New Waves
The Research Newsletter of the Texas Water Resources Institute
Volume 1, Number 1, January 1988

Editor's Note

In this inaugural issue of New Waves, I want to take a brief moment to explain the purpose for this newsletter and to invite water researchers in Texas to take part in it.

The Texas Water Resources Institute is the federally-funded water research center for Texas and is part of a national network of centers operating under the guidance of the U.S. Geological Survey. The mission of these centers is three-fold: research, the training of future scientists, and technology transfer (more information about the Institute is attached).

After evaluating the Institute program, we concluded that one critical need was to improve the communication of water research Information. This includes research funded by the Institute as well as research conducted and/or funded at all universities in Texas. Potential benefits include: 1) opportunities for team research or joint projects between research units at various institutions can be identified, 2) scientists in similar disciplines or areas of interest can become aware of others who are investigating similar issues, 3) duplication of research programs can be avoided and 4) opportunities for research funding can be identified.

To make the newsletter successful, we need contributions from the Texas water research community, including changes in key personnel, new publications, announcements of research awards, abstracts of recently completed projects, notices of conferences and meetings and general news about your institution. Tentatively, the newsletter will be published four times annually (January, April, July and October).

We welcome your submissions to the newsletter as well as your comments and suggestions. For more information or to be added lo the mailing list, please contact me personally: Ric Jensen, Information Specialist, Texas Water Resources Institute, Texas A&M University, College Station, TX 77843-2118. The phone number is (409) 845-8571.

TWRI Funded Projects 1987-88

The Texas Water Resources Institute has announced that the following projects have been selected for its September 1987-August 1988 federal allotment program. Funds for this

program are provided lo the Institute through the U.S. Geological Survey. Project duration and FY 1987 allocation of federal funds are shown in parentheses.

- *Developing a Data Base for Modification and Verification of Hydrologic Models to Predict Runoff and Sediment Yield from Silviculture*

  , Mary Leigh Wolfe (Principal Investigator), Agricultural Engineering Dept., Texas A&M University, College Station, TX, and cooperating investigators: Robert W. Knight, Range Science Dept., Texas A&M University, College Station, TX; Edwin Miller, Forestry Dept., Oklahoma State University, Stillwater, OK; R. Scott Beasley, Forest Resources Dept., University of Arkansas at Monticello, Monticello, AR; and Edwin R. Lawson, U.S. Forest Service, Forest Hydrology Laboratory, Oxford, MS. (1 year, $4,427).

- *Stochastic Simulation of the Nonpoint Source Runoff Process*

  , Michael A. Collins, Civil Engineering Dept., Southern Methodist University, Dallas, TX. (1 year, $18,287).

- *The Role of Particles in Controlling Toxic Chemical Contamination in Surface Waters*

  , Desmond F. Lawler, Civil Engineering Dept., University of Texas, Austin, TX. (2 years, $17,356).

The Institute is also continuing funding for the following 2-year projects, which were originally funded in September 1986.

- *Optimizing Reservoir Operations in Texas*

  , Ralph Wurbs, Civil Engineering Dept., Texas A&M University, College Station, TX. (2 years, $26,329).

- *Water Quality Assessment and Guideline Retrieval System*

  , H. Dale Pennington and John Sweeten (Co-Principal Investigators), Texas Agricultural Extension Service (TAEX), Texas A&M University, College Station, TX, and cooperating investigators: Michael Hickey, TAEX, Lubbock, TX and Don Wilkerson, Floron Faires, Susan Quiring, and S. Kenneth Johnson (all TAEX, Texas A&M University, College Station, TX). (2 years, $10,000).

- *Reuse of Municipal and Industrial Wastewater in Agriculture - Strategies to Enhance System Selection*

  , Bobby Carlile, Soil and Crop Sciences Dept., Texas A&M University, College Station, TX (2 years, $16,299).

Additional information on individual projects is available from the Institute.

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Forecasting Water Use In Texas Cities

Principal Investigator: David R. Maidment, University of Texas, Austin, TX.

Project Duration: May 1985-August 1987

Funded by: Texas Water Resources Institute, Texas A&M University, College Station, TX, City of Austin, TX, and City of Corpus Christi, TX.

Problem: Water utilities serving cities in Texas need the ability to make short-term forecasts of water use. The need is especially pronounced during droughts when water managers need to know the impact of temporary water use restrictions.

Objectives: To develop a method for estimating the parameters needed for a daily water use model which would be self-calibrating as changes occur in population, season and water policies.

Methodology: A waler demand forecast model (WATFORE) was modified using a new microcomputer package (WATCAL) that was developed in this project. WATCAL takes historical data on water use, rainfall and maximum air temperature and determines parameter values for a given city. The WATCAL file is then passed to WATFORE and is used together with current data on water use and weather variables to make water use forecasts.

