act (SDWA) of 1974 and subsequent amendments provided a national framework, promoted general continuity, and expanded the federal role in drinking water protection and regulation. These laws have led to significant improvements in the overall quality of the nation's drinking water. Nevertheless, states have traditionally been responsible for direct oversight and supervisory activities for the protection of public water supplies. In some cases, this responsibility dates back to 1914, when standards for bacteriological quality were first established. State programs provide the backbone of the national regulatory framework which ensures the high quality of drinking water in the United States.

As in many states, Utah's drinking water program had humble beginnings. Chlorination of Salt Lake City's water supply began in 1915. Early efforts at waterborne disease control were limited and there were still localized outbreaks of diseases like cholera and typhoid in the 1920s and 1930s. The first conventional water treatment plant was not built until 1944, and prior to 1953 the drinking water supply in Utah was not formally regulated by state government. In fact, there was only a single individual who occasionally conducted inspections of facilities and watersheds, and arranged for the major water supply systems to conduct a few chemical and bacteriological analyses on their water.

(Bousfield is Compliance Manager, Utah Bureau of Drinking Water/Sanitation, Utah State Department of Health.)

During this time, there was simply no recognition by the state government of a need to devote extensive resources to the regulation of drinking water supplies. Utah gets 97 percent of its drinking water from underground sources—springs and wells. Since such sources were often located in remote, pristine mountain areas, they were perceived as relatively invulnerable to contamination. Even today it is still said that the old-time prospectors and mountain men could drink water out of a ditch without getting sick. And the relatively small number of reported outbreaks of waterborne diseases compounded the low priority concern about drinking water quality, even though resources for monitoring and testing water supplies were generally lacking and suspected bacteriological contamination could not be confirmed.

As in many states, Utah's drinking water program had humble beginnings.

Because of the lack of modern treatment and testing capabilities (and the lack of regulatory requirements for such capabilities), it is probable that significant water quality problems actually did exist in various parts of the state. In fact, in many of the mountain areas the underground supplies are subject to increasingly shallower discharges and the systems are becoming less and less resistant to disease-carrying contaminants. Today, however, Utah's state program is much better able to monitor the water supplies and implement quality protection regulations.

The Utah state program was formally created by the legislature in 1953; regulations published in 1955 specified a number of duties for the fledgling agency. Central to the state program activities at the time was review and approval of plans for the development and/or modification of water supply facilities. The central program office reviewed proposals submitted by utilities and determined if they met siting, construction, and water source protection standards. The Utah program also required regular testing of water samples by public water systems.

Although this represented progress for the state, it still left much to be desired. Only bacteriological parameters were tested. Until relatively recently, acute waterborne diseases such as hepatitis and cholera were the major concerns for drinking water quality. Most of the many other potentially dangerous substances that can turn up in drinking water were overlooked. The sampling that was done required only monthly bacterial concentration averages so that failure to detect brief, potentially disease-causing contamination peaks would not be unusual. And, because of continued shortfalls in resources, the state program was unable to conduct quality assurance activities to ensure that those samples that did come in were accurate and legitimate.

Further, the lack of manpower and automation made it necessary to establish priorities for the types of systems that would get the most attention. Despite requirements that data be collected from systems, only those larger systems serving non-transient type populations (i.e., a system serving a small city as compared to one serving one of Utah's many campgrounds or resorts) generally submitted samples. In fact, it would have been fairly simple for the state's utilities to ignore the regulations if they were so inclined.

The third major component of Utah's early program involved on-site "sanitary surveys" of existing water supply facilities, their watersheds and drainage basins. These surveys were supposed to assure continued compliance with design, construction, and source protection standards. But they tended to focus largely on compliance with construction standards and ignore the others. What's more, less than 25 surveys were done each year even though there were hundreds of regulated systems in the state. Since then, the quality and quantity of these crucial inspections have improved dramatically; Utah's 406 community water systems and 544 non-community systems know the state means business!

With the enactment of the Federal Water Supply Act in 1958 and the subsequent establishment of additional drinking water quality standards for some chemical contaminants in 1962, the state regulatory role became more firmly entrenched. Utah's program expanded as additional resources were made available. The program staff grew, even before supplemental federal funds became available. Although the additional resources could not overcome all of the program's shortcomings, they did allow the state to more clearly delineate the needed improvements and to devise strategies for solving major problems. There were growing pains, of course. As sampling and water testing increased, there were tremendous advances in mitigating bacteriological and contamination problems, but, at the same time, the volume of samples caused severe strains on laboratory capacity.

As time went on, Utah made every effort to plan for and anticipate side effects of problem-solving efforts. The enactment of the SDWA in 1974 helped Utah and other states standardize and stabilize their drinking water regulatory efforts. Since assuming primary responsibility for implementation of the federal program, the state has expanded its data management and program evaluation, allowing it to further identify and pinpoint problem areas and adjust program areas accordingly. In addition, the state has gained greater expertise in using technical assistance and enforcement methods to improve the quality of local water supplies. For example:

- When tests in wells in the area surrounding the town of Hinckley showed arsenic levels six times higher than permissible, enforcement procedures were used to resolve the problem. The town was made to drill remote wells and then pipe the water in to dilute the arsenic levels in the system.

- Three small towns in the Cedar Valley area of southern Utah showed extremely high nitrate levels in their water supply. The people turned to drinking bottled water while the state looked for a solution. The pollution source was not man-made; it came from unusually large nitrate deposits that were leaching into the underground aquifer. The problem was solved by "annexing" the towns to the purer water supply system of an adjacent community.

Utah Travel Council

Provo River Falls in Utah, fed in part by mountain springs. As recently as 50 years ago, mountain springs and other sources of Utah's drinking water were considered invulnerable to contamination.

- Although mining activities have generally not caused problems for Utah's water supplies, the world's largest open pit copper mine on the southern edge of the Salt Lake Valley is believed to be contaminating ground-water aquifers. While this has not affected any wells now in use, it raises the question of future well contamination as the pollution moves underground and represents a possible violation of laws protecting natural resources. The state is currently considering legal action against Kennicott Copper, owner of the mine.

Violations of bacteriological parameters have been confirmed throughout the state, and water testing problems were compounded by the imposition of testing requirements for more and more substances. As the state looked at the problem, it seemed obvious that the most significant problem-causing factor was the lack of expertise and awareness on the part of water system operators as to the proper technical and regulatory procedures to follow. This applied especially to the smaller, rural systems. To remedy the program, Utah initiated a technical assistance program for operators and later passed a mandatory operator certification law which applies to larger water systems serving non-transient populations. In addition, the Rural Water Association of Utah was formed to help promote proper operation and maintenance of the smaller systems. This organization has played a crucial role in assuring water quality and public health protection in small systems throughout the state.

This evolutionary process of progressively refined development in the Utah state drinking water program has led to significant progress in improving the state's overall water quality. The number of bacteriological quality violations has declined by 60 percent as a result of regulatory and technical assistance activities. Sanitary surveys have improved in number and quality. The most important result of this long term development may be in the way Utah views its state role in the regulatory process.

When the state program still lacked large-scale information management and program evaluation capabilities, there was often a "we can (and should) do it all" attitude. This has changed. The Utah state program now recognizes the important roles of supplying safe drinking water played by many different entities and sees its role more as that of a coordinator of cooperative involvement on the part of utility operators, local governments, the educational community, laboratories, national professional organizations, equipment manufacturers, and design and construction engineers.

As new needs and problems are identified, state and federal regulatory structures responsible for drinking water have had to adjust accordingly. For Utah, this has been a drastic change from 50 years ago—or less—when the belief in the purity of mountain springs dominated the state's approach to water supply protection to the increasingly advanced technical and regulatory approaches of today. Utah, along with other states, will continue to provide state programs that, in combination with federal programs, are the most effective means by which public health protection through improved drinking water quality can be maintained. □

Rural America

by Russ Donoghue

A ditch like this one provided "hours of enjoyment and a drink every now and then" to the author when he was growing up in Colorado.

While growing up in Western Colorado in the 1940s, I never thought of my home town—Collbran, population 301—as a rural community. We had our own movie house, a swimming hole in Buzzard Creek, and a store where you could buy ice cream, flannel shirts, Levis, knives, and strawberry soda pop. The streets were gravel for the most part, and there weren't any stop signs. There was a ditch, my ditch, that ran through town and provided me with hours of enjoyment and a drink every now and then. Not everybody drank from my ditch because the small ranching town had a water system; at least water came out of the kitchen tap. I never knew where that tap water came from, and, as a young boy, I never really cared. I never cared where my ditch water came from either; it was always running when I needed it. I liked the ditch water better than tap water because I didn't have to use it to wash behind my ears, brush my teeth, or wash the dishes.

I didn't drink much water in those days. I preferred strawberry soda pop. However, water sure did taste good when I unhooked my grandfather's desert water bag from his jeep and tipped it up for what seemed like an ice-cold drink.

If there was a local health department in those days, I sure didn't know it. But, I was only a seven-year-old boy, and when I got sick my mother took me to Dr. Zeigel and then to the store to get some medicine. That was my health department.

Thinking back on my days in Collbran, I remember mom giving me advice and cautioning me about swimming under the bridges in Buzzard Creek and drinking water from my ditch. Her words went something like, "I don't mind your swimming in the creek if you won't dive off the rocks and if you'll take somebody with you." Now those rules weren't too hard to obey, but when she said that I couldn't swim when I had cuts or scratches because I might get an infection, and that I couldn't drink out of my ditch, well, that was almost too much to "swallow".

Like most boys, I never put two and two together and figured out that if creek water could infect a cut, it might do something worse to my stomach.

My family moved to Utah in 1954 and settled in a rather large rural town of 5,000 people that had a real swimming pool, well water to drink, and desert water bags for sale at every service station. Only 37 miles away was a little place called Thompson Springs.

Some 30 years later, I returned to the area when the main water line in Thompson Springs was destroyed by a flash flood. Fifty residents, a truck stop, and two state visitor centers were without water. People hauled water until service could be restored, and then the system was placed on a boil order. As Program Manager of the Utah Rural Water Association, I was there to offer our technical assistance service and to encourage the residents not to drink their ditch water.

The Utah Bureau of Public Water Supplies and the Rural Water Association worked together and helped the town's part-time maintenance man, Kenny Davis, install an emergency chlorinator, flush the system, and start a thorough sampling program. Local health officials worked hand in hand with the system in the months that followed so that the results of the water tests could be discussed and corrections made on chlorine feed rates if necessary.

Kenny, an old friend of mine, knew about Collbran, Buzzard Creek, ditch water, and cool drinks from a water bag. He also knew other things about drinking water: proper spring development, adequate pressure, operable valves, sufficient storage, and the need for fire hydrants. He was a little concerned about disinfecting the system because he didn't know much about chlorine and its effects. After spending time with the health officials and the Rural Water Circuit Riders, he soon became comfortable with the process. They explained to him the need for a residual in the system, how to operate the equipment and make adjustments, and why a sampling program was necessary.

Kenny is 75 years old and works part-time because he wants to. He has a pride in and a sense of worth in his work that are hard to maintain at times in rural America. The town will soon have a new water distribution system, and, even though trains don't run as often as they used to run and the highway traffic goes by to the south, the town will once again have quality drinking water.

Thanks to the Safe Drinking Water Act, EPA, the state agencies that administer the program, and other water-related groups—including the National Rural Water Association and its member states—people are able to travel from town to town and state to state and have some assurance that the water they drink is being tested and cared for by trained and competent people. Rural America, wherever that might be, is still made up of creeks, ditches, windmills, and water bags, but education and a keener awareness of drinking water can show us a better and safer way to get a drink. □

(Donoghue is a Training Specialist with the National Rural Water Association.)

