A Reader's Digest REPRINT

Breakthrough in Water Pollution

Now, a practical way to treat sewage and end up with water of drinking quality

Condensed from DENVER POST   LEONARD A. STEVENS

A view of Lake Tahoe from Bliss State Park

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And it is going to remain precisely that. For nearly a decade a desperately serious battle has been going on to keep Tahoe from becoming polluted—a fate that would ruin it forever. Because it is so deep (1645 feet in one place) and contains such a tremendous volume of water—enough to cover all of California with 14 inches—nature would need more than 600 years to clean up severe pollution. Now the battle against sewage pollution has been won. And, in the process, new techniques have been developed to completely purify municipal sewage—thus providing a key

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to clearing up our nation's water.

The threat to Lake Tahoe became serious in the late 1950s, when population along the south shore of the 21-mile-long lake increased from 2450 to 13,500 and there was a massive invasion of tourists. With the boom came an ever-expanding flow of sewage that had to be disposed of by the South Tahoe (Calif.) Public Utility District. The district's small septic tank had to be replaced, and voters approved a bond issue for a modern primary and secondary treatment system. But for Tahoe that wasn't good enough.

More than 99 percent of raw sewage is pure water, with less than one-percent impurities. Using large settling tanks and aeration tanks, primary and secondary treatments remove almost seven eighths of the impurities in the form of a thick, dark sludge, which is often used in landfills. But the remaining eighth of one-percent impurity clings relentlessly to the plant's effluent water, holding abundant amounts of phosphorus and nitrogen, nutrients that cultivate algae and reduce water clarity. Tahoe's incomparable beauty stems from the lake's unusually low content of these nutrients, and citizens were determined not to let *any* sewage get in.

Most communities can dispose of secondary-treatment effluent in a nearby stream. In the Tahoe Basin, however, all but one of the 67 streams lead to the lake, and stream disposal is out. As an alternative, the district board leased land in the surrounding hills and began spraying the effluent onto the soil, hoping that it would be cleaned as it filtered through the earth.

Instead, Lake Tahoe had an environmental disaster. The land just couldn't take the daily shower (750,000 gallons), and began to smell, foam and bubble. Often, more effluent ran off than soaked into the soil, and frantic workmen dug ditches to guide the overflow back to storage ponds. On Labor Day weekend 1961, two million gallons escaped and flowed down to the lake. It did little harm, but fired growing resentment against the district board.

Finally, after three bond issues to provide more land for absorbing spray had been voted down, and several directors ousted, the beleaguered board hired a consultant, Harlan Moyer. Since he was unable to find any place outside the Tahoe Basin to export secondary effluent, the only acceptable alternative to spraying was to clean the effluent so thoroughly that it could be safely dumped anywhere. This meant some form of tertiary treatment. But in the early 1960s, experts were pessimistic about developing such treatment on a large scale and at a price municipalities could pay.

One man who did not share this pessimism was Russell Culp. A research and design specialist in sanitary engineering, retained on Moyer's recommendation, Culp believed that a good tertiary process could be developed and tested, relatively in-

expensively, right at the South Tahoe treatment plant. With $15,000 put up by the district board, and $5000 apiece from Moyer's and Culp's consulting firms, a pilot plant was completed; and after months of trial and error it produced 25 gallons a minute of remarkably good water from secondary effluent. Culp was satisfied that he could design a tertiary plant capable of treating millions of gallons per day. In 1964, the board authorized such a plant, and construction started in the fall.

Culp and a fellow consultant, Gene Suhr, relied on technology already proved in other fields. The key was a new type of filter developed by the Neptune Microfloc Corporation of Corvallis, Ore., for purification of drinking water. Its engineers had found just the right combination of three filtering materials: coal, garnet and sand. Culp and Suhr also developed a lime-treatment process for phosphorus removal, from research conducted at the University of Wisconsin in 1938 and from methods used in the pulp and paper industry prior to 1950. From the sugar industry, which uses carbon to remove color from raw sugar, they worked out a process to decolorize the effluent and remove other dissolved organic impurities, leaving crystal-clear water.

In July 1965, the first phase of the new tertiary system was completed; raw sewage flowed into the system, producing water of drinking quality, free of odor, color, bacteria, virus and nearly all of the phosphorus. The solid wastes, however, still had to be disposed of in landfills.

And for a long time the tertiary effluent was still sprayed on Forest Service land, for its nitrogen content was still not low enough to permit its being recycled into the lake. Eventually, trees were virtually being drowned, and a substitute had to be found. The solution proposed by Moyer and the directors: Why not make a lake in a farm area where the water would be welcomed for irrigation and recreation?

The engineers found a lake site 28 miles to the south, over Luther Pass in sparsely settled Alpine County, Calif. The members of the county board there, mostly farmers and ranchers, were negative at first, but changed their minds after being convinced of the benefits and the water's purity. The pipeline for this export and an expansion of South Lake Tahoe's three-stage treatment capacity from 2.5 to 7.5 million gallons daily was financed by a bond issue—approved by nearly 90 percent of the voters.

In 1968, the first effluent was pumped over Luther Pass to the new lake, christened Indian Creek Reservoir. Now tertiary treatment was fully effective. More than 50 percent of the nitrogen was gone, and the solid wastes had been reduced to a fine gray ash, which may have value in making bricks, cement blocks and road paving. And the new plant didn't even emit any smoke.

By the summer of 1969, the 165-

acre lake was full—just in time to meet extra irrigation demands in an unusually dry season. With the water, farmers were able to produce three alfalfa crops when only one would have been possible otherwise. Meanwhile, the lake was stocked with rainbow trout, and shortly it became one of the county's favorite fishing spots. Then last summer, the state, finding no contamination, approved the reservoir for swimming. It is now becoming a popular recreation area, practically as clear as Lake Tahoe itself—living proof that tertiary sewage treatment can work on a municipal scale.

And the cost is reasonable. "Add up everything," says Culp, "and it cost $28 million, of which South Lake Tahoe citizens paid $19.5 million—about the share any community has to pay with today's federal aid for sewage treatment." Even then, the Tahoe price includes onetime research-and-development money that others wouldn't have to pay. Subtract this, and it turns out that tertiary treatment costs about double the price of the usual primary- and secondary-treatment system. "The tertiary plant alone," says Culp, "costs us around 75 cents per month per person. Pretty small price to pay to help preserve Lake Tahoe—or any other stream or lake."

Not every community needs to treat sewage to the purity achieved at Tahoe. But as population mounts, we will run out of places to dump our waste water, and more and more municipalities will have to go beyond conventional secondary treatment. Thus, it is not surprising that hundreds of official visitors from all over the United States have come to inspect South Tahoe's pioneering project.* Eminent foreign visitors have come, too, including the chief engineer of Moscow's water and sewage systems. The South Tahoe process is already being imitated elsewhere in the United States. Nassau County, N.Y., for example, is using similar tertiary treatment to replenish its groundwater supplies. And Moyer is helping to design a similar system in Denver.

"Our process can work on any scale, for a small town or a big city," Culp explains. "Perhaps our most important accomplishment was simply proving that tertiary treatment is possible." That way, before returning our waste waters to nature, we can clean them up to her standards.

*Other communities around the lake still depend on secondary treatment, and so far have been able to export the effluent out of the basin; many feel that these areas will have to go to tertiary treatment soon.

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