



Tim Townsend, UF associate professor of environmental engineering, looks over a 13-acre landfill that has been turned into a bioreactor that is designed to speed decomposition of trash.

Allen Chenant

Experiment Tests New Approach To Landfills

A massive outdoor experiment is under way to test a new approach that could significantly extend the lifespan of the nation's overburdened landfills and reduce their potential for pollution.

Workers on the University of Florida project have spent three years transforming a 13-acre garbage mound at the New River Regional Landfill in north Florida into a huge "bioreactor." They began pumping liquid into the garbage last spring, kicking off a decay process that will be closely monitored with an elaborate and extensive array of sensors and computer equipment. The experiment aims to speed up the breakdown of the garbage dramatically, creating space for more waste and reducing the threat of contamination of groundwater.

Today's standard practice is to place garbage in landfills isolated from the ground by heavy-duty plastic liners. These liners are intended to intercept toxic leachate — the liquid that develops as rain percolates through the waste — from reaching groundwater, said John Schert, director of the Florida Center for Solid and Hazardous Waste Management at UF, which is managing the project.

When a section of the landfill is full,

workers bury the garbage in dirt to impede vermin and odors. Cut off from air and a consistent source of water that soaks all the waste, the garbage often remains preserved for decades — even centuries, he said.

The problem is by the time the garbage finally decays, the liner may no longer hold, allowing leachate to reach and impact groundwater, said Tim Townsend, a UF associate professor of environmental engineering and co-leader of the project with Debra Reinhart, a professor of environmental engineering at the University of Central Florida.

By infusing the trash with leachate, water and air, the bioreactor will spur proliferation of the natural bacteria that break down garbage, forcing it to decompose in the first few years when the liner is in the best condition, Townsend said.

Another big issue with current landfill technology is that until it decays, garbage remains bulky, filling space that could otherwise be used for more waste, Townsend said. That's important because new landfills are notoriously difficult to build because of opposition from residents.

No new household waste landfill has been built in Florida since 1994. Yet the amount of garbage collected soared from

19 million to 25 million tons between 1991 and 2000, and it continues to grow, said Bill Hinkley, chief of the Florida Department of Environmental Protection's Bureau of Solid and Hazardous Waste.

By breaking down garbage quickly, the bioreactor landfill could reduce the volume of waste in landfills significantly, making room for more. A main goal of the project is to figure out just how much compaction will occur. Noting that some 70 percent of garbage is composed of paper, food scraps, cardboard and other materials that decompose, Hinkley estimated the bioreactor could halve the bulk.

"I don't think anyone knows the outer limit of what kind of space could be created," Hinkley said.

While bioreacting technology could someday be built into landfills as they are constructed, researchers on this project had to convert a conventional landfill into a bioreactor. The Florida Department of Environmental Protection was the main sponsor of the project, contributing \$5.4 million in grants since 1998.

Construction also was extensive. For instance, workers drilled 300 4-inch holes into the landfill, with some reaching nearly to the bottom of the 70-foot hill. Many of these holes serve as wells, pumping water as evenly and thoroughly as possible throughout the garbage.

They contain packs of temperature, pressure and gas sensors, which give researchers specific information on how much decomposition is occurring, where it is occurring, how much methane and other gas is being produced by the decomposition process and other data.

"The plain reality is we continue to landfill the majority of our solid waste," Townsend said. "If we're going to keep doing that, we need to figure out better ways to design and operate our landfills."

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