Wellhead Protection: A Preventive Approach

by Marian Mlay

One way of protecting drinking water supplies is to prevent contaminants from entering them in the first place. Half of all Americans get their drinking water from wells. To them, this means keeping pollutants from getting into the ground water that supplies these wells.

People building a house in the country, for example, are concerned that their septic tank does not leak into their drinking water well, or that of their neighbors. Similar concerns exist in regard to larger wells serving up to hundreds or thousands of people because of the many man-made chemicals that can enter and contaminate ground water. Such pollution doesn't come just from big industrial complexes or improperly managed hazardous waste sites. It results also from a large number of common and socially beneficial practices such as the use of fertilizers and pesticides, the disposal of human waste, the storage of gasoline in buried tanks, or the disposal of used dry cleaning fluids, all of which can contaminate ground water unless properly managed.

Preventive actions are necessary to protect all potable ground water. Considerable EPA and state attention is being focused on developing and implementing comprehensive ground-water strategies. These strategies recognize that the problems of contamination can become particularly acute in areas close to wells for several reasons:

- Although ground water moves very slowly, unless contaminants are quickly spotted they may move into the areas immediately adjacent to a well and make that well unusable unless the water is extensively treated.
- Most ground water used for drinking is untreated. There may be chlorination for microbiological contamination, but rarely is there treatment suitable to eliminate more complex man-made chemicals.
- It is often difficult to find the party responsible for the contamination. It is also very expensive to remove or control contaminants entering a well or to add sophisticated drinking water treatment. Therefore, the owner of the well, whether a community or an individual homeowner, is often stuck with the bill.

A number of communities in this country have begun programs to protect the ground water entering the wellhead areas around their wells.

In some Western European countries, including England, West Germany, and the Netherlands, protective zones of 300 feet or more guard wells against microbiological contaminants. Most countries, however, are increasingly concerned about man-made chemicals, which are far more persistent because they move through ground water for much longer periods of time before disintegrating. West Germany, for example, has a series of zones, the outermost of which extends a mile from the well.

An outstanding program in this country is now in place in Dade County, FL, where the city of Miami is totally dependent on a large cluster of wells for its water supply. The county protection zones range up to several miles. A number of activities, including the transport and handling of hazardous wastes, the use of septic systems, the disposal of small business wastes such as dry cleaning fluids, and the siting of potentially contaminating activities are carefully monitored and controlled. Florida is also embarking on a state-wide wellhead protection program for larger public wells. The state has a special problem because its ground water is close to the surface and moves relatively rapidly.

Smaller communities, too, are taking major steps to protect their wells. Several municipalities on Cape Cod, for example, are protecting the "zone of contribution" around their wells.

Federal technical and financial support for the development of wellhead protection programs for public wells is now available as a result of the Safe Drinking Water Act Amendments of 1986. This assistance includes federal guidance in the delineation of wellhead areas and federal grant dollars to states whose programs are adequate to protect wells from potentially health-threatening contaminants.

In many ways this new program is unique. It does not penalize states if they do not set up a program (except for the loss of associated grant dollars), nor does it call for EPA to carry out the program in lieu of the states as is provided for in other EPA statutes. It allows for maximum flexibility on the part of the states in the design and implementation of protection programs. EPA will not be telling the states what to do or how to do it, but will provide leadership, guidance, and financial support.

During the coming year, EPA's Office of Ground-Water Protection will be grappling with many questions that need to be answered in the guidance materials which will be sent to states:

- What is an adequate program?
- How will EPA exercise its responsibility to make that determination?
- How can wells be protected adequately if they are located in the middle of town?
- How much information is needed to determine the wellhead areas, to inventory the potential sources of contamination, and to design appropriate protection programs?

We will hope to answer these and other questions with the help of state and local officials, environmental advocates, the business and industrial community, and others interested in protecting this precious resource: the nation's ground water. □

(Mlay is Director of EPA's Office of Ground-Water Protection.)

You and Your Drinking Water
An *EPA Journal* Special Supplement

- Drinking Water in America: An Overview
- A Decade of Achievement: Accomplishments Under the Safe Drinking Water Act of 1984
- What Lies Ahead: Our Nation's Agenda Under the Safe Drinking Water Act of 1986

Drinking Water in America: An Overview

"When the well's dry, we know the worth of water"- Ben Franklin, Poor Richard's *Almanac*

Safe drinking water is a blessing many Americans take for granted. It's not hard to see why. What could be easier than turning on the tap and getting gallons of drinkable water? But behind each gallon, behind each drop, is the unceasing effort of scientists, engineers, legislators, water plant operators, and regulatory officials. It is their mission to keep this precious resource clear, clean, and—above all—safe.

Our drinking water comes from two different categories of untreated water. About half comes from rivers, streams, and other forms of "surface" water. The other half comes from reserves of water hidden beneath the earth in areas known as "aquifers." Protection of both surface and ground water is vital if we are to have drinking water that is not only safe but plentiful.

Protection at the Source

Concern over the quality of our surface and ground-water supplies is a function of geography as well as the effects of human activity. Water moves constantly, often passing from areas beneath the ground to the surface, and vice versa. The cycles of precipitation and evaporation continue ceaselessly, day in and day out.

Various natural processes—physical, chemical, and biological—occur as water moves above, on, and below the earth's surface. These processes all, to a greater or lesser extent, affect the quality of our water resources. Exactly what effect these processes have is determined by the type and extent of the contact the water has with rock, soil, vegetation, and other substances, both soluble and insoluble.

Several different kinds of contamination can result from natural causes. Undissolved material—known as "suspended matter"—shows up frequently in untreated water, as do dissolved minerals and salts, such as sulfates, chlorides, and nitrates. A well-known toxic metal, arsenic, occurs naturally as an impurity in various minerals and in the ores of certain commercially mined metals. If untreated, arsenic can cause liver and kidney damage when it gets mixed into drinking water supplies.

Another natural contaminant controllable with modern technology is fluoride. This inorganic chemical, which is the seventeenth most abundant substance in the earth's crust, can cause skeletal damage as well as a brownish discoloration of the teeth known as "fluorisis." Fortunately, modern technology is well equipped to manage fluoride and other forms of natural drinking water pollutants.

Today's treatment techniques are also effective against radionuclides. Radionuclides include naturally occurring minerals such as radium and uranium as well as the radioactive gas known as radon. Radon is a particular concern at the present time. This colorless, odorless, tasteless gas poses unique problems. The gas is a decay product of uranium deposits located in various regions of the United States. It enters American homes dissolved in drinking water. When that water is heated or agitated in a shower or washing machine, it becomes a breathable drinking water contaminant that may, in the opinion of scientists, greatly increase the risk of lung cancer. EPA is now considering the proposal of formal controls on radon and uranium.

People, too, can have an adverse effect on water quality. Human organic waste has, throughout most of recorded history, posed the greatest threat to the safety of drinking water. Typhoid and cholera epidemics were commonplace for centuries. Cholera was brought under control by the early 1870s, but typhoid was still killing approximately 28,000 Americans a year at the turn of the century.

Typhoid, cholera, and other water-borne infectious diseases could not be fully conquered until U.S. citizens backed serious efforts to improve the quality of our nation's drinking water. Water systems throughout the U.S. adopted chlorination and filtration, sometimes against opposition, and these methods have been remarkably successful.

Pollutants other than bacteria are posing new challenges to the guardians of our drinking water: contaminants such as viruses, protozoa, and toxic chemicals. One chlorine-resistant protozoan, *Giardia*, has caused 38 outbreaks of gastro-intestinal illness that have infected 20,000 people since 1972. Overall, waterborne illnesses afflicted 85,875 Americans from 1971 to 1982.

An analysis of these cases showed that 49 percent were the result of treatment deficiencies. Nearly one-third were found to stem from defective distribution systems. Surprisingly, these figures represent a slight increase over previous years, but most experts attribute this seeming increase simply to more active surveillance.

Whatever their cause—or trend—these figures are clearly justification for sustained vigilance. This is especially true in view of the emergence in recent years of a whole new group of man-made drinking water contaminants. Over 60,000 toxic chemicals are now being used by various segments of U.S. industry and agriculture. These substances range from industrial solvents and pesticides to cleaning

The Bostonian Society

In Boston in 1896, crews work to lay water pipes under Boston Common. In some cities in the eastern U.S., corrosion has caused old water pipes to leak, allowing treated water to escape and contaminants to enter.

preparations and septic tank degreasers. When used or discarded improperly, these chemicals can pollute ground and surface waters used as sources of drinking water.

Subsurface activities can also cause problems. Mining operations, the injection of waste chemicals and brines, and the storage of substances in underground tanks have all been linked to the contamination of ground and surface water.

Not all problems of drinking water quality originate with the surface or ground-water supplies. Sometimes contamination can occur during the treatment process itself. In other cases, it can occur in transit from the treatment plant to your home.

Certain disinfectants used to purify water can create potentially hazardous by-products. A good example is chlorine, which has for many years been the major disinfectant used at U.S. drinking water treatment plants. In the late 1970s, scientists at EPA and in Europe discovered that chlorine can react with natural and man-made chemicals in water to create by-products known as trihalomethanes. One of these by-products—chloroform—has been proved to cause cancer when administered in large doses to laboratory mice. Other disinfectants have also been found to generate undesirable by-products.

After purified water leaves treatment plants, it enters pipes and conduits that may themselves be defective or contaminated. Corrosion by-products from rusting pipes can pollute treated water. So can bacteria and other growths. In some of the older eastern cities, as much as 40 percent of treated drinking water is lost through these leaks caused by corrosion.

Contaminants can enter carefully purified drinking water through these leaks. Furthermore, water passing through lead or lead-soldered pipes can become contaminated with lead, one of the most harmful of metals.

Protection at the Tap

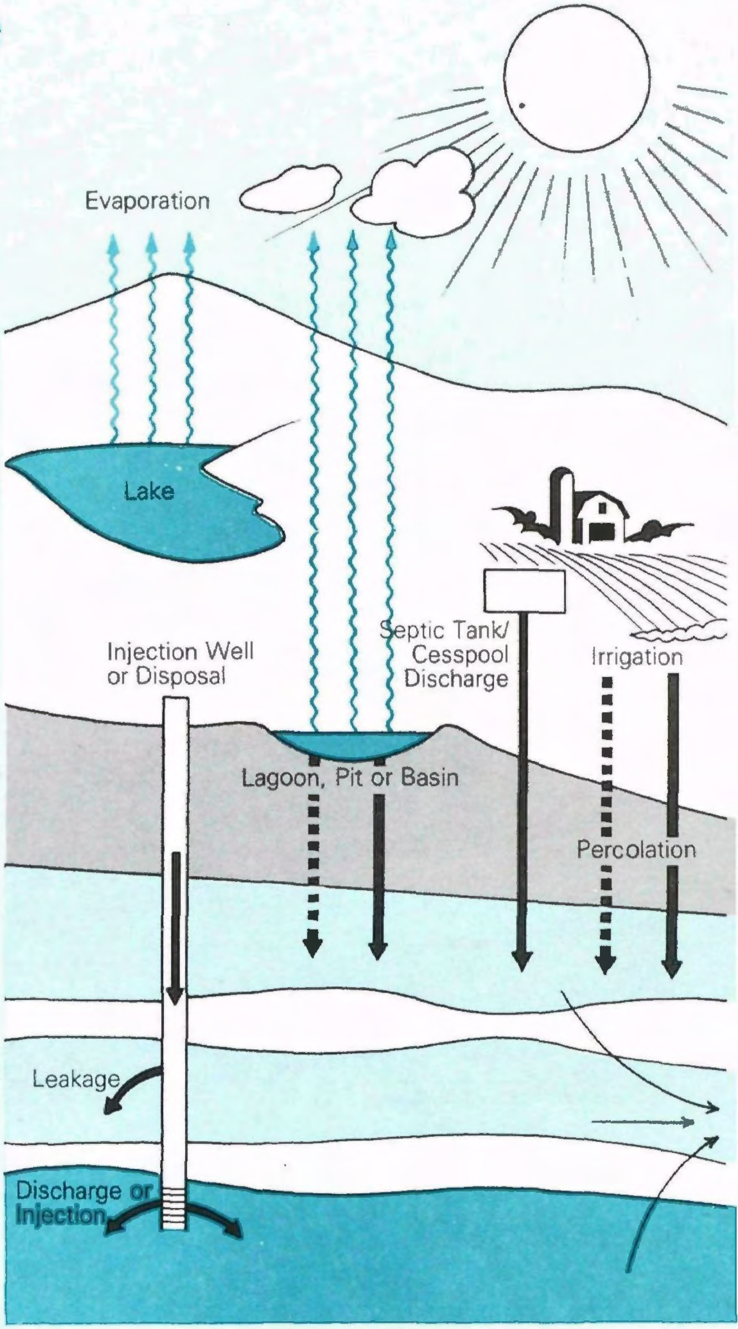
The Safe Drinking Water Act sets a very exacting standard for EPA to follow: it requires the Agency to set primary drinking water regulations for any pollutants that "may" have an adverse effect on human health. In other words, the intent of the law is preventive as well as reactive. EPA is responsible not only for eliminating demonstrated hazards, but also for preventing potential adverse health effects.

