New directions in water pollution abatement

Ecologists urged that sewage be viewed as "resources out of place," not waste and that recycling should be the goal

by Richard H. Gilluly

Last year was clean air year in Congress, as major amendments were passed strengthening air pollution abatement programs. This year promises to be clean water year, as Sen. Edmund Muskie's (D-Me.) air and water pollution subcommittee holds hearings on a rash of water bills, including Muskie and Administration bills that would greatly increase funding for Federal sewer grant programs.

Hard-pressed cities and towns desperately need the money if they are to build new sewage treatment facilities. But scientists are concerned that the Environmental Protection Agency's Water Quality Office has in the past placed far too much emphasis on 50-year-old water treatment technologies that get the job done only imperfectly and forgo major benefits that can come from new innovations. In addition, critics such as Ralph Nader say that WQO, the Administration and Congress have ignored special problems that come from the addition of industrial wastes to municipal sewage systems (SN: 4/17/71, p. 262). These critics hope the forthcoming new legislation will emphasize the innovative approaches. Fortunately, there is evidence Congress and the Administration are becoming aware of these approaches.

One of the reasons clean air received first legislative priority was the general belief that air pollution abatement problems are far more complex and difficult to solve than water pollution problems, a view recently expressed by EPA's Administrator William D. Ruckelshaus.

This view has prevailed because water treatment is an old, established technology and officials often assumed that the treatment was being done right. But scientists increasingly point out that the old ways may not always be the right ways and that there is as much room for innovation in water pollution abatement as in air pollution abatement.

"I don't disagree entirely with Ruckelshaus," says Dr. Robert C. Ball, head of Michigan State University's Institute of Water Research. "Water pollution abatement is better known." But, he adds, a higher level of research and development than now provided for in WQO's budget is needed—especially into techniques for in-house treatment of industrial wastes so that pollutants can be removed before they enter municipal systems.

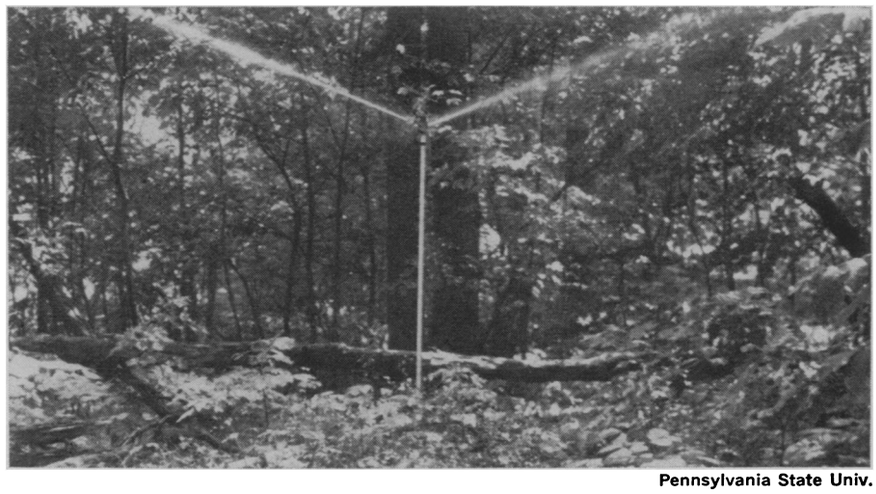
(Ruckelhaus was quoted April 14 to the effect that he viewed the Nader report on water pollution as a valid criticism of WQO. This suggests his views on the need for new innovative technologies may have changed.)

Most of the new innovations rely on considering sewage as "resources out of place" rather than wastes. Dr. Howard A. Tanner, also of Michigan State University, says a policy of requiring industries to pay fees to municipalities for treating their sewage may be exactly the wrong approach in this context. If the ecological goal of recycling wastes is to be met, then dumping industrial effluents into municipal systems simply makes it more difficult to recover valuable materials. "Never dilute 40 percent ore to 4 percent," is an old resource recovery principle that should be applied to sewage treatment, Dr. Tanner says.

