

WRC NEWSLETTER

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WATER RESOURCES CENTER, TEXAS TECH UNIVERSITY, LUBBOCK, TX 79409
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Pollution, Conservation, Wastewater Issues Addressed by New WRC Projects

Editor's Note: *As the Water Resources Center begins a new fiscal year, our solicitation for water resources related research proposals was recently issued to all campus units. The following is a brief synopsis of each of the projects that were selected for WRC support following independent review of all of the proposals received by the WRC Proposal Review Committee.*

Investigation of Radon Occurrence in the Ogallala Aquifer in the Southern High Plains of Texas

The purpose of this study is to expand the currently insufficient information on both geologic distribution of radon in important drinking water aquifers and correlation of health effects with exposure to radon through drinking water. The specific objectives of this project may be summarized as:

- Review existing geologic information for estimation of possible radon activity variations in the Ogallala aquifer across the southern High Plains;

- Based on the review, measure radon activities in groundwater samples collected in selected areas and interpret this information on a geologic basis;
- Collect health history information from citizens who have been using groundwater with radon activity above the proposed MCL; and
- Propose and estimate costs of engineered measures to remove or reduce radon levels in the produced water for applications at domestic or municipal systems.

The primary result of this study will be a great improvement in the understanding of the distribution of radon activity in the Ogallala aquifer in the southern High Plains.

An interdisciplinary team of faculty from the Departments of Geosciences and Civil Engineering has been formed for this project. Team members are Dr. K.A. Rainwater and Dr. T.R. Mollhagen, Department of Civil Engineering; and Dr. G.B. Asquith, Dr. C.C. Reeves and Dr. T. M. Lehman, Department of Geosciences.

Water Balance of Cotton Products Systems

The Southern High Plains of Texas represents the largest cotton production region in the United States with over three million acres planted annually. The lack of an adequate water supply to meet the needs of the cotton plant represents the single greatest limiting factor to cotton production.

Dr. Daniel R. Krieg, Department of Agronomy, Horticulture and Entomology, and Dr. Robert Lascano, Texas Agricultural Experiment Station, principal investigators involved in this project, have as their purpose to quantitatively define the annual water status of several different types of cotton production systems currently being used on the Southern High Plains. This project is designed to answer the following questions.

- How much of our total annual water supply is lost to runoff?
- How do soil texture and surface characteristics affect runoff?

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- How effective are furrow diking and wheat stubble conservation systems in minimizing runoff losses?
- How much of our total annual water supply is lost to free soil evaporation?
- How do soil texture and surface characteristics affect evaporation?
- How effective is the wheat stubble conservation system in reducing evaporation in comparison to the water costs for growing the wheat crop?
- What is the additional water supply available to the cotton crop from each of these modifications and the lint yield increase associated with the additional water?

Integrated Wastewater Treatment and Fish Protein Production

With the Texas High Plains having the largest concentration of large cattle feedlots with nearly 3 million head standing and over 6 million head fed annually, development of alternatives to the disposal of livestock waste offers both a challenge and an opportunity. Dr. C.B. Fedler, Department of Civil Engineering, and Dr. N.C. Parker, Department of Range and Wildlife, are the principal investigators involved in this project that will treat wastes in a lagoon system that is integrated with a fish production system.

Large effluent will be collected from general sites located in the Texas High Plains based on the

average hydraulic retention times (HRT) allowed. This effluent will be mixed with fresh water at the volumetric mixtures of lagoon effluent: water of 100:0, 75:25, 50:50, 25:75, and 0:100. For each mixture, triplicated tests of culturing tropical fish and baitfish will be made and analyzed for survival and growth rates.

In addition to the culture of fish, the lagoon effluent will be examined for its potential to produce fresh water algae that also can be used as an ingredient in fish diets. The algae provides another mechanism of waste strength reduction by utilizing available nutrients for growth. Algae removed will coincide with a mass reduction of organic matter from the effluent.

Characterization and Classification of Playa Basin Watersheds Based on Their Potential to Contribute to Non-Point Source Pollution

In this project Dr. Tony Mollhagen will be surveying and classifying playa basins to provide insights into data accumulated from two other studies:

- (1) "Non-point Source Contamination of Playa Basins in the High Plains of the Texas Brazos River Watershed," and
- (2) "Development of a Bioassay to Predict Water Quality of Playa Basins."

Polyelectrolyte Enhanced Ultrafiltration for Removal of Metal Ions and Organic Compounds

Dr. Raghu S. Narayan, Department of Chemical Engineering, is the

principal investigator involved in this project. He proposes to develop and evaluate the potential of Micellar or Polyelectrolyte Enhanced Ultrafiltration (MEUF or PEUF) process as a cost-effective and commercially viable alternative for treating large volumes of aqueous industrial and municipal waste streams.

This process is anticipated to provide an economically attractive combination of competitive capital requirement and low operating cost for the removal of organic compounds (such as benzene, toluene, xylene) and metal ions (such as Cr, Pb, Cu, Hg) from these effluent streams. As part of this past year's objective, the viability of this process has been successfully tested, and removal of greater than 99% of organic compounds and metal ions has been demonstrated.

Interactions-The Role of Playas in the Southern High Plains

Dr. R.H. Ramsey, Department of Civil Engineering, and Dr. R.E. Zartman, Department of Agronomy, Horticulture and Entomology, are the principal investigators for this study being concluded this year. Their objective for the project for the coming year is to continue the collection of baseline data on the concentration and fate of specific storm water pollutants that enter playa lake waters on selected urban watersheds in the Lubbock area.

Research findings obtained during previous funding periods for this project indicate that the numerous playa lake basins in the region may

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In Memory of:

Editor's note: It is with regret that we inform you of the deaths of the following two men associated with the WRC.

Dr. Fouad Mohamed

Dr. Fouad Mohamed, co-principal investigator with Dr. Ken Rainwater of the WRC funded project "Well Response Test: Application to Partially Penetrating Wells in Unconfined Aquifers," passed away August 2, 1992. Their project was intended to answer the need for a new tool for hydrologic investigation in the Ogallala aquifer, as well as other unconfined aquifers.

Dr. Mohamed, having been at TTU since 1989, had recently become Associate Professor in the Department of Mathematics. He received his BS (1973) and MS (1977) from the University of Asiut, Egypt. His Ph.D. (1983) was from Oregon State University. He is survived by his wife Dr. Samia Ali.

Douglas Wilkerson

In early September, Douglas Wilkerson passed away in a drowning accident in Taiwan. Prior to joining our master's program, Douglas was a petroleum engineer (BS also from TTU) who worked at various locations in West Texas. During his master's research, he worked most closely

with Drs. Rainwater and Claborn, as well as Brad Thornhill, WRC technician, and Dr. Harry Parker, professor in the Department of Chemical Engineering. Douglas left Lubbock in the spring of 1988 and spent three years working for two different environmental consulting firms. He then moved to Taiwan to become an assistant researcher at the Tainan Hydraulics Laboratory at the National Cheng Kung University. He shared an office there with Dr. Teh-Fang Lee (Ph.D, 1990, TTU). He participated in studies of groundwater and tidal hydraulics, and also taught English to some of the staff there. Douglas is remembered as an adventurous person, always open to new challenges and cultures. He will be missed.



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be the primary recharge site for the Ogallala aquifer. The quality of the playa lake water thus is an extremely important topic in both rural and urban areas if future use of the groundwater is contemplated.

Water Conservation with Efficient LEPA Irrigation System Management

The primary objective of this project is to produce an educational video program for Texas High Plains farmers on conserving water resources by careful management of LEPA (Low Energy Precision Application) irrigation

systems for cotton, peanuts, corn, grain sorghum, wheat, sugar beets and other crops. A LEPA irrigation system managed properly can reduce water use by 15 to 60% depending on the kind and quality of the irrigation system it replaces.

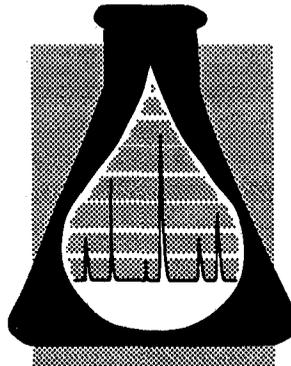
Production will begin with scripting done by Pam Alspaugh, Video Services, News & Publications, with technical assistance from irrigation specialists. Footage will be shot following the crops through a complete growing season. Ms. Alspaugh will shoot and edit the material adding graphics, titles, and music. The finished video will be ready in August, 1993.

ESL Testing Playa Water for BRA

The Texas Water Commission recently provided funds to the Brazos River Authority (BRA) to study water quality of 100 playa basins in the High Plains of Texas Brazos River watershed. Because some water accumulated from stormwater runoff infiltrates into the lake basin soils and subsequently recharges underlying groundwater, the quality of the playa lake water becomes extremely important. These playa lakes are located at the lowest elevation of the closed drainage basins typical of this area in both rural and urban areas.

Phase I of the study is to determine the significance of non-point

source pollution occurring from runoff from the agricultural lands of the High Plains of Texas. It is also anticipated that the Environmental Science Lab and the Water Resources Center will further help develop a Phase II study to include a non-point source study off the



edge of the escarpment of the Llano Estacado in flowing waters of the Brazos River drainage.

The analytical work is being conducted under the supervision of Dr. Tony Mollhagen at the Environmental Science Laboratory, Water Resources Center. The water samples are being collected by the High Plains Underground Water Conservation District under the supervision of Don McReynolds, Geologist of the District's technical programs. Drs. Lloyd Urban and Heyward Ramsey will provide consultation and direction as necessary in the sampling effort and help in the analysis of the data.



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