The Agency is charged with setting contaminant levels at which "no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety." But the Safe Drinking Water Act also specifies that these levels must be technically "feasible," taking cost into account— that is, achievable in the real world of locally operated public water systems.

Today, as a result of the Safe Drinking Water Act of 1974, the standards governing the treatment of drinking water in the U.S. are more rigorous and uniform than they were a decade ago. As a matter of fact, drinking water has reached a level of regulation in the U.S. stricter than almost any place in the world. Coming years will make measures designed to protect our drinking water even more rigorous, as a result of the 1986 amendments to the Safe Drinking Water Act.

Before we look more closely at what's been accomplished in the past decade—and what lies ahead in the next few years—let's pause to reflect on the broader outlines of progress toward safer drinking water both in the United States and elsewhere in the world. □

Water, Water Everywhere



The human body is mostly water: 55 to 65 percent water for women, 65 to 75 percent water for men. People can survive without food for two months or more, but no one can survive without water for more than a few days.

Only one percent of the water on Earth is fresh and accessible for human use. The remaining 99 percent is either unusable brine or ice.

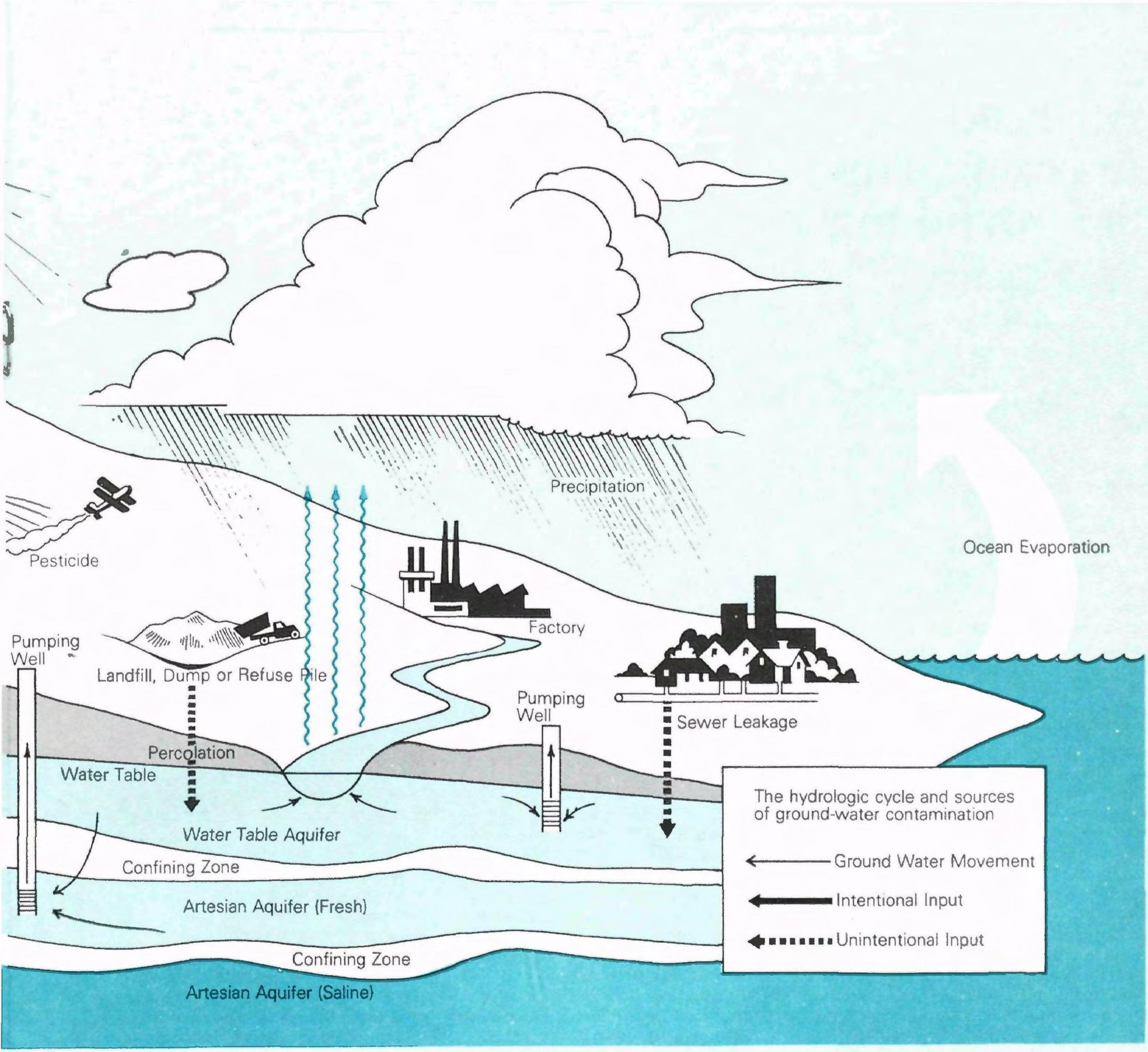
Every day 4.2 trillion gallons of precipitation fall on the U.S. More than half of this huge quantity of water evaporates: 2800 billion gallons. A sizable portion—1200 billion gallons—is carried by rivers and streams across the U.S. border to Canada or Mexico, or out into the ocean. About 61 billion gallons soak into U.S. aquifers.

The U.S. has 2 million miles of streams and over 30 million acres of lakes and reservoirs. In addition, our country has untold huge reserves of fresh water in underground aquifers: 50 times more, in fact, than our supply of surface water.

Ground water supplies over 100 million people—about 50 percent of all Americans—with their drinking water.

The U.S. withdraws about 90 billion gallons of ground water every day for all uses. This includes 12 billion gallons per day for public water supply.

Each day, public water systems supply every person in the United States with approximately 160 gallons of clean water.



The world has a vast quantity of water: 326 trillion gallons. That amount of water remains constant, but the various forms it takes are constantly changing.

The same water recirculates over and over again: first evaporating, then condensing, then falling to the earth again as rain or snow.

This precipitation replenishes supplies of surface and ground water. The pull of gravity draws the water down to coastal areas and the ocean—where it evaporates and sets the cycle in motion once again.

Sources of Drinking Water Contamination

Before Treatment

- Natural minerals and salts
- Decay products of radon, radium, and uranium
- Human and animal organic waste
- Defective storage tanks
- Leaking hazardous waste landfills, ponds, and pits
- Intrusion of salt water into depleted aquifers near the seashore
- Agricultural run-off (fertilizers, pesticides, etc.)
- Surface run-off (overflowing storm sewers, rainwater from oil-slicked or salt-treated highways, etc.)
- Underground injection of industrial waste

During Treatment

- Disinfection by-products
- Other additives

After Treatment

- Corrosion of piping materials, including lead and asbestos
- Bacteria and dirt from leaking pipes
- Cross connections (incorrect pressure gradients that can suck polluted water into pipes instead of pushing it out)

A Decade of Achievement: Accomplishments Under the Safe Drinking Water Act of 1974

"Dangerous" water According to a study completed in 1970, that's what an estimated 360,000 Americans were drinking. According to the same study, while 59 percent of the U.S. public was drinking "good" water, an alarming 41 percent was drinking "inferior" water. Fifty-six percent of water systems, especially smaller ones, were not constructed or operating properly. Seventy-seven percent of water plant operators lacked sufficient training in microbiology, and 79 percent of water systems had not been inspected by federal officials in over two years.

With the exception of limited regulations governing water supplies serving interstate carriers, the United States had no enforceable national standards for drinking water. Each state set its own standards, and these varied in range and rigor from state to state.

This was the situation in 1972 when the Clean Water Act became law. The United States set 1983 as its goal for ensuring that all surface water would be "fishable and swimmable." In 1974, with passage of the Safe Drinking Water Act, "drinkable" water joined "fishable and swimmable" water on the national agenda. Over the past ten years, the U.S. government has spent approximately $42 billion in pursuit of these goals.

The first regulations under the Safe Drinking Water Act took effect in 1977. Unfortunately, there is no benchmark data from that year, so it is hard to quantify the exact impact the law has had. But it is clear that substantial progress has been made over the past ten years.

The enforcement universe of the Safe Drinking Water Act consists of the 58,000 community water supply systems in the United States that serve 25 or more people, or have 15 or more service connections. Also subject to the Safe Drinking Water Act are approximately 160,000 non-residential water suppliers.

Water from both these sources reaches the drinking glasses of 200 million Americans—83 percent of the U.S. population.

Today 87 percent of these 58,000 water systems in the United States are in compliance with Safe Drinking Water Act maximum contaminant levels (MCLs). MCL standards are laid out in the regulations that EPA has promulgated over the past decade for 26 important drinking water pollutants: two microbiological contaminants, four radionuclides, 10 organic chemicals, and 10 inorganic chemicals.
During the same period, EPA has set sodium monitoring and reporting requirements to deal with the problem of salt in drinking water, as well as monitoring and distribution system composition requirements for corrosion.

Responsibility for enforcing these standards originally resided with EPA. But 95 percent of the states have qualified for what is known as "primacy" in the enforcement of EPA-promulgated maximum contaminant levels. Primacy means responsibility for enforcing standards at least as stringent as those set by EPA. As of August, 1986, only the District of Columbia and the states of Wyoming and Indiana do not yet have Safe Drinking Water Act primacy.

Recent data show that the states are rising to the challenge of their enforcement responsibilities. In fiscal year 1985, 72 percent of all public water systems met EPA's monitoring and reporting requirements. Approximately 89 percent of all public water systems met all national microbiological MCL standards, while nearly 95 percent were in full compliance with turbidity MCLs.

Fewer than three percent of water systems were found to be "persistent violators" of turbidity and microbiological MCL requirements. A persistent violator is one who has been out of compliance with federal standards for four months or longer during the year.

EPA does more than simply promulgate drinking water standards for states to enforce. The Agency also tries to help the states become more effective in exercising primacy. EPA has awarded grants to many states for the purpose of improving their testing and analytical capabilities. In addition, the Agency has expanded programs to train and certify water system operators.

