Turfgrass Irrigation with Municipal Effluent: Nitrogen Fate, Turf Kc Values and Water Requirements

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Goals:

- Determine the potential movement of nitrogen contained in municipal secondarily treated wastewater used to irrigate turf.
- Determine how effluent irrigation influences the water and nitrogen requirements of turf.
- Evaluate five evapotranspiration equations currently used in the United States to predict actual turfgrass water use.
- Accumulate an atmospheric database and turfgrass water use database that can be used by the public and private sector to develop and test the accuracy of evapotranspiration equations.

Two weighing lysimeters were installed at the University of Arizona Karsten Turfgrass Research Center for researching the consumptive water use of turf, nitrogen fertilizer loss through leaching, and solute transport through a fine sand soil profile.

Each tank is 13 feet deep and 8 feet in diameter, and has a soil-filled weight of approximately 99,120 lbs. Each tank has sampling ports in groups of five, which are spaced at 120° intervals around the tank. These ports begin at the 3.3 foot depth (level) and are then positioned every 1.6 feet down to a depth of 11.5 feet. Tensiometers with pressure transducers, Time Domain Reflectometry (TDR) probes, and ceramic and stainless steel solution samplers have been installed, three at each level.

A single neutron probe access tube was installed in the center of each lysimeter. These devices are used for sampling soil water and monitoring soil moisture content. A Cardinal scale with an electronic loadcell measures changes in tank weight to ± 0.44 lbs (0.002" water loss or gain).

Atmospheric and turfgrass water use data collection began in 1995 following about eight months of data collection with bare soil. The data continue to show that the two giant weighing lysimeters are behaving similarly and accurately.

Results show that the various Penman equations being tested in this project respond similarly to changes in atmospheric conditions. Some variation does exist in how well these equations predict actual turf water use, as measured by the lysimeters. All of the equations overestimate turf water use. The Kc values (ratio of actual turf wa-

ter use to predicted water use) of this bermudagrass turf appear to be 86% to >100% depending on the particular equation. This is higher than currently reported in the literature, but it may be due to the immaturity of the bermudagrass turf stand in 1994.

Next year's data should clarify this issue. An atmospheric and turfgrass water use database is being collected and will become available to the private and public sector for evapotranspiration (ET) equation development and testing after completion of this project. It will provide more atmospheric data than is usually needed for calculating ETo. This additional information may be useful in determining why predicted water use values differ from actual water use.

Data collection is completed for the 1994 bermudagrass growing season and has begun on winter overseeded ryegrass. These data will shed light on the water requirements of winter turf, particularly in the spring when air and soil temperatures increase. The fate of nitrogen applied to turf in the lysimeters will be investigated in summer 1995 after the bermudagrass is fully mature.