But there are more immediate problems than losing resources, says Mary Fulmer, a sanitary engineer and chairman of the Columbus, Ohio, Sewer and Water Advisory Board. She points out that where industrial wastes are dumped into municipal systems, scheduling is often haphazard and communication nil. Thus a municipal sewage plant can get hit with a dollop of toxic industrial wastes without time for preparation and sometimes even without knowing what the substance is. Bacteria for biological treatment are sometimes killed. Or, Dr. Ball points out, some pollutants, such as mercury, go right on through the system and enter waterways.

Mrs. Fulmer says one of the problems is that sewage treatment traditionally has been aimed at public health goals, rather than ecological ones. Removal of phosphates, for instance, is primarily an ecological goal of a kind only recently adopted. Cost, she says, can be immense, with a sodium aluminate process for precipitation of phosphates possibly doubling the cost of treatment. And Dr. John R. Sheaffer of the University of Chicago says even the public health goals probably are not being met. Coliform bacteria—traditionally gauged by a count of *E. coli*—may be killed in conventional treatment, but there is evidence, says Dr. Sheaffer, that pathogenic viruses are getting through.

Dr. Sheaffer, now on leave from Chicago to work with the Army Corps of Engineers, is a major architect of a scheme now getting under way in Muskegon County, Mich., that is being watched with great attention by water scientists everywhere because it promises to solve almost all of these problems and, in addition, provide major



Pennsylvania State Univ.

Pennsylvania State experiment: Sewage effluent is valuable for forest growth.

by-product benefits. (WQO, incidentally, is financing more than half the $30 million cost of the Muskegon plan, partly with R&D funds, partly with construction grant funds.) And there are similar projects getting under way elsewhere in the country.

The Muskegon project, on which construction will begin this year, relies on some surprisingly simple principles. One is that dirty water filtering through soil is quickly cleansed by the soil. Another is that such enrichment of soil makes it far more fertile. Putting these two facts together, scientists at Pennsylvania State University conceived the notion of spraying sewage effluents on marginal soils instead of dumping them into waterways. They tried it, and it worked. Not only was soil fertility greatly increased, but also a decline in the water table was slowed as excess irrigation water filtered through the soil into the water table.

Dr. Sheaffer and others decided there was no reason not to try the idea on a far larger scale, and Muskegon County (population 170,000) officials were willing. The sewage outlets of cities and towns in the county will be turned away from the lakes they now pollute, including Lake Michigan, and will go into a large collector system that will take the sewage to marginal land in the eastern part of the county. First, the effluent will go into aeration lagoons for biological treatment by bacteria. Then it will go into storage lagoons capable of holding the effluent during the non-irrigation season. From there it will go to spray-irrigation devices. Corn will be grown on the irrigated fields.

The aeration lagoons will be large enough to accommodate a large dose of industrial wastes toxic to the bacteria in them without killing all the bacteria in any given lagoon. Thus the bacteria killed could be replaced by regrowth.

Another advantage is that the viruses not removed by conventional sewage treatment will be filtered entirely out of the effluent as it goes through the 6,000 acres of soil to be irrigated. One estimate of the annual return from the corn growing on the now marginal soil is $740,000. There are many other side benefits, the major one perhaps being that recreational development of Lake Muskegon and two other small lakes in the county will be possible because they will no longer be polluted.

The plan is an expensive one, but most scientists are optimistic about its eventual success. Mrs. Fulmer and others, however, believe there simply have not been extensive enough pilot projects for many of the innovative new approaches. Sometimes, she says, a so-called pilot project for a new sewage treatment technique is conducted with glassware and quarter-inch tubing. And she is still leary of industrial wastes in connection with techniques that use sewage—either effluent or sludge—as fertilizer.

There is little doubt that far more extensive R&D is needed. In its fiscal 1972 budget, the Nixon Administration is emphasizing increased sewer construction grants and assistance to local and state enforcement agencies. The fiscal 1972 R&D budget of WQO is actually down from 1971—from about $60.5 million to $56.5 million. Thus projects such as the Muskegon one will get shorter shrift, while enforcement, which may compel construction of more of the conventional treatment plants, will be stressed.

But the Muskegon project will be completed in 1973. Dr. Sheaffer points out that most major cities have the right combination of nearby marginal soils and inadequate sewage treatment plants to make similar projects feasible. If the Muskegon project works as planned, it may serve as the major model for sewage treatment. □