EPA has also sponsored research into many different aspects of drinking water pollution, including important research on organic chemicals and radionuclides. One of the most significant EPA-funded research initiatives uncovered the problem of trihalomethane (THM) contamination. Further EPA action helped to bring this potentially dangerous group of chlorination by-products under control. THMs are now being monitored and regulated by approximately 93 percent of U.S. surface water systems.

EPA is also responsible for ensuring that its own officials and those of states with "primacy" notify the public in the event that contaminant levels exceed

George Beach, Inc.

A water treatment operator opens a drain valve for a settling basin. EPA has expanded programs to train and certify water system operators.

federal water quality standards. These notices of violation must explain the health significance of the violation in non-technical terms. This important requirement is a keystone of EPA's efforts to assure compliance with the national drinking water regulations and to protect public health. It also fosters awareness of the importance of safe drinking water and encourages the public to assist in solving water quality problems. □

Other Laws Protecting Drinking Water Supplies

• The **Clean Water Act** sets water quality standards for all significant bodies of surface water, requires sewage treatment, and limits the amount of industrial effluents that can be discharged into the nation's surface waters.

• Under the **Resource Conservation and Recovery Act (RCRA)**, EPA has developed "cradle to grave" regulations governing the generation, storage, transport, treatment, and disposal of hazardous wastes. RCRA gives EPA the power to protect all sources of ground water from contamination by hazardous waste. This law also prohibits pollution of surface water and air by hazardous waste sites.

• The **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, better known as "Superfund," is used to clean up existing hazardous waste sites that pose a threat to water or other resources.

• The **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** and the **Toxic Substances Control Act (TSCA)** give EPA the power to regulate pesticides and toxic substances that may have an adverse effect on the environment, including ground water and other sources of drinking water.

Drinking Water Milestones

We have come a long way since the days when water-borne diseases such as cholera and typhoid were deadly killers. To appreciate what vast progress has been made toward safer drinking water, it helps to take a backward glance:

2000 BC: Sanskrit manuscript observes that "It is good to keep water in copper vessels, to expose it to sunlight, and filter it through charcoal."

Circa 400 BC: Hippocrates emphasizes the importance of water quality to health and recommends the boiling and straining of rainwater.

1832 AD: The first municipal water filtration works open in Paisley, Scotland.

1849: Dr. John Snow discovers that the victims of a cholera outbreak in London have all used water from the same contaminated well in Broad Street.

1877-1882: Louis Pasteur develops the theory that disease is spread by germs.

1882: Filtration of London drinking water begins.

1890s: The Lawrence Experiment Station of the Massachusetts Board of Health discovers that slow sand filtration of water reduces the death rate from typhoid by 79 percent.

Late 1890s: The Louisville Water Company innovates by combining coagulation with rapid sand filtration. This treatment technique eliminates turbidity and removes 99 percent of bacteria from water.

1908: Chlorination is introduced at U.S. water treatment plants. This inexpensive treatment method produces water 10 times purer than filtered water.

1912: Congress passes the Public Health Service Act, which authorizes surveys and studies of water pollution, particularly as it affects human health.

1914: The first standards under the Public Health Service Act are promulgated. These introduce the concept of maximum permissible safe limits for drinking water contaminants. The standards, however, apply only to water supplies serving interstate means of transportation.

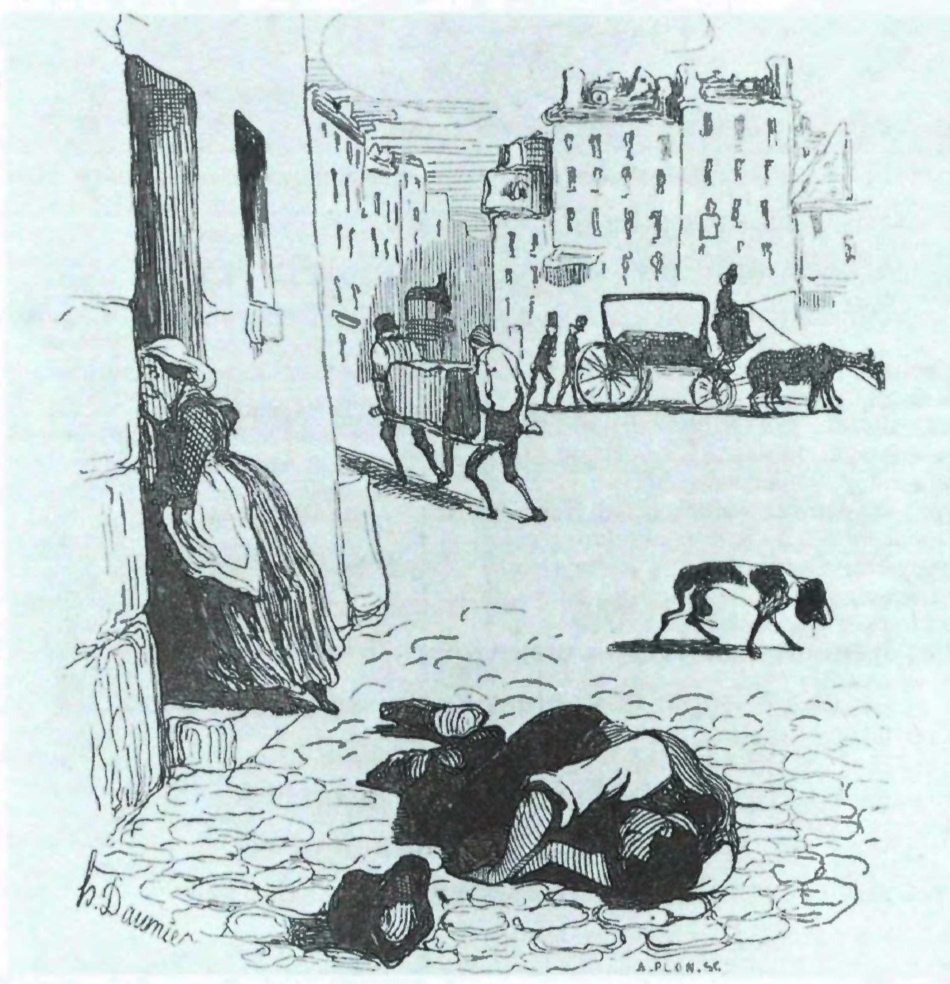
1948: Congress approves a Water Pollution Control Act. Its provisions, too, are restricted to water supplies serving interstate carriers.

1972: The Clean Water Act, a major amendment to the Federal Water Pollution Act, contains comprehensive provisions for restoring and maintaining all bodies of surface water in the U.S.

1974: The Safe Drinking Water Act is passed, greatly expanding the scope of federal responsibility for the safety of drinking water. Earlier Acts had confined federal authority to water supplies serving interstate carriers. The 1974 act extends U.S. standards to all community water systems with 15 or more outlets, or 25 or more customers.

1977: The Safe Drinking Water Act is amended to extend authorization for technical assistance, information, training, and grants to the states.

1986: The Safe Drinking Water Act is further amended. Amendments set mandatory deadlines for the regulation of key contaminants; require monitoring of unregulated contaminants; establish benchmarks for treatment technologies; bolster enforcement powers; and provide major new authorities to promote protection of ground-water resources.



National Library of Medicine

In this 19th century woodcut, a cholera victim lies unattended in the street. In the background, men carry the casket of another victim to burial. A few years after this woodcut was done, a British scientist established a link between cholera and contaminated water.

What Happens to Your Water Before It Comes Out of the Faucet?

1 EPA and the states work to protect the quality of ground and surface water needed to keep the United States supplied with safe drinking water.

2 Water is moved from surface and ground-water sources to storage areas. Sometimes copper sulfate is added to control algae growth.

3 Water is strained to remove debris.

4 Chemicals such as chlorine, lime, and alum are added to coagulate particles, disinfect, and sometimes to soften the water.

5 Water is allowed to sit in sedimentation basins while solid particles sink to the bottom.

6 Water then flows through beds of gravel and sand for final filtering.

7 Chlorine or other disinfectants are added as a final treatment to kill bacteria.

8 Water is then tested for purity to ensure that it does not contain any quantities of pollutants in excess of EPA's Maximum Contaminant Levels.

9 Treated water goes to reservoirs or holding tanks. In some cases, it goes directly into the water system.

10 Drinking water comes gushing out of the faucet in your kitchen or bathroom.

Who Keeps Your Drinking Water Safe?

Local Water Systems:

- Site wells and intakes (pipes that suck water into drinking water systems)
- Treat water to meet standards
- Sample water and maintain test records
- Notify the public if problems arise

Local Pollution Control Agencies:

- Protect surface water
- Protect ground water from contamination by controlling contaminating sources
- Monitor ground water and detect contaminants

State Drinking Water Programs:

- 95 percent of the states have primary enforcement responsibility, obtained by establishing state drinking water standards at least as stringent as the national standards
- Train staff of local water systems
- Inspect systems and maintain records
- Take enforcement action against systems that violate monitoring and reporting regulations or drinking water standards
- Regulate underground injection wells if primacy in that sphere has been granted by EPA

State Ground-Water Protection Agencies:

- Develop comprehensive ground-water protection strategies
- Develop programs and laws to control contaminating sources and activities
- Conduct statewide monitoring of ground water

EPA Drinking Water Program:

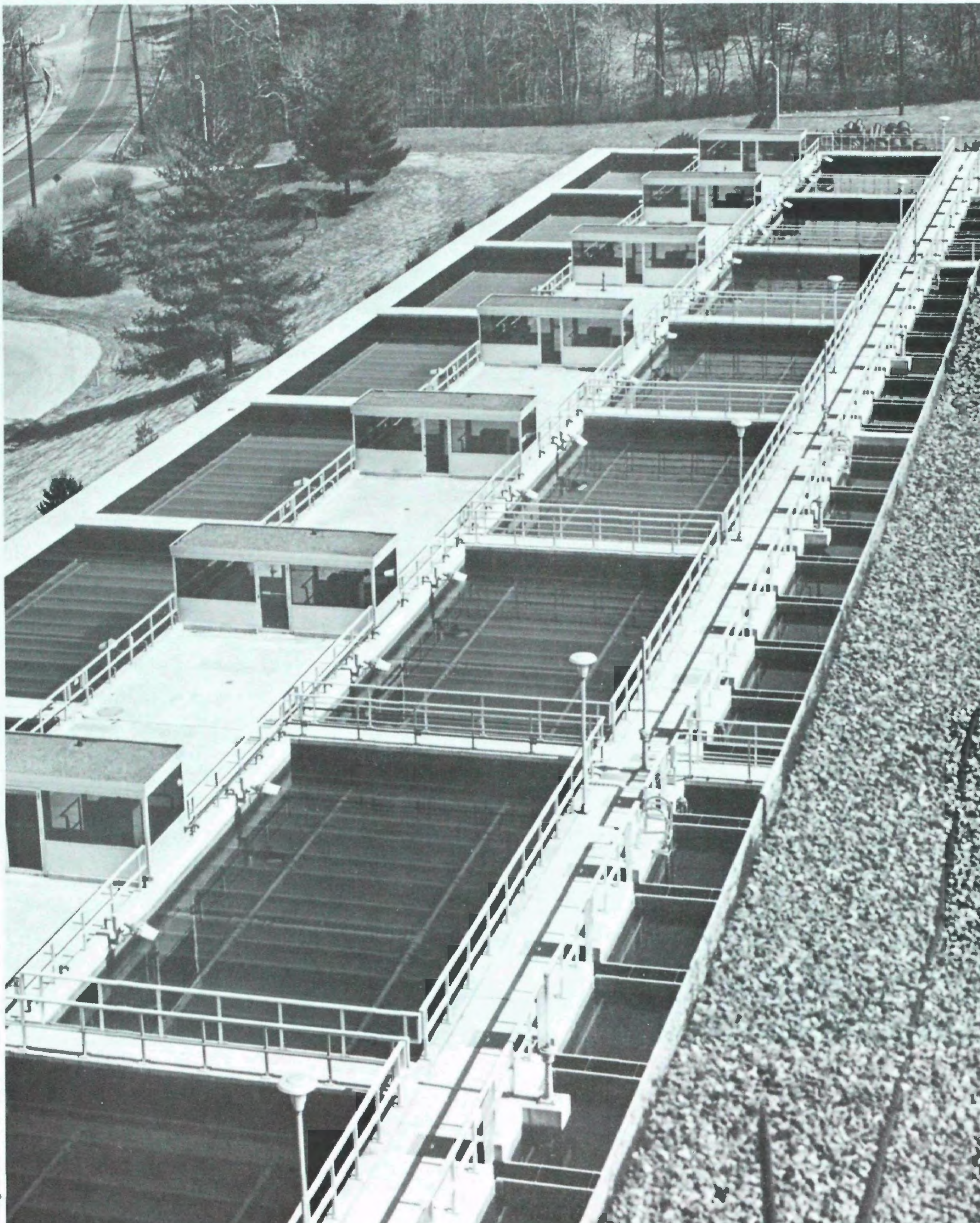
- Retains primary enforcement responsibility in three areas that have not attained "primacy": Wyoming, Indiana, and the District of Columbia.
- Sets primary and secondary drinking water standards
- Establishes monitoring and reporting requirements
- Provides funds and technical assistance to the states, including Health Advisories on unregulated contaminants; steps in to help during emergencies
- Sets rules for operation of underground injection wells
- Conducts research

