WRC NEWSLETTER

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WATER RESOURCES CENTER, TEXAS TECH UNIVERSITY, LUBBOCK, TX 79409
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WRC Funds New Project

A Dual-Porosity Model for the Characterization of Aquifer Recharge Through Playa Lakes

Drs. P.W. Jayawickrama, K.A. Rainwater and R.H. Ramsey are principal investigators of this project. Their specific objectives are:

- to develop a mathematical model which is capable of simulating the macropore-dominated aquifer recharge process that occurs through playa lake basins.
- to perform preliminary calibration of the model.
- to conduct a series of field tests at selected playa lake basins to collect necessary data for the final verification of the model.

All playa basins hold water for a limited period of time after significant rainfall events, although the typical duration of inundation and the depth of water retained, vary considerably from one playa basin to another. At this time, it is recognized that some playas are "leaky" while others are "tight." Yet, there is no standardized methodology for classifying playas in terms of their water retention characteristics. Such a systematic procedure for the characterization of playas will be useful in a number of different ways.

(1) It can be used as a tool for estimating the amount of groundwater recharge that occurs through playa basins.

(2) Such a methodology can be helpful in evaluating the playa lakes as a source of groundwater contamination.

(3) This methodology will be in the identification and designation of playa basins as "wetlands."

Although there is no agreement on the exact definition of a "wetland" at the present time, it can be expected that such a definition will include factors such as: percentage time the land remains inundated and the depth of water retained. In the absence of such data, the task of classifying 17,000 to 30,000 existing playas can be daunting for the regulatory agencies. The only solution to this dilemma is a quantitative tool which combines field reconnaissance of soil type and condition, vegetation, and land use factors with the associated hydraulic controls on infiltration in a given playa basin. The methodology to be developed in this study will fulfill this need.

From Native Grasses to Aquaculture:

The WRC Supports Wide Range of Research

In addition to the project detailed above, five additional projects are being supported by the WRC.

"Evaluation of Native Grasses to Reduce Irrigation Water Demands," submitted by Drs. C.B. McKenney and R.E. Zartman, Department of Agronomy, Horticulture and Entomology, is a project related to research initiated in FY92. The objective of this project is to continue evaluation of performance of four turf grasses adapted to the High Plains under three irrigation regimes. All grasses were established from sod installed in 1992. The established grasses are common bermuda, Texoka buffalograss, Colorado common buffalograss, and Prairie buffalograss. The turf plots are evaluated for color and will be

Continued on page 2 ...
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Continued from page 1

evaluated for turf density near the end of the growing season and for survivability during the dormant season. This research will demonstrate the benefits of and point towards the increased utilization of native grasses on the Southern High Plains. It could show a method to significantly reduce the demand for groundwater by more than 30%.

Dr. Daniel R. Krieg, Department of Agronomy, Horticulture and Entomology, and Dr. Robert Lascano, Texas Agricultural Experiment Station, are the principal investigators of the continuing project, **"Water Balance of Cotton Production Systems."** The purpose of this project is to quantitatively define the annual water status of several different types of cotton production systems currently being used on the Southern High Plains. We will determine the impact of each cultural system on each component of the water balance equation with particular emphasis on the net water supply available for the cotton crop.

Specific objectives are:

- to determine the amount of water lost to runoff within each cultural system as a function of rainfall intensity and soil texture
- to determine the amount of water lost to "free" soil evaporation
- to determine the amount of water required to grow the cover crop in the conservation tillage system
- to determine the "net" amount of water available to the cotton crop and the efficiency of its use.

The results of this project will clearly define the magnitude of currently wasted water losses in our conventional cotton production systems and the potential benefits of some relatively simple cultural system modifications. At present, many changes are being proposed without factual information to support the changes or the direction of the change. This information is desperately needed before wide-scale changes are recommended.

"Interactions - The Role of Playas in the Southern High Plains," has the following objectives:

- to continue baseline data collection on specific playa lake water characteristics by obtaining samples once a quarter in 15 urban playa lakes in the Lubbock area.
- to install gauges and record water levels in two urban playa lakes in Lubbock
- to record groundwater levels bi-weekly in a battery of wells in and around a playa lake near Tahoka, Texas.

Results obtained in previous work on this project and in the proposed continued work effort on quality of urban playa lake waters in the City of Lubbock will help in developing the understanding needed locally as well as in municipalities over the nation as they begin to formulate storm water management programs under the provisions of the permit application regulations for storm water discharges. Information on fate of pollutants in storm water detention facilities can aid in evaluating their applicability for improving runoff quality.

Dr. R.H. Ramsey, Department of Civil Engineering and Dr. R.E. Zartman, Department of Agronomy, Horticulture and Entomology, are the principal investigators of this project.

The project **"Integrated Wastewater Treatment and Fish Protein Production - Phase II,"** led by Dr. C.B. Fedler, Department of Civil Engineering and Dr. N.C. Parker, Department of Range and Wildlife Management, has as its objective to develop a process to remove nutrients from feedlot cattle waste lagoons reducing them to a level acceptable for fish production. Current work has shown that with aeration for four days, the ammonia nitrogen level is reduced by over 95%, but that is still insufficient to allow survival of fish. When biological filtration for nitrogen removal is added to the treatment process, up to 50% of the remaining ammonia is removed, but the level still remains too high to support survival of fish. The problem is that nutrients, principally ammonia nitrogen, are difficult to remove in a lagoon type treatment system. One approach for waste treatment is to integrate a lagoon system with other processes such as sedimentation and aquatic plant production. The following methods will be analyzed:

- The processes of sedimentation and filtration combined with aeration to compliment work that is currently in progress.
- The production of hydroponic turf grass production as a means of removing nutrients, especially ammonia nitrogen,

Continued on page 3 ...

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Dan M. Wells Scholarship Awarded

Congratulations

Mr. Vishwanathan Murugesh has recently been awarded the Dan M. Wells Memorial Endowed Scholarship for the 1993-94 academic year. Mr. Murugesh has interest in a career in a field directly related to water resources. Among the qualifications he has demonstrated are scholastic ability, leadership potential and character.

For the past two years, he has worked in the area of wastewater treatment while completing his master's degree in chemical engineering. This research project was funded by the Water Resources Center. His next research project, which will contribute to research for his Ph.D. degree, will target wastewater polluted with organics like benzene, toluene and xylene. "Treating wastewater polluted with organics is a difficult problem to deal with: however, I intend to view it as a challenge and plan to come up with an economical and efficient treatment process," Mr. Murugesh says.

The annual scholarship is available for Texas Tech University seniors or graduate students. The scholarships are funded by family, friends and students in honor and recognition of Dr. Dan M. Wells, who served as Director of the Water Resources Center at Texas Tech University from 1967 to 1977. Donations are welcomed and should be directed to the Director of the Water Resources Center.

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WRC Supports Research
Continued from page 2

while producing a salable product for the landscaping industry.

In the past two years, Dr. Raghu Narayan, Chemical Engineering, has investigated polyelectrolyte enhanced ultrafiltration (PEUF) as a potential technique to treat aqueous industrial waste streams contaminated with heavy metals. While PEUF has demonstrated its efficacy to separate heavy metal ions, our work has revealed that UF membranes with small pore sizes are required. Such tight membranes limit the permeate water flux through the membrane to between 10 and 15 gal/day/ft^2, thus rendering this approach not as economical as originally anticipated.

Related to the previous research is a new project, **"Removal of Heavy Metal Ions From Large Volume Aqueous Waste Streams - A Radically New Approach."** Its objective is to develop and evaluate a new approach for complexing heavy metals with large molecular size star polymers followed by ultrafiltration. Such an approach is anticipated to yield a highly effective and economic process for treating aqueous industrial waste streams containing heavy metals. This technology could be potentially extended to treat radioactive aqueous waste streams.

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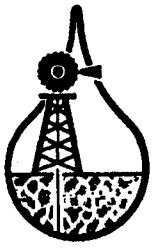

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