Results: Conservation programs involving water use restrictions were evaluated with the modified WATFORE model. Voluntary conservation programs did not significantly reduce water use, but mandatory programs reduced usage by 10% in Austin and by 30% in Corpus Christi (proportional to the severity of the program). There are also indications that the water use pattern is weather dependent but independent of city size and location within a region. The WATFORE model is being used in Texas by the cities of Austin, Corpus Christi and Longview, and the Lower Colorado River Authority, and the

Metropolitan Water District of Southern California. The modified WATFORE model is being used in short courses and workshops and may be marketed to the general public through commercial software manufacturers.

Publications: Shaw, D. T., and David Maidment, "An Analysis of the Effects of Conservation on Daily Water Use, Corpus Christi, Texas, 1984," *Proceedings of the 21st Water for Texas Conferences*, Texas Water Resources Institute, Texas A&M University, College Station, TX, 1986. "Intervention Analysis of Water Use Restrictions", *Water Resources Bulletin*, Vol. 23, No. 6 (December 1987), pp. 1037-1047.

Urban Water Demand Estimates Under Increasing Block Rates

Principal Investigators: Michael L. Nieswiadomy and David J. Molina, North Texas State University, Denton TX.

Funded by: North Texas Stale University, Denton TX.

Problem: Economists studying water resources have begun focusing particular attention on the effects of water pricing on individual customer usage. Earlier studies ignored the presence of block rates. A significant problem which must be addressed by researchers is that in a block rate structure water usage is both determined by and determines the price of water. For example, a water rate may be $4.50 per month plus $1.45 per 1,000 gallons up to 20,000 gallons. If more than 20,000 gallons are consumed the price changes lo $1.80 per l,000 gallons.

Objectives: To compare methods using ordinary least squares, twostage least squares, and instrumental variables techniques to estimate water demand using an increasing block rate data set including weather information.

Methodology: This study employed a data set of monthly observations of individual customers' water usage under an increasing block rate structure. The data set consisted of a random sample of 104 individual customers' monthly water use records from the City of Denton, TX for the summer months of 1981-1985. The sample was screened to include only residences with lawns, and residences with swimming pools were deleted from the study. Water records were cross-referenced with information on house size, lot size, house age, and appraised home values, which were used as a base income proxy. House size and lot size were used to determine lawn area. The study also utilized a comprehensive weather variable which was calculated as potential evapotranspiration of bermuda grass minus precipitation. Models emphasizing price and actual household consumption were used to estimate the effect of the different variables on water usage.

Results: Lawn size, weather, house age, and income were always significant and newer homes were found to have higher water use rates because of the inclusion of more water using devices and a lack of shade cover for turfgrasses. Also there was an overall lack of consumer response to prices. This was explained by the fact that the aveage monthly water bill amounted to no more than 1% of monthly income. The results suggest that

determination of price elasticity of demand for water will remain difficult as long as water bills remain an insignificant part of a customer's budget.

Publications: Nieswiadomy, Michael L. and David J. Molina, "Urban Water Demand Estimates Under Increasing Block Rates," *Growth & Change* , Vol. 19, No. 1 (Winter, 1988) pp. 1-12.

Borehole Geophysical Techniques for Determining the Water Quality and Reservoir Parameters of Fresh and Saline Water Aquifers In Texas

Principal Investigator: Hughbert Collier, Abilene Christian University, Abilene, TX.

Project Duration: August 1987-August 1989

Funded by: Texas Water Development Board, Austin TX, and numerous private companies.

Problem: Techniques are needed to accurately assess the availability of fresh and saline groundwater resources. Wire line logs have the potential to provide rapid assessment of groundwater aquifers but little research has been conducted to develop logging techniques.

Objectives: 1) Developmeril of wireline logging techniques for determining water quality (dissolved solids and hardness) and reservoir parameters (hydraulic conductivity, grain size, porosity, and lithology); 2) Application of new and existing logging techniques to selected Texas aquifers to assess the effectiveness of the techniques; 3) Publicalion of a manual on borehole geophysical techniques for analyzing freshwater and saline aquifers; and 4) Recommendation of procedures for collecting hydrological data from wireline logs.

Methodology: Selected aquifers will be studied. Research will focus on groundwater with salinities of up to 50,000 milligrams per liter. Fresh and brackish water portions of aquifers will be studied with existing data and by logging 30 to 50 water wells. Research wells will be logged with density, neutron, gamma ray, and multi-resistivity tools. Log evaluation techniques will be correlated and tested against water analyses. Saline portions of aquifers will be studied with appropriate existing data. The study will examine the relationship between logging responses and water type, salinity, and lithology. *From*

Personnel Changes

Ernest Smerdon has resigned as Director of the Center for Research in Water Resources at the University of Texas in Austin to become dean of the College of Engineering and Mines at the University of Arizona. A replacement for Smerdon has not yet been announced.