EPA Ground-Water Protection Program:

- Manages EPA Ground-Water Protection Strategy
- Assists states in developing comprehensive programs
- Focuses EPA programs on ground water
- Administers wellhead protection and sole-source aquifer protection programs

You, the Citizen:

- Have the right to know who is supplying your water, where it comes from, how it is treated, how it is tested, and what its quality level actually is
- When necessary, lend political and financial support to efforts to improve the quality of drinking water
- Should follow results of drinking water tests in your area; attend public hearings; and keep track of other developments relating to the quality of your drinking water
- Should exercise your right to bring civil suits when your local water system, your state, or your federal officials fail to do their job
- Should be aware of potential sources of ground and surface contamination; also, support efforts aimed at protecting these vital resources


Washington Suburban Sanitary Commission

View of a water filtration plant in Maryland.

What Lies Ahead: Our Nation's Agenda Under the Safe Drinking Water Act of 1986

Let's do more to protect the quality of our drinking water, and let's do it faster: that's the message of the new amendments to the Safe Drinking Water Act. Signed into law in June 1986, these amendments change and strengthen the Safe Drinking Water Act in many important ways.

Protecting Drinking Water Quality

Accelerated regulation of contaminants is probably the single most important provision of the new law. During the first 12 years of the Safe Drinking Water Act, EPA developed final Maximum Contaminant Levels (MCLs) for 26 contaminants. Under the new amendments, the Agency must speed up its regulatory efforts. EPA has until 1989 to issue MCLs for 83 contaminants, and until 1991 to issue MCLs for 25 more.

It should be emphasized that the target of 83 includes the 26 contaminants already subject to enforceable Maxmimum Contaminant Levels. For 43 of these, EPA has already proposed Recommended Maximum Contaminant Levels (Health Goals). The Agency has also proposed MCLs for eight volatile organic chemicals.

Having more contaminants to regulate will put a premium on effective enforcement. Under the new amendments to the Safe Drinking Water Act, EPA will be better able to take enforcement action against violators. Stiffer penalties against violators will give greater weight to these enforcement actions when they occur. The net effect of these and other provisions of the new amendments should be safer drinking water for all Americans.

But even with this head start, EPA will need a major increase in funding to meet its heavy new workload. In fiscal year 1986, $63.59 million was appropriated to implement the Safe Drinking Water Act. For fiscal year 1987, the Reagan Administration will make a much higher authorization request: approximately $170 million.

Increased funding will go farther with a slightly streamlined process for promulgating Maximum Contaminant Levels. The amended Safe Drinking Water Act enables EPA to eliminate one stage in the process required by the old law. Under the old law, EPA issued Recommended Maximum Contaminant Levels (RMCLs) prior to promulgating final MCLs. From now on, EPA will propose Maximum Contaminant Level Goals (MCLGs)—the new term for the old RMCLs—at the same time MCLs are set. This will make it somewhat easier for EPA to issue regulations, from a procedural standpoint. But all of the same technical assessments will still need to be done—with less time to do them.

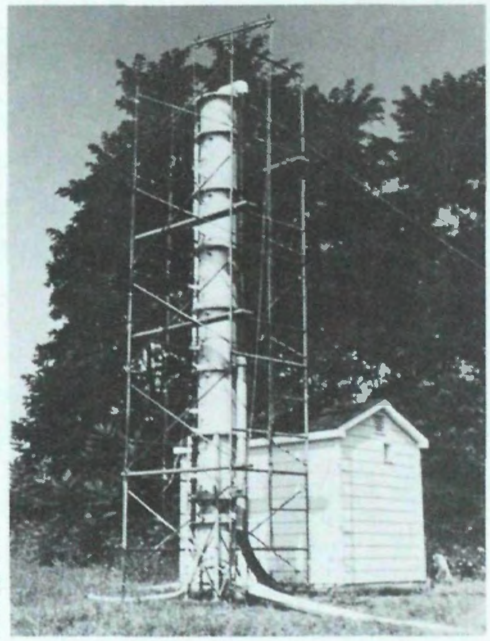
Moreover, enforcing all these new MCLs—plus the old ones—will be both difficult and expensive. In most cases (95 percent), the states have primary responsibility for enforcement. Many states will find their resources strained once the number of regulated drinking water contaminants more than triples.

Local water systems will have to scramble to monitor and control all of these newly regulated contaminants. Simply finding laboratory facilities adequate to handle increasingly sophisticated and numerous procedures will be difficult. Drinking water systems will also face another burden: mandatory monitoring of unregulated contaminants at least once every five years.

The added cost of all this extra work will, most likely, be passed along to American consumers, who currently enjoy much cheaper water than their neighbors in Europe and eastern Asia.

Under the revised Safe Drinking Water Act, it will be easier for EPA to ensure that the states take enforcement action swiftly and effectively. The new law gives the Agency added authority to take action against public water systems found to be in violation of SDWA standards. EPA can also impose heavier fines on violators.

Effective enforcement is vital to the success of the amended Safe Drinking



Mike Cummins

In Washington, NJ, a pilot decontamination system removes trichloroethylene from a drinking water supply well in an adjacent shed. The system, known as a packed column air stripping process, mixes volatile organic compound (VOC)-contaminated water with uncontaminated air, transfers the VOCs from the water to the air, then disperses the VOCs to the atmosphere. The Office of Drinking Water has tested the ability of the mobile pilot system to remove trichloroethylene and vinyl chloride from water, and next year will evaluate its ability to remove radon from water.

On Osage Indian lands in Pawhuska, OK, geological technician Andrew Yates records information from pressure test of injection well. Recent amendments to the Safe Drinking Water Act state that EPA may now deal with Indian tribes as sovereign entities in drinking water and ground-water matters

Water Act. At present, small water systems pose the greatest challenge. Lack of resources and expertise often impede small systems in their efforts to meet federally mandated drinking water standards. To alleviate such problems, EPA will provide technical assistance to such systems over the next three years.

Even large systems will have trouble meeting some of the requirements of the revised Safe Drinking Water Act. For example, one amendment mandates that granular activated carbon filtration—a highly regarded but also expensive technology—should be considered to be the best available technology for controlling synthetic organic chemicals.

Two other technological provisions of the amended law will also force water systems, both large and small, to invest in new equipment. One of these—designed as a safeguard against *Giardia* and other forms of contamination—requires filtration of surface supplies of drinking water that are not otherwise adequately protected against contamination. The other mandates the disinfection of all drinking water supplies: a practice long under way in large communities but not in many small ones.

Several other key provisions of the amended Safe Drinking Water Act include:

- An immediate ban on all future use of lead pipe and lead solder. Lead contamination of drinking water has been a source of growing concern in the United States. It is hoped that a ban on future use of lead pipe and lead solder will help to reduce the risk of lead poisoning in the years ahead.

- A requirement for EPA to evaluate methods of monitoring Class I (industrial and municipal disposal) underground injection wells. Rules for the monitoring of these deep man-made wells already exist, but Congress has asked EPA to investigate the best methods of performing required monitoring.

- The stipulation that EPA may now deal with Indian reservations as sovereign entities in all matters pertaining to drinking water and ground water. In the past, EPA has safeguarded the quality of drinking water on Indian reservations. Now, if Indian tribes can meet the same criteria as states that have attained "primacy," they too can exercise primary authority in this sphere. If primacy is granted, EPA will provide grant money to qualified tribes. The Agency will also distribute development grants to tribes seeking to attain primacy.

In a major initiative unrelated to passage of the 1986 Safe Drinking Water Act amendments, EPA is also considering whether to undertake the regulation of the 20,000 non-community water systems supplied with water from private sources. These systems provide the drinking water for public places, such as schools, offices, and factories. Such facilities are already subject to Safe Drinking Water Act standards in areas where drinking water is drawn from public water supplies.

Protecting Ground-Water Quality

Ground water, which supplies half of U.S. drinking water, will get its own special protection under the new Safe Drinking Water Act. Our dependence on this source of water is growing greater by the day. Two provisions of the new Safe Drinking Water Act are specifically designed to protect ground water:

- States are to develop programs for preventing contamination of surface and subsurface areas around public water wells.

  EPA will cover from 50 to 90 percent of the cost of these "wellhead protection" programs, including determining the area to be protected, inventorying sources of contamination, and designing protection programs.

