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WATERING WITH WASTE

Sprinkle wastewater onto a forest and produce clean water, fast-growing trees and plentiful, fat earthworms

BY JULIE ANN MILLER

It could be called organic forestry, or perhaps sylvan wastewater purification. By any name, a novel system is converting sewage into drinking water inexpensively in an area just 20 miles south of Atlanta.

On June 1 sprinkler heads began to rotate in 3,500 acres of hilly woodlands recently purchased by the county of Clayton. The system working at full capacity will supply almost 16 million gallons of drinking quality water to the county's 170,000 residents. And part of the expenses will be paid by the sale of timber obtained from the irrigated, fertilized forestland.

The idea of treating wastewater by allowing it to percolate through the soil is not new. Land treatment sites already are scattered around the country. But, according to Wade Nutter, the University of Georgia soil scientist and hydrologist whose work is the basis for the system, the Clayton County project is unique in several regards. It is the largest land treatment system to operate year-round, it is the largest system to use forest lands and it is the only system that provides a community with drinking water directly.

Put most simply, the system allows people to pump drinking water out of the river, use it, dispose of it as sewage, and use that sewage to irrigate forest land. The forest cleans water and returns it to the river ready for drinking again.

The wastewater that goes into the Clayton system comes from the homes, businesses and light industry of the

county. It is pretreated to settle out the solids, or sludge, and is given just enough biological treatment, with bacteria and algae, to eliminate odors. The water is then pumped approximately 7 miles to the treatment site. There a system of 18,000 sprinklers irrigates 2,200 acres, each area receiving about 2.5 inches of water in 12 hours once a week. Water quality is monitored at 22 groundwater wells, at the creek that receives the land-purified water and at the uptake of the drinking water reservoir.

Except when a sprinkler is working, there is no obvious indication that the area is a treatment site, Nutter says. Even when a sprinkler is on, the vegetation limits the spray to a 50-foot radius. "When we first talked about spraying wastewater on forests, people got all kinds of weird ideas about what it would look like. I think they were expecting to find toilet paper hanging in the trees," Nutter recounts. Both the EPA and the local community, including such groups as the Audubon society, eventually agreed that forest wastewater treatment is an acceptable technique.

The land in Clayton county was purchased specifically for water treatment, and consequential timber growth. Loblolly pines will be sold as pulpwood. The county also is planting hardwoods that can be harvested for firewood and wood fuel on a four-year cycle. Nutter predicts that 20 percent of the operating cost of the wastewater land treatment system could be covered by timber revenue. In keeping with the EPA's interest in sites that serve multiple uses, a program of hiking and bicycle trails is also currently under consideration.

The sprayed water contains pathogens, including bacteria and viruses, and high levels of nitrogen and minerals. The viruses are absorbed on the soil surface and are quickly killed. Other pathogens dry on plant leaves, are killed by UV radiation or are attacked by bacteria living in the soil. The pathogens are destroyed within the top foot of the soil, Nutter says.

Much of the information on what happens to wastewater in the soil comes from a pilot project that has been running for seven years in the Unicoi State Park near Helen, Ga. There Nutter found increasing levels of the minerals phosphorus, potassium, calcium and magnesium in the soil. "That's just what we want," he says. "The more, the better for the plants." There is no indication of the soil becoming overloaded even in studies that have run 30 years.

Nitrogen is particularly important in the system because it is a required plant nutrient, but high concentrations in drinking water can be harmful to human health. The Unicoi study demonstrated that nitrogen is not stored in soil but is rapidly recycled. Nitrate and ammonia are actively taken up by plants and also nitrogen gas is released by bacteria.

Irrigation with wastewater clearly pro-

motes the growth of trees in the forest areas. The diameter and height of the dominant trees was significantly increased at the Unicoi site. Hardwoods grow 2 to 4 times faster, Nutter reports. And the surrounding animal life, from worms to deer, also thrives.

The Unicoi experiment demonstrated that sloping land can be used for wastewater treatment. Previously, sites for land treatment systems were restricted to slopes of less than 10 percent. Nutter says, "We know forests well enough now to say that water's going to go in the soil even if the slope is too steep for most land use." In fact, a slope can handle more wastewater than can level land because it drains more quickly (but the water still is adequately cleansed).

Forest wastewater treatment systems are being planned for several other areas of the southeastern United States. "It is ideal for delicate areas," says Alan Fletcher, also of the University of Georgia. When asked what would limit other areas of the country from using similar land treatment systems, Nutter replied, "Just prejudice. 'There are very few soil and plant conditions where land treatment couldn't be used in some form.'"

Of course complete water treatment would not always be sensible economically, although the system itself is relatively inexpensive. The initial costs to Clayton county were about the same as for building an advanced wastewater treatment plant, but the land treatment system requires only about half the operating costs.

The problem for most large cities would be that nearby land is not cheap. As a rule of thumb 130 acres are required to treat the wastewater generated by 10,000 people. Thus, to treat the water generated by New York City and its suburbs would take 320 miles of forest, approximately the area of the city itself.

In Clayton county the forest wastewater treatment system helps alleviate a water shortage. The treated water flows into the creek that is the source of the drinking water supply. Other land treatment systems channel the treated water into streams running to the ocean, so the water is lost to the area. Unfortunately, the system is most useful as a water conservation measure in the areas least likely to need to conserve water. In dry regions, such as the southwestern states, a significant amount of water would be lost to evaporation, and less water would be returned to the streams. Nutter says that other experimental systems have shown that land treatment is even feasible to some degree in cold areas where the water would freeze on the soil. It takes more land, he explains, but the water still infiltrates the soil.

In the long run the delicacy and the economy of land treatment systems will probably be their major selling points. As Nutter says, "Why pay for something soil and plants will do for free?" □