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Texas Water Problems No Laughing Matter

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A cartoon of a Texan standing knee-deep in mud and blinded by a dust storm is probably not very funny to those Texans who have experienced both flood and drought in the past two years.

"Normal" rainfall in Texas, it seems, is either too much or too little. Precipitation in many areas of the state often varies as much as 50 percent from one year to the next. Annual rainfall and runoff also vary quite drastically from one area of the state to another. Rainfall averages from less than 9 inches in far West Texas to 56 inches around Beaumont. Runoff in parts of Texas is virtually nonexistent while East Texas runoff averages 20 inches a year. Three-fourths of the state's runoff, as a matter of fact, is in the Eastern one-fourth of the state.

Because of the variability, eccentricity, and scarcity of Texas rainfall, most Texans--both urban and rural--depend on water stored underground for their water needs. Water pumped from underground reservoirs supplies more than half of the state's municipal systems and irrigates seven million acres of cropland each year.

Diminishing supply of groundwater is the subject of another cartoon which pictures a High Plains farmer pumping dirt instead of water onto his crops. Certainly this is no laughing matter to Texans in parts of the state where water in underground reservoirs is pumped out faster than nature can replenish it.

No matter how you look at it, Texas is a water-short state. There are Texans striving to change rainfall patterns in the state, others trying to recharge underground reservoirs, and still others hoping to import water from water-rich states. None of these solutions, however, will be available before water demands in Texas far exceed the supply.

Most Texans can relate now--or soon will relate--to a third cartoon. It shows a customer sitting in a restaurant discussing what to order. He can't order any item on the menu including drinking water because of potential health hazards.

Few Texas communities can boast of unlimited water supply; even fewer have water treatment and distribution systems adequate to meet future growth. Still fewer are totally confident that their water supplies are protected from pollution.

Development in Texas has exacted a high price in water quality. Rivers, lakes, and coastal waters have been affected by the discharge of waste, by polluted runoff from urban, agricultural, and resource development, and by accelerated erosion and sedimentation. Even water stored in underground reservoirs is not immune to contamination.

Institute Program

Many of the problems presented in these three cartoons are topics of research at the Texas Water Resources Institute. The Institute supports and coordinates research on fresh water in the state. For the past 15 years, the Institute has focused on wise management, efficient use, and careful protection of the state's water resources.

The Texas Water Resources Institute is one of 54 research institutes federally authorized in 1964 to "conduct research and train scientists so there would be water sufficient in quantity and quality to meet the requirements of an expanding population." That's a tall order in a state with mushrooming population and diminishing water supply.

Since its inception, the Institute has sponsored water resources research projects on a truly statewide basis. Projects stretch:

- From urban flood management in Houston to recreational impact on water in the Guadalupe Mountains.
- From salt water effects on agricultural fields around Amarillo to subsidence problems in the Galveston area.
- From water distribution systems in the Rio Grande Valley to reservoir development in Central Texas.
- From drinking water safety in Texas cities to timbering practices along East Texas streams.
- From public access laws on Hill Country streams to economic impact of natural gas price increases in the Pecos area.
- From groundwater depletion on the High Plains to water quality in Lake Waco.

Institute projects have been conducted on 10 university campuses: Baylor University, North Texas State University, Rice University, Texas A&M University, Texas Tech University, University of Texas at Austin, University of Texas at El Paso, University of Texas at San Antonio, University of Houston, and Lamar University.

Because water resources problems are complex and varied, many academic disciplines are involved in Institute projects. In 1980 alone, researchers from agricultural economics, agricultural engineering, geosciences, social sciences, and soil and crop sciences received Institute funding.

While much research was conducted in university laboratories and with computers, there was still field work. Agricultural engineers moved daily through fields near Plainview to test soil moisture and irrigation equipment; forest scientists collected runoff during and after East Texas thunderstorms.

Institute research not only benefits water resources in the state, but also provides an indirect benefit through training of graduate students. These future scientists and engineers will, in turn, address water resources problems into the next century.

Research Needs

Research priorities are established by Institute Director J. R. Runkles and officials of state, federal, and private water resources agencies.

Officials from 11 agencies make up the Water Resources Officials Advisory Committee and meet annually to hear researchers from across the state present proposals for research. After reviewing proposals, committee members rate them according to which will contribute the most to solving critical water resources problems. Officials now serving as members are:

- Robert J. Kemp, Director of Fisheries, Texas Parks and Wildlife Department
- Emmett L. Gloyna, Texas Representative, U.S. Power and Water Resources
- Wiliam F. Guyton, Consulting Groundwater Hydrologist
- George C. Marks, State Conservationist, Soil Conservation Service
- Fred Pfeiffer, General Manager, San Antonio River Authority
- Harvey Davis, Executive Director, Texas Department of Water Resources
- Bill J. Waddle, General Manager, Texas Water Conservation Association
- Colonel Donald J. Palladino, District Engineer, U.S. Army Corps of Engineers
- Bill Wedemeyer, Director of Research and Education, Texas Farm Bureau
- Catherine Perrine, Water Chair, League of Women Voters of Texas
- Ivan D. Yost, District Chief, Water Resources Division, Geological Survey.

Water conservation in agriculture was recently identified by the committee as the top priority for Institute research through 1985.

Research Update

Irrigation--whether in rice fields, cotton fields, citrus orchards, or pastureland--is water and energy consumptive. As energy prices escalate, in fact, a farmer's very survival is often dependent upon conservation of both water and energy.

Three Institute projects in 1980 add to a long list of irrigation efficiency studies sponsored by the Institute. Researchers at Texas A&M University looked at the

feasibility of trickle irrigation in orchards, the advantages of high frequency irrigations, and economics of new irrigation methods in 1980. Texas A&M scientists working on these irrigation efficiency research projects included agricultural economists Ron Lacewell, Robert