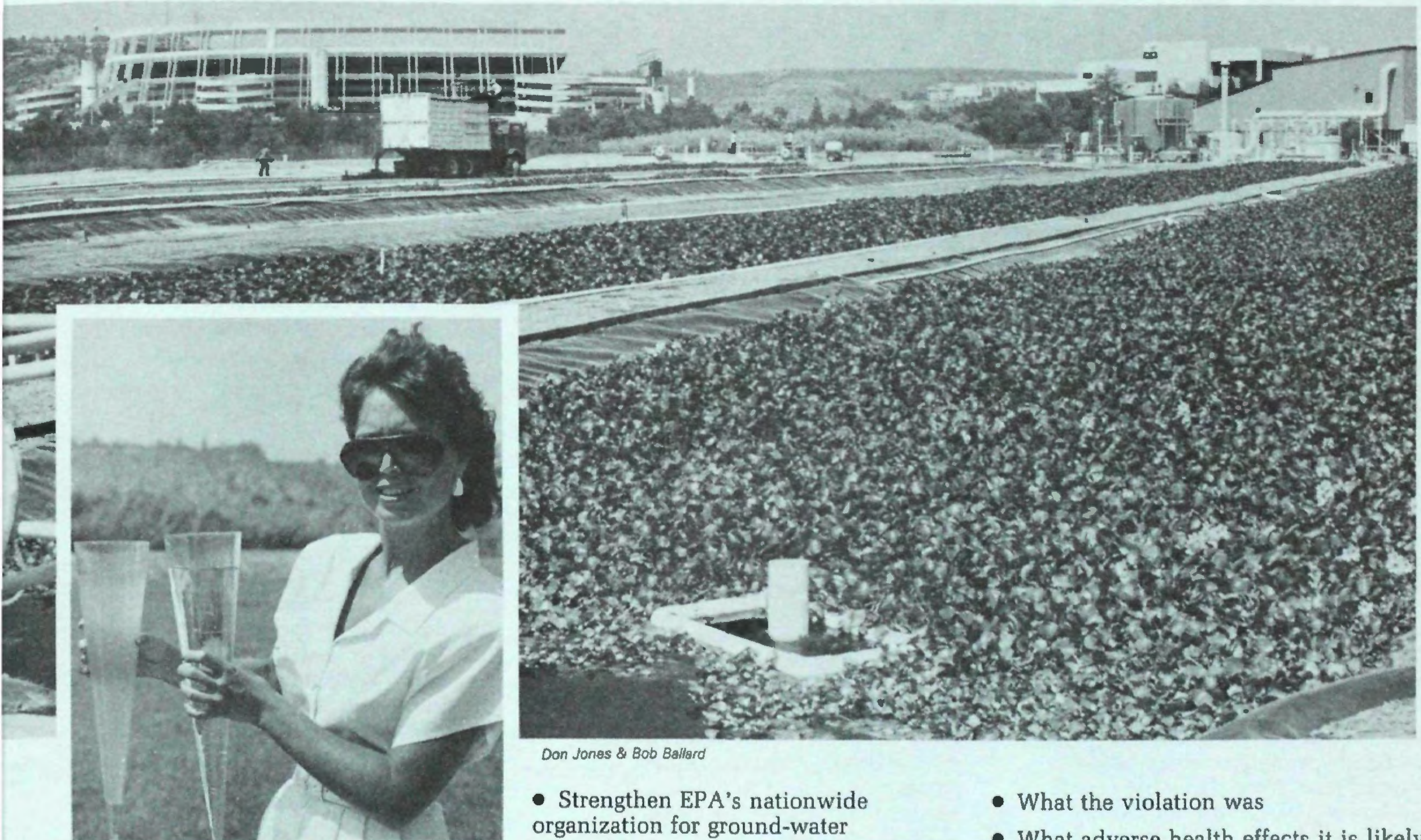
- EPA will administer a grant program to demonstrate innovative methods of protecting the critical aquifer areas of designated sole-source aquifers. These are areas in which ground water is the sole or principal source of drinking water for a large population and the ground water is particularly vulnerable to contamination. Support will go to states or local agencies for this effort, which will highlight both technical and institutional means of protecting sole-source aquifers.

EPA will implement the new ground-water provisions of the SDWA as part of its Ground-Water Protection Strategy. This strategy, developed in 1984, calls for better coordination of all federal and state efforts aimed at the protection of ground water. Specific goals of the strategy are to:

- Build and enhance state ground-water protection strategies and programs.

- Expand controls over currently uncontrolled sources of contamination.

- Achieve greater consistency in ground-water protection and cleanup.



Don Jones & Bob Ballard

Drinking water of the future? At San Diego's Aquaculture Plant, water hyacinths pull nutrients from sewage which flows through ponds hundreds of feet long (foreground). In closeup, Yvonne Rehg of the San Diego Water Utilities Department holds two dramatically different water samples. The cloudy water in the cone on the left contains untreated sewage. The other cone contains water from which 90 percent of the pollutants have been removed by water hyacinths. Department employees hope that further treatment will render this water safe to drink.

- Strengthen EPA's nationwide organization for ground-water protection.

EPA is developing classification guidelines for use in defining different types of ground water. These will enable the Agency to tailor its protection efforts to the usage patterns of aquifers, and their vulnerability to contamination. EPA also has a grant program to support state ground-water protection efforts.

You, the American Citizen

What about you, the average U.S. citizen and consumer of drinking water? Some of the revisions in the 1986 Safe Drinking Water Act will improve your access to key information about the quality of your drinking water supply.

EPA and state authorities now have the flexibility to devote the lion's share of their attention to keeping the public informed of truly serious health risks and truly persistent violators. Previously, time and resources were wasted on routine notification of minor violations.

Notification of Maximum Contaminant Level violations posing a serious health risk must now occur within 14 days of their detection. Such notification must explain to the public:

- What the violation was
- What adverse health effects it is likely to have.
- Steps that are being taken to correct the violation.
- The need for alternate water supplies.

When violations are continuous, such notification must also continue every three months. For less serious violations, only annual notification is now required.

Congress has presented EPA and the nation with a major challenge. Making a reality of the stricter provisions of the 1986 Safe Drinking Water Act will require redoubled efforts by all those involved in protecting your drinking water: local, state, and federal officials, scientists, engineers, and water plant operators.

But once these provisions are a reality, we will all reap the benefits and reassurance of even safer drinker water than we already enjoy. And no one can exaggerate the importance of safe drinking water to the health and prosperity of the United States. ◻

Regulated Contaminants and Their Health Effects

Drinking water regulations fall into two basic categories: primary and secondary.

Primary regulations determine how clean drinking water must be to protect public health.

Enforceable primary regulations are known as Maximum Contaminant Levels (MCLs). These must be set as close to generally more stringent Recommended Maximum Contaminant Levels (RMCLs) as is "feasible." Feasible means consistent "with the use of the best technology, treatment techniques and other means, which the Administrator (of EPA) finds . . . are available (taking cost into consideration)."

To retain "primacy," states must adopt laws that are at least as strict as EPA's primary drinking water regulations. They also must meet certain reporting and monitoring requirements.

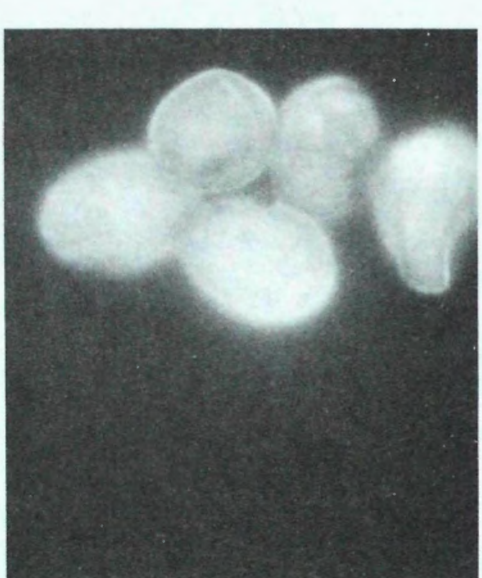
In addition to interim Maximum Contaminant Levels, most of the contaminants listed below have a proposed Recommended Maximum Contaminant Level (RMCL). One of them, fluoride, has a final RMCL.

What is an RMCL? An RMCL is an ideal health goal, which is not enforceable. As a result of the 1986 amendments to the Safe Drinking Water Act, they will be known henceforward as Maximum Contaminant Level Goals (MCLGs). Here we will refer to them by their old name: RMCLs.

RMCLs have been proposed at levels that, in the opinion of EPA, present no known or anticipated health effect with a margin of safety. They set goals for contamination compatible with virtually zero risk of cancer and and other major illness. The purpose of Recommended MCLs—like that of the new MCL Goals—is to serve as targets for the revision of interim MCLs, the enforceable drinking water standards. "Health Goals," whether RMCLs or MCLGs, are set without regard to technical feasibility or cost.

Secondary drinking water regulations are not health-related. They are intended to protect "public welfare" by offering unenforceable guidelines on the taste, odor, or color of drinking water, as well as certain other non-aesthetic effects. Water systems are not required to comply with secondary standards. EPA recommends them to the states as reasonable goals for the aesthetics of drinking water.

EPA also issues guidance documents called Health Advisories, which assist the states in the implementation of their drinking water programs by identifying potentially hazardous contaminants and their health effects, along with available analytical measurement techniques and technologies for controlling the contaminants.



Dr. Judith F. Sauch, EPA/HERL, Cincinnati

Giardia lamblia cysts taken from a human donor but similar to those found in contaminated water.

Primary Regulations

Over the past 10 years, EPA has set interim Maximum Contaminant Levels for 26 drinking water contaminants. These MCLs are called "interim," because the 1974 Safe Drinking Water Act stipulated that EPA was to issue its MCLs on an interim basis and then periodically to revise them. Thus far, only the MCL for fluoride has been issued in final revised form.

Listed below, with their health effects, are the 25 drinking water contaminants with interim Maximum Contaminant Levels, plus the twenty-sixth regulated contaminant, fluoride, which is the only one thus far that has a final revised Maximum Contaminant Level. The contaminants are divided by category.

Also listed here are two other drinking water regulations promulgated by EPA since 1974: one governing the monitoring and reporting of sodium; the other establishing rules for monitoring distribution systems to see if they are corroded or have other problems.

Under the heading "Proposed Regulations," you will find a complete list of Maximum Contaminant Levels and Recommended Maximum Contaminant Levels that were proposed by EPA prior to the passage of the 1986 Safe Drinking Water Act amendments.

Existing Standards

MICROBIOLOGICAL CONTAMINANTS

Microbiological organisms were the first drinking water contaminants to arouse concern. The first federal standards to control these "microbials" date back to 1914. Cholera has been under control in this country since the 1870s, and typhoid since about 1910. Two types of microbial-related contaminants are now subject to regulation under the Safe Drinking Water Act.

Interim Maximum Contaminant Levels in Force:	Principal Health Effects:
Total Coliforms (Coliform bacteria, fecal coliform, streptococcal, and other bacteria)	Although not necessarily in themselves disease-producing organisms, coliforms can be indicators of organisms that cause assorted gastro-enteric infections, dysentery, hepatitis, typhoid fever, cholera, and other diseases of surface water; also interferes with the disinfection process

INORGANIC CHEMICALS

Most inorganic chemicals, such as arsenic and fluoride, are present naturally in water from geological sources. Others, such as lead, enter the water as the result of human intervention.

Interim MCLs In Force For:	Principal Health Effects:
Arsenic	Dermal and nervous system toxicity effects
Barium	Circulatory system effects
Cadmium	Kidney effects
Chromium	Liver/kidney effects
Lead	Central and peripheral nervous system damage; kidney effects; highly toxic to infants and pregnant women
Mercury	Central nervous system disorders; kidney effects
Nitrate and Nitrite	Methemoglobinemia ("Blue-Baby Syndrome")
Selenium	Gastro-intestinal effects
Silver	Skin discoloration (Argyria)

Final Revised MCL In Force For:	Principal Health Effects:
Fluoride	Skeletal damage

ORGANIC CHEMICALS

The organic chemicals listed here—except trihalomethanes, a chlorination by-product—fall into two main categories: synthetic organic chemicals (SOCs) and volatile synthetic organic chemicals (VOCs). In scientific terms, "volatile" means capable of being readily vaporized, evaporating readily at normal temperatures.

Synthetic Organic Chemicals

SOCs are synthetic organic compounds used in the manufacture of a wide variety of agricultural and industrial products. The best-known SOCs are pesticides and herbicides.

Interim MCLs In Force For:	Principal Health Effects:
Endrin	Nervous system/kidney effects
Lindane	Nervous system/liver effects
Methoxychlor	Nervous system/kidney effects
2,4-D	Liver/kidney Effects
2,4,5-TP Silvex	Liver/kidney effects
Toxaphene	Cancer risk

Volatile Organic Chemicals

VOCs are a broad class of synthetic chemicals used commercially as degreasing agents, paint thinners, varnishes, glues, dyes, and pesticides. They are most commonly used in urban industrial areas, where they can contaminate ground water if improperly disposed.

No interim MCLs are yet in force for VOCs, but RMCLS (now known as MCL Goals) have been promulgated, and MCLs have been proposed.

Other Organics (Disinfection By-Products):

Interim MCLs In Force For:	Principal Health Effects
4 Types of Trihalomethanes	Cancer risk

RADIONUCLIDES

Radionuclides are radioactive compounds sometimes found in drinking water. Radionuclides get into drinking water drawn from ground-water wells. On occasion, these wells can become contaminated by uranium and radon deposits that occur naturally in the soil of various regions. In a few cases, man-made radionuclides—from radioactive waste—can be the source of contamination. Like other drinking water contaminants, radionuclides pose a threat to human health when ingested.

