The Weighing Lysimeter Project

Dig a hole about 13 feet deep and 8 feet wide, put a steel tank in it with a scale at the bottom, and fill it with 65,000 to 70,000 pounds of dry, fine sand. Then plant turfgrass on top, irrigate it, and measure how much water the grass used. That's roughly how a lysimeter works, and the University of Arizona now has two of them.

Located at the recently completed Karsten Laboratory for Turf Research in Tucson, the lysimeters, or soil water measurement tanks, will be used to evaluate the activity of water, chemicals and other substances in the soil. The results will have implications for the management of turf, water and wastes or residues.

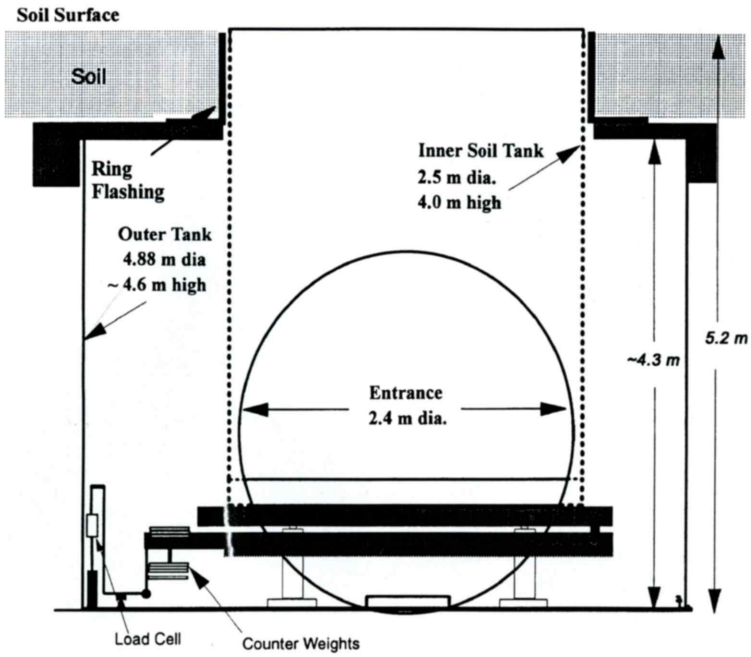
"For example, by measuring accurately how much water the plants use and how the fertilizers move in the soil, we can improve the irrigation and fertilization scheduling for different turfgrasses," said Peter Wierenga, head of the UA Soil and Water Science Department.

Each tank has 90 sampling ports along the sides, equipped with devices to collect soil solutions and to gauge water content. At ground level the tanks appear to be large metal circles built flush with the soil surface, but an underground tunnel provides open space around the tanks to allow access to the ports for sampling.

"We'll be sampling soil water through these ports to see how it is changing in the ground after we put it on," Wierenga said. "We're irrigating one tank with effluent, and the other with tap water."

Through laboratory analysis, Wierenga and his associates can analyze the samples to determine how quickly chemicals, contaminants, microbes and viruses move through the soil.

"We want to follow nutrients and organic contaminants to see what's in there, because we don't know," Wierenga said.



M. Young

"We'll also take samples through the top of the lysimeter," said Mike Young, a graduate student in soil and water science. "We want to measure the rate of advance of the water front." Sampling began in mid-August after the tanks were filled with soil.

In the tunnel next to the base of the lysimeters, computers hooked to water content measuring tools display the amount of water in the soil at any depth selected. Data-loggers record the data for retrieval.

Although the soil-filled tanks weigh up to 100,000 pounds, the scales can still detect small changes in weight.

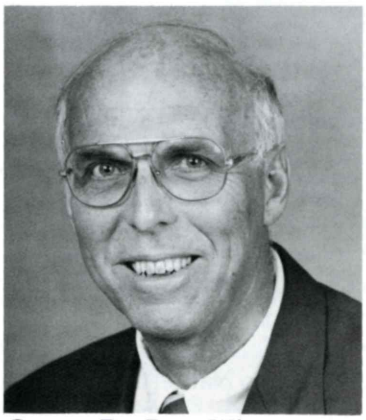
"The whole tank actually can move," Wierenga said. "It sits on a balance capable of weighing changes as small as seven ounces. That's equivalent to about 1/1000 of an inch of water on the surface."

The system allows researchers to conduct several experiments at the same time. U.S. Gulf is monitoring the differences between the effluent and tap water. Thomas Thompson, a UA soil and water science professor, is analyzing the nitrogen balance in the soil. Ian Pepper, also a UA soil and water professor, is studying the presence of viruses in effluent water and their migration over time.

Paul Brown, an associate specialist in soil and water science, is conducting a climatological study using a weather station located near the lysimeters.

"He'll predict the water use of the grass using his climatological data," Wierenga said. "He'll be able to test his information against the actual measurements."

The UA lysimeters are the deepest weighing lysimeters in the world, according to Wierenga. Several locations in the United States have lysimeters, but none as deep and as well equipped for soil contamination studies. ❖



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