



## WATER RESOURCES RESEARCH GRANT PROPOSAL

**Project ID:** KS921

**Title:** Measuring Seepage Losses from Waste-treatment Lagoons: A Simplified Water balance Approach for Use By Government Agencies, Consultants, and Industry

**Focus Categories:** Agriculture, Methods

**Keywords:** Animal Waste Lagoon Seepage Groundwater Evaporation

**Start Date:** 03/01/2001

**End Date:** 02/28/2002

**Federal Funds:** \$1,311

**Non-Federal Matching Funds:** \$9,442

**Congressional District:** 2

**Principal Investigator:**

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**Abstract**

Anaerobic lagoons are used throughout Kansas to collect, store, and treat waste from concentrated animal feeding operations (eg., swine, cattle, dairy). In addition, lagoons are used to treat domestic sewage, especially in rural areas. Most lagoons are soil-lined, and concerns have been raised that seepage losses from these facilities could pollute local groundwater. Lagoon effluent contains nutrients, pathogens, and other chemicals that potentially could affect drinking water supplies and impact public health. Kansas, like many other states, has standards that stipulate that lagoons should be designed to seep less than some specified rate (e.g., 3 mm d<sup>-1</sup>, 6 mm d<sup>-1</sup>). Unfortunately, these standards apply to the design of a lagoon rather than its actual performance. Seepage rates from existing lagoons are rarely measured, and data that are obtained are usually acquired by research scientists with specialized skills and equipment. Because there have been so few seepage measurements, uncertainty regarding groundwater pollution from lagoons has created much public concern. Research by Ham and DeSutter (1999) and Ham (1999a,b) shows that it is possible to measure seepage from lagoons using short-term water balance experiments. However, the equipment and theory they used was complex and expensive. More recently, work by the same investigators suggests that seepage can be measured using much simpler equipment and theory. This proposal describes a simplified water balance approach for measuring lagoon seepage that could be used by consultants, state agencies, and industry. Like most water balance methods, seepage will be calculated as the difference between changes in lagoon depth and cumulative evaporation during periods when waste additions and removals are precluded. Changes in depth will be measured using float-based water-level recorders and evaporation will be measured using on-shore evaporation pans. Seepage (to within  $\pm 0.5$  mm d<sup>-1</sup>) will be calculated with simple computations using only 5 to 10 days of data. The entire system will be sized for transport in a single pick-up truck, will cost less than \$2,000 dollars, and will be designed for installation by one worker. Once the performance of the seepage measurement systems has been verified in a research setting, the approach can be used by many individuals and agencies across the state when seepage losses from a specific lagoon are in question. Development of this technique would allow the state to move toward measurement-based performance standards for lagoons.

This proposal has direct relevance to several objectives in the State Water Plan: Objective 3.1.3. related to water treatment, Objective 3.1.8a addressing groundwater quality, and Objective 3.1.12 on research targeting a specific water resource issue in Kansas.