Interim MCLs In Force For:	Principal Health Effects:
Gross alpha particle activity	Cancer
Beta particle and photon radioactivity from man-made radionuclides	Cancer
Radium-226	Bone cancer
Radium-228	Bone cancer

MISCELLANEOUS

Monitoring Regulations In Force For:	Health Effects:
Sodium monitoring and reporting	Hypertension
Monitoring of distribution systems for corrosion and other problems	Lead poisoning and other problems

SECONDARY

Non-enforceable secondary standards exist for the following:

Contaminant:	Effects:
pH	Water should not be too acidic or too basic; must fall between 6.5 and 8.5 on the pH scale
Chloride	Taste; corrosion of pipes
Copper	Taste; staining of porcelain
Foaming agents	Aesthetic
Sulfate	Taste and laxative effects
Total dissolved solids (Hardness)	Taste; possible relation between low hardness and cardiovascular disease; Also an indicator of corrosivity (Lead problems); can damage plumbing and limit effectiveness of soaps and detergents
Zinc	Taste
Fluoride	Dental fluorosis (A brownish discoloration of the teeth)
Color	Aesthetic; consumers turn to alternative supplies
Corrosivity	Aesthetic; also health related
Iron	Taste
Manganese	Taste
Odor	Aesthetic

Proposed Standards

EPA already has a head start on many of the regulatory tasks mandated in the 1986 amendments to the Safe Drinking Water Act.

Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs, formerly known as Recommended Maximum Contaminant Levels—or RMCLs) have been proposed for a whole range of drinking water contaminants.

MCLGs, like RMCLs before them, are to be set at a level at which, in the judgment of the EPA Administrator, "no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety." MCLGs and RMCLs are known as "Health Goals" both because they are unenforceable and because they do not take feasibility factors, such as cost and available technology, into account.

MICROBIOLOGICAL CONTAMINANTS

RMCLs Proposed:	Principal Health Effects:
Giardia lamblia	Gastro-enteric disease (Giardiasis; sometimes known as "Backpacker's Disease")
Viruses	Gastro-enteric and other disease

INORGANIC CHEMICALS

RMCLs Proposed:	Principal Health Effects:
Arsenic	Dermal and nervous system toxicity effects
Asbestos	Possible cancer
Barium	Circulatory system effects
Cadmium	Kidney effects
Chromium	Liver and kidney disorders
Copper	Gastro-intestinal disturbances
Lead	Central and peripheral nervous system damage; kidney effects; highly toxic to infants and pregnant women
Nitrate	Methemoglobinemia ("Blue Baby Syndrome")
Nitrite	Methemoglobinemia ("Blue Baby Syndrome")
Selenium	Selenosis (Liver damage from very high doses; other effects from lower doses)

ORGANIC CHEMICALS

Volatile Organic Chemicals

MCLs Proposed For:	Principal Health Effects:
Benzene	Cancer
Carbon tetrachloride	Possible cancer
p-Dichlorobenzene	Possible cancer
1,2-Dichloroethane	Possible cancer
1,1-Dichloroethylene	Liver/Kidney effects
1,1,1-Trichloroethane	Nervous system effects
Trichloroethylene	Possible cancer
Vinyl chloride	Cancer

RMCLs Proposed:	Principal Health Effects
Chlorobenzene	Nervous system/liver effects
Trans-1,2-dichloroethylene	Liver/kidney effects
Cis-1,2-dichloroethylene	Liver/kidney effects

Final RMCLs In Place For:	Principal Health Effects:
Benzene	Cancer
Carbon Tetrachloride	Possible cancer
1,1-Dichloroethylene	Liver/kidney effects
1,2-Dichloroethane	Possible cancer
Trichloroethylene	Possible cancer
1,1,1-Trichloroethane	Nervous system effects
Vinyl chloride	Cancer

Synthetic Organic Chemicals

RMCLs Proposed For:	Principal Health Effects:
Acrylamide	Possible cancer
Alachlor	Possible cancer
Aldicarb, aldicarb sulfoxide, and aldicarb sulfone	Nervous system effects
Chlordane	Possible cancer
Carbofuran	Nervous system effects
Dibromochloropropane (DBCP)	Possible cancer
1,2-Dichloropropane	Liver/kidney Effects
Epichlorohydrin	Possible cancer
Ethyl benzene	Liver/kidney effects
Heptachlor	Possible cancer
Heptachlorepoxide	Possible cancer
Pentachlorophenol	Liver/kidney effects
Polychlorinated biphenyls (PCBs)	Possible cancer
Styrene	Liver effects
Toluene	Nervous system/liver effects
Xylene	Nervous system effects

RADIONUCLIDES

EPA is now considering proposal of a Maximum Contaminant Level for the most significant of all the radionuclides linked to the contamination of drinking water: radon.

This colorless, odorless, tasteless gas occurs naturally in several types of rock and soil found in certain parts of the U.S. These can contaminate adjacent ground water with radon. Wells pump this radon-laden water into homes. When it is heated or agitated by showers or washing machines, this dissolved gas can be released into the air.

This presents a health problem, especially in air-tight dwellings, because the inhalation of radon gas may greatly increase the risk of lung cancer. Thus, radon is a drinking water contaminant that is dangerous not when drunk, but when breathed. And preliminary health data suggest that it may be one of the most harmful to human health.

A Maximum Contaminant Level for uranium is also under consideration.

Also on EPA's agenda is revision of its existing interim MCLs for other radionuclides, including radium-226 and radium-228.

All of EPA's interim MCLs for other categories of contaminants will be subjected to a similar process of review and updating.

A Strategy to Reduce Pollution from Ozone

by Lee M. Thomas

Ozone levels continue to be a serious problem in many parts of our country where efforts to reach safe levels are far from our goals. Many major urban areas such as California, the Northeast, the Texas Gulf Coast, and the Chicago area have made progress over the last several years in reducing oxone concentrations, but still exceed the Clean Air Act standard of 0.12 parts per million of air designed to protect human health.

The most recent air quality data indicate that more than 30 percent of the American population live in areas where they are potentially exposed to peak ozone concentrations above the level of the standard.

EPA Administrator Lee M. Thomas made a speech on the subject at the Air Pollution Control Association convention in Minneapolis, MN, on June 23. Excerpts from his remarks follow:

A number of areas across the country still have not met the ozone standard. Some should make it by the deadline. Others will not make it no matter how hard they try. The Clean Air Act provides us with little guidance on how to address chronic nonattainment problems after the December 31, 1987 deadline. In short, ozone presents us with two monumental challenges: how do we protect the public health, and how do we effectively administer the Clean Air Act beginning in 1988?

We have regulated almost all the major sources of hydrocarbons, and we've spent a lot of money doing it. Our efforts clearly have improved air quality, especially in those areas with the highest ozone concentrations. The number of ozone nonattainment areas has declined by about 15 percent since 1980. On a national basis, ozone air quality has improved about 10 percent. The health risks for millions of Americans have been reduced significantly.

This progress did not come easily or cheaply. Sources in the automobile and petroleum industries, sources that apply surface coatings to cans and metal furniture, and sources involved in graphic arts—to name a few—have had to spend millions of dollars so we could improve air quality.

Yet today more than one-third of the American people live in ozone nonattainment areas. If those areas are to reach attainment, and if current attainment areas are going to stay that way in the face of economic growth, then we will have to search for additional emissions reductions from smaller sources that play an even bigger role in our everyday lives. The cost is bound to go up, since the cheapest, most obvious targets have already been regulated. Cities not in attainment are going to have to work that much harder, cut that much deeper, if they hope to reduce ozone concentrations to the extent required by law. We also know much more today about ozone's health effects than we knew in 1980. Everything we've learned gives us more impetus to control.

Today more than one-third of the American people live in ozone nonattainment areas.

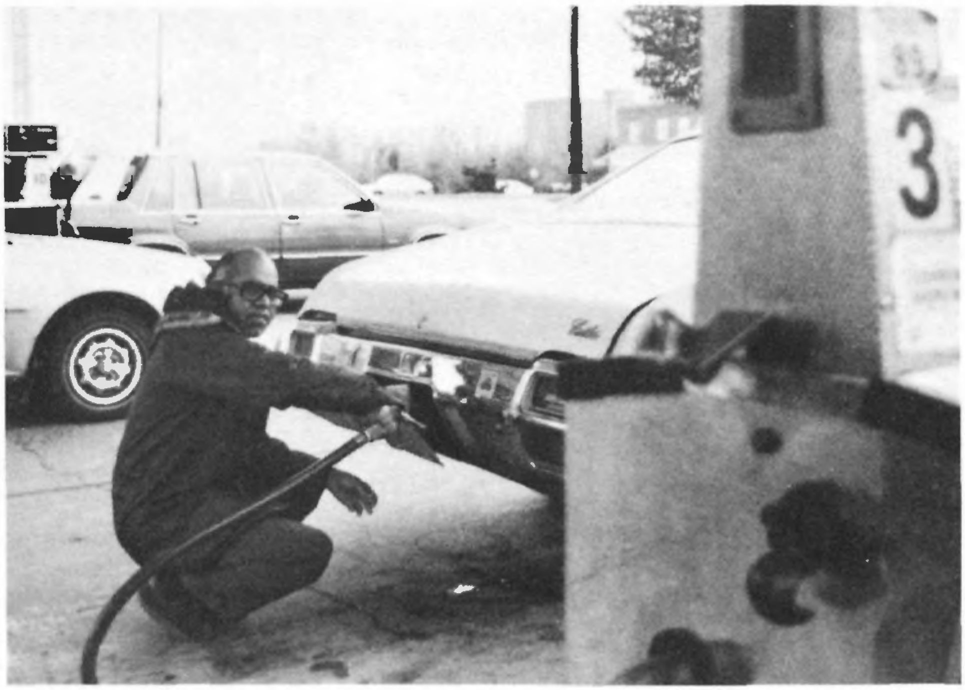
Two months ago the Clean Air Scientific Advisory Committee concluded that the current short-term health standard had little or no margin of safety, and that more lasting health effects might result from long-term exposure. And loosening of the standard now is quite unlikely. Another disturbing consequence of nonattainment is its effect on human welfare. Studies have confirmed that ozone can significantly decrease the yield of important agricultural crops, cause severe damage to some trees in the West, and is potentially playing a role in forest decline in the East.

The need to act is compelling, but the way is not at all clear. EPA prefers to follow a risk-based management approach in designing a control strategy. We balance the benefits of control against the costs. The Clean Air Act does not allow this approach in the case of National Ambient Air Quality Standards. They are set strictly on the basis of health and welfare effects. Deadlines are set, and states and communities are charged with attaining the standards by the deadline. Our regulatory options to address chronic nonattainment after 1987 are somewhat limited.

Given the complexity of this problem and the lack of legislative guidance, EPA could delay implementation of new control strategies and let Congress clarify the situation. Congress certainly has a strong interest in any strategy that shapes the implementation of the Clean Air Act after the 1987 deadline. We are bringing the problem to the attention of Congress, and we want to work closely with the Congressional committees. But EPA can't afford to delay developing a strategy for post-1987 attainment. States and communities need to make decisions now about what to do about their ozone problems. From a health perspective, there is an even more compelling reason to act. If we reduce ozone concentrations incrementally, we will reduce the risk to human health incrementally, even when the standard is not attained.

We can't afford to do everything, and we can't afford to do nothing. So we articulated the goals that we thought our ozone strategy should strive for:

- Be consistent with the spirit of the Clean Air Act.



Highway Users Federation

Gasing up at a self-service pump. Controls on gasoline refueling could help some areas of the country reach safe ozone levels.

- Reduce ozone concentrations to better protect human health.
- Strengthen federal, state, and local ozone control programs.
- Build cooperation among all levels of government, especially since ozone is transported across jurisdictional lines.
- Treat all parties fairly.
- Encourage states to fulfill their obligations to plan and implement controls, but don't be punitive.
- Avoid unnecessary economic disruption.

Although we are still most willing to consider any good idea, I am presently inclined toward four specific actions.

First, we can improve the effectiveness of our existing regulations and programs. Existing regulations have not been implemented or enforcecd consistently across the country. Their effectiveness has been uneven, and their overall impact weakened. We can strengthen what's already on the books by expanding our monitoring networks and tightening compliance procedures. Vigorous enforcement of our standards for new motor vehicles will bring significant decreases in hydrocarbon emissions. Further gains can be achieved through improved Inspection and Maintenance (I/M) enforcement and better tracking of emissions reductions from stationary sources. We can provide state air agencies with training and technical support needed to carry out permitting, source inspections, and enforcement actions.

Second, we are evaluating a number of possible new control measures or policy changes to determine which could be included in our ozone strategy and for which areas. The most likely candidate is control of gasoline refueling through on-board controls (a vapor collection on board the auto) and/or Stage II (vapor control at the gas pump). We are also actively considering controls on gasoline volatility. Other measures to be evaluated include tighter light-duty truck hydrocarbon standards, enhanced I/M programs, and the control of stationary source categories like architectural coatings, auto body refinishing, wood burning refinishing, and metal rolling. We'll also look at procedural charges in Reasonably Available Control Technolgy (RACT) determinations, new source review, and other air quality management policies.

Third, we could require states to demonstrate attainment within some specified time frame, say three years. For the worst areas, EPA could begin by making State Implementation Plan (SIP) calls in the spring of 1987. Additional nonattainment areas would receive calls based on an analysis of their 1987 or 1988 ozone data. Within one year of receiving SIP calls, states would be required to develop plans that attempt to demonstrate how they would achieve attainment within the three-year time frame.

Once a coherent strategy is implemented, we expect most of the current nonattainment areas will come into attainment over time, but not by the 1987 deadline. About 25 areas won't reach attainment in the foreseeable future, even with these additional control measures.

The fourth action we are considering—the Sustained Progress Program—is targeted for those states to ensure continued, measurable progress in those areas with the worst ozone problems. Under this program, states would periodically assess the effectiveness of existing regulations and consider additional measures. EPA would propose such measures based on a periodic review of controls throughout the country and advances in state-of-the-art technology. We are not sure how to balance Sustained Progress Program responsibilities among EPA and state and local officials. EPA must retain the ultimate responsibility to ensure adequate progress. This function cannot be delegated under the Clean Air Act. We want to allow state and local officials the flexibility to tailor the program to their specific situations. Under our future ozone strategy, there is a major role for sanctions. EPA is prepared to impose sanctions if a state does not submit a required ozone control plan, or if a state fails to implement part of its plan. However, I do not envision imposing sanctions in every area that does not attain the standard by the end of 1987 simply because of failure to attain.

Our actions to control ozone are still in the formative stages. We are trying to define the best possible way to approach an extremely difficult problem. My remarks are meant to initiate extensive discussions on the whole range of options before us and, in particular, on the four specific actions I just described. We face the question of how to carry the spirit and successes of the Clean Air Act into the post-1987 era. □

Opening Doors for Minorities at EPA

by Margherita Pryor

As an organization devoted to environmental protection, EPA is accustomed to dealing in the long term. Not only must the Agency handle current problems that will continue for long periods; it must also try to predict future problems in hopes of preventing them.

That's difficult enough. But how do you figure out now what kind of people you may need down the line to solve those future problems? And, once that is decided, how do you ensure those people are available? And that they truly represent a cross section of the nation's population?

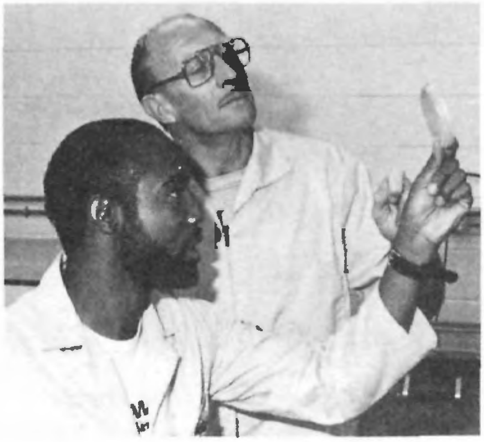
EPA is working on that.

One example is the Agency's commitment to increasing the number of minority employees in higher-grade positions. Despite recent gains, minorities historically have been severely underrepresented in the scientific and technical fields. Rather than wait for time to correct this situation, EPA is taking a sort of "back to the future" recruitment strategy. Simple mathematics suggests that the more minority students enrolled in science and engineering courses, the more minority professionals will be available to work for EPA. So EPA is encouraging young people to enter these fields now, trying to catch them before they dismiss the possibility of technological careers.

To carry out this strategy, the Agency has three key programs: the Faculty Intern Program; the Minority Fellows Program; and the Minority Apprentice Program. Each rests on the premise that direct experience will encourage kids to choose environmental careers.

The Faculty Intern Program is EPA's newest effort. Begun last year with only two professors, the program this year selected 17 faculty members from 15 predominantly minority institutions to work in five EPA facilities. In addition to the opportunity to work with state-of-the-art equipment in their professional specialties, they also had the chance to become familiar with the Agency's scientific and administrative requirements and staffing needs. With this first-hand knowledge of Agency operations, EPA expects that faculty members will be able to develop curricula in their schools that reflect some of EPA's needs, keep abreast of current environmental concerns and developments, encourage environmental interests in their students, and establish a tradition of employee referrals. In short, their mission is to replace the "old-boy" network with a "new-boy" (and girl) network.

The Minority Fellows Program is a little older. By Executive Order, EPA and 26 other federal agencies were directed to increase their involvement with a group of institutions known as Historically Black Colleges and Universities (HBCUs). Since 1982, the Research Grants Program in the Office of Research and Development has awarded 30-40 fellowships each year to college seniors and graduate students enrolled in environmental fields. All the Fellows are screened for high academic standing and interest in environmental careers; this summer, 11 outstanding Fellows were also given the chance to work as summer interns in EPA laboratories and private facilities.



At the EPA research lab in Gulf Breeze, FL, Daryl Moore, left, and Dr. Peter Chapman examine bacterial cultures. A master's degree candidate in environmental science at Hampton Institute, Moore is participating in EPA's Minority Fellows Program.

The third element of EPA's strategy is also the oldest. The Minority Apprentice Program grew out of a 1979 initiative to stimulate interest in science and engineering among minority students. But it's unique in that it is geared to students as young as sophomores in high school. The students are paired with "mentors"—EPA professionals who volunteer to work with students on substantive projects—and exposed to a variety of scientific and engineering approaches to environmental protection, research, and development.

Clarence Clemons, manager of the program at EPA's Environmental Research Center in Cincinnati, claims that "These young people really make a contribution."

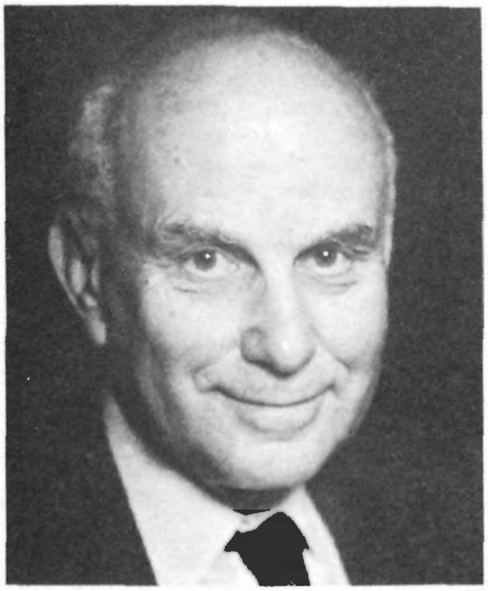
The program has been a great success, according to Clemons, because the students are screened to ensure the selection of only highly motivated, science-oriented kids. "One of our problems has been getting kids before they make choices. We hope we're giving them that encouragement. And 80 percent of the kids have been truly outstanding. Probably 98 percent of them go on to college, and they still maintain their interest in the environment. One of our first students was just graduated from the Air Force Academy, and another one was graduated from one of the other service academies. Lisa Ford, another one of our students, is now at Case Western Reserve University preparing to go on to medical school."

Is this effort in long-term people planning paying off?

"Yes. We are johnny-come-lately, but we are picking up momentum very fast," says EPA Civil Rights Director Nat Scurry. "With our Faculty Intern Program, just this year alone we're reaching 50,000 students that we would not otherwise reach; we are involving 15 universities with EPA and its mission that might not otherwise be involved. That's good. But not as good as we can be. The real kicker is whether we can sustain the momentum. Next summer, we have set a goal to employ at least one intern in each of EPA's 10 Regions, 3 major laboratories, and 12 Headquarters' organizations. This would allow us to almost double the number of professors in the program, reach indirectly close to 100,000 minority and women students, and expand the number of universities involved with EPA by two-fold. We're getting on with it. We can do it." □

(Pryor is Contributing Editor of EPA Journal.)

Appointments



Gerald Harwood has been appointed to the position of Chief Administrative Law Judge (ALJ).

Judge Harwood has been an ALJ with EPA for nearly 10 years. Prior to joining EPA, he served as Assistant General Counsel for Litigation and Environmental Policy with the Federal Trade Commission (FTC). Judge Harwood joined the FTC as a trial attorney in 1956.

A native of New York, N Y, Judge Harwood received a B.A. from Yale University and an LL.B. from Harvard University in 1948.

William L. Long has been named as EPA's new Deputy Associate Administrator for International Activities.

Long has served as Director of the State Department's Office of Food and Natural Resources in its Bureau of Oceans and International Environmental and Scientific Affairs since 1979, and before that was Deputy Director of Environmental Affairs. He has held positions at the College of William and Mary, the Smithsonian Institution, the National Council on Marine Resources and Engineering Development in the Executive Office of the President, the President's Council on Environmental Quality, and the Agency for International Development.

Chuck Elkins, Special Assistant and former Acting Assistant Administrator for Air and Radiation, will become the new Director of the Office of Toxic Substances.

Elkins was one of the persons responsible for the creation of EPA. Prior to joining EPA he was budget examiner for environmental health programs at the Bureau of the Budget. He later served as principal deputy to the Assistant Administrator for Hazardous Materials Control in EPA, and helped create the Office of Toxic Substances. Since 1983, he has held various policy positions in the air pollution program. He was a key figure in the development of the Air Toxics Strategy.

Elkins graduated cum laude from Yale University with a B.A. and received a law degree from Yale Law School.

William M. Henderson, Director of the Resource Management Division in the Office of the Comptroller, has been selected as the new Associate Comptroller.

Henderson has held key positions throughout the federal government. From 1971 to 1979 he held positions in the areas of banking, debt financing, and cash management at the Department of Treasury. From 1979 to 1983 he served at the Office of Management and Budget, Executive Office of the President as Deputy Director of the Debt Collection Staff and Director of the Cash Management Staff. From 1983 to the present he has worked at EPA in the Office of the Comptroller, where he was responsible for overseeing the Agency's internal control programs under the Federal Manager's Financial Integrity Act. □

Steve Delaney

A young possum on a tree stares back at the photographer who snapped its picture.

Back cover: Kites above the water. Photo by Dennis Johnson, Folio, Inc.

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