Mike McLatchy is the new head of the Hydrology Division at Tarlelon State University in Stephenville. McLatchy replaces Tom Rinckson, who resigned to enter private business.

House Approves New Legislation to Protect Groundwater

A bill approved by the U.S. House of Representatives in November of 1986 may help remedy instances of groundwater contamination across the country.

The bill (HR 791) is known as "The National Groundwater Research Act of 1987". It authorizes a comprehensive groundwater research program to be carried out by the Department of the Interior (DOI), the Environmental Protection Agency (EPA), and the Department of Agriculture (USDA).

Under the bill, DOI would be charged with establishing a national groundwater assessment program. Within two years of the bill's enactment the U.S. Geological Survey (USGS) would begin a program to determine the location, hydrogeological properties, quantity, quality, and rate of depletion of groundwater resources in the U.S. DOI would also be instructed to set up a national groundwater clearinghouse. EPA would be required to conduct and publish risk assessments on the health and environmental effects of exposure to 30 significant groundwater contaminants within two years of enactment of the bill and would be responsible for developing and demonstrating technologies to prevent, detect, and remedy groundwater contamination. EPA would also establish an internal groundwater research committee and would be authorized to set up live groundwater research institutes with up to 50% federal funding. USDA would establish an agricultural nitrogen best management practices task force that would develop ways to reduce nitrate contamination. HR 791 would authorize about $500 million over the next three years.

The Senate is considering a companion bill (S 1105) which is currently in the Committee on Environment and Public Works.

NTSU Begins Water Resources Research Field Station

North Texas State University (NTSU) has a new facility, the Water Resources Research Field Station, which it plans to use to assess under field conditions the effects of chemicals and pesticides on aquatic ecosystems. The station is under the direction of NTSU's Institute of Applied Sciences.

Initial facilities on the nine-acre site include a feeder pond and 14 testing ponds as well as equipment for filling drainage sampling and testing. Each testing pond is designed to prevent leakage or overflow of test chemicals into the surrounding environment. Studies planned at the station include the response of aquatic ecosystems to agricultural and industrial chemicals, and interactions between fish, insects, plants, and bacteria in various aquatic environments.

Pond-Raised Clam Study Underway in South Texas

The Texas A&M University Sea Grant Program is sponsoring a project to determine the possibility of growing clams in a 100-acre dredge spoil pond on the Brownsville Ship Channel. Cameron County marine agent Tony Reisinger says the demonstration project involves placing clams on a bed of pea gravel in plastic covered trays. The trays are suspended by floats midway in the 3-4 foot deep pond to avoid the silt covered bottom, which may inhibit clam growth. The project hopes to determine if clam farming in South Texas has potential and if it is feasible to raise more than one species in the same pond. Clams should be in the pond by the end of April and it will be one or two years before there is enough data to determine if clam farming can be successful.

National Academy of Science Sponsors Exchange Program

The National Academy of Sciences (NAS) invites applications from American Scientists who wish to make visits to the USSR, Bulgaria, Czechoslovakia, the German Democralic Republic, Hungary, Polandd, Rumania, and Yugoslavia from September 1988-December 1989. Applicants must be U.S. citizens and must have a Ph.D. in such disciplines as earth, atmospheric and oceanographic science, biology, and fishery science. Requests should reach the NAS by February 13 1988. For information contact: National Research Council, Ollice of lnternational Affairs, 2101 Constitution Ave. NW, Washington, DC 20418.

Troubled Waters On Tap

A new report by the Center for the Study of Responsive Law, a Washington D.C.-based study group, suggests that 2,110 organic and inorganic contaminants have been found in the nation's drinking water supplies since the enactment of the Safe Drinking Water Act in 1974. The report, "Troubled Waters on Tap - Organic Chemicals In Public Drinking Water Systems and The Failure of Regulation," was the result of a survey of state drinking water officials and public water suppliers, and one-time testing of drinking water in selected cities, that took place between 1976 and 1980. According to the report, 190 contaminants detected in U.S. drinking waters may cause adverse health effects, 97 are known or suspected carcinogens, and 82 are known or suspected mutagens. The report recommends that the U.S. Environmental Protection Agency (EPA) should implement mandatory testing of all public waler systems for a wider range of organic chemicals than required by the amended Safe Drinking Water Act of l986.

For more information contact: Center for the Study of Responsive Law, PO Box 19367, Washington, DC 20036. The phone number is (202) 387-8030.

New TWRI Publications

The Texas Water Resources Institute has the following recent publications available. To request single copies or for ordering information please call (409) 845-8571 or write to:

Texas Water Resources Institute, 301 Scoates Hall, Texas A&M University College Station, TX 77843-2118. Single copies are free unless specifically noted.

- *Handbook of Texas Water Law: Problems and Needs*

  , by Ronald A. Kaiser.

- *Irrigation Water Management for the Texas High Plains: A Research Summary*

  (TR-139), by John M. Sweeten and Wayne R. Jordan.

- *Urban Water Resources Management, Proceedings From the 21st Water For Texas Conference*

  (single copies are $25).

Water Resources Abstracts

Free subscriptions to the U.S. Geological Survey's *Selected Water Resources Abstracts* are available to academic departments and university libraries in Texas from the Texas Water Resources Institute. The abstracts are an excellent source of recently published information on many water-related fields and are a valuable reference tool. It should be noted, however, that a finite number of free subscriptions are available. Also please limit your request to one free subscription per academic department per university. To request a free subscription to *Selected Water Resources Abstracts* please contact: Texas Waler Resources Institute, 301 Scoates Hall, Texas A&M University, College Station, TX 77843-2118, or call (409) 845-8571.

SMU To Publish Conference Proceedings

The Center for Urban Water Studies at Southern Methodist University is now accepting orders for the proceedings from their September 1987 conference *Water Planning and Financing for the 21st Century*. The cost is $65. To order the proceedings or for additional information contact: Center for Urban Water Studies, School of Engineering and Applied Science, SMU, Dallas, TX 75275-0335. The phone number is (214) 692-3061.

EPA Publishes Research Guide

The EPA has recently published two excellent booklets describing research opportunities and procedures for applying for research funding from the agency. *FY-1988 EPA Research Guide* (EPA/600/9-87/021) provides information on planned EPA research, the amount of money allocated to each program area, and EPA offices to contact for further details. Areas in which EPA funds are available include indusirlal wastewater treatment technology, wastewater treatment, water quality in lakes and estuaries, hazardous wastes, and clean-up of "Superfund" sites. *Solicitation for Research Grant Proposals*

(EPA/600/8-87/051) details eligibility requirements and application procedures for EPA grants in environmental health, environmental biology, environmental engineering, air and water chemisiry, and physics.

Both publications are available free from: Office of Research and Development, EPA, Washington, DC 20460.

The State of the Rio Grande/Rio Bravo

A new book that examines water quantity and quality issues along the Rio Grande River is now available. The book *The Slate of the Rio Grande/Rio Bravo* was edited by David Eaton, a professor at the University of Texas LBJ School of Public Affairs, and John M. Anderson, an economist for the U.S. Department of Commerce. It features information on groundwater, surface water, and the impact of demographic change on water supplies. The book costs $24.95 from: University of Arizona Press, 1615 E. Speedway, Tucson, AZ 85719.

Eutrophication Study Available

Results of a study aimed at developing the technical tools necessary to determine the eutrophication potential of Texas lakes and reservoirs were recently published in a technical report produced by the Center for Research in Water Resources at the University of Texas. The report, *Eutrophication Analysis Procedures for Texas Lakes and Reservoirs* (TR-214), was written by Neal Armstrong. It contains information on analytical methods and models to predict nutrient loading, measurement of annual loading rates, application of selected models to lakes and reservoirs, and general procedures to evaluate the effects of waste discharges on Texas reservoirs. The report is available for $70. Contact the Center for Research in Water Resources, 10100 Burner Road, University of Texas, Austin, TX 78758-4497, or call (512) 471-3131 for more information.

Furrow Dining and Subsoiling in the Rolling Plains

The Texas Agricultural Experiment Station has recently published a technical report which reviews sorghum and cotton production with furrow diking and subsoiling tillage practices in the Texas Rolling Plains from 1979-1985. The publication suggests that dryland production of grain sorghum is feasible in the Rolling Plains of Texas if furrow dikes and other appropriate cultural practices are employed. The publication *Furrow Diking and Subsoiling studies in the Rolling Plains* (B-1585), was authored by C.J. Gerard. Single copies are available in either a paper or microfiche form from: Texas Agricultural Experiment Station, Texas A&M Universily, College Station, TX 77843. The phone number is (409) 845-2211.

Sea Grant Program Publications

The Texas A&M University Sea Grant Program is an excellent resource for researchers wanting information about Texas bays and estuaries and the Gulf of Mexico. The Sea Grant Program publishes an excellent quarterly magazine, *Texas Shores*, which focuses on specific water resources issues, and *Shoreline*, the newsletter of the Marine Advisory Service. Publication lists are also available listing Sea Grant publications in the areas of coastal and ocean engineering, fisheries, mariculture, oceanography, recreation, and other areas. For more information on the Sea Grant program or to order any of its publications contact: Sea Grant College Program, Texas A&M University, College Station, TX 77843. The phone number is (409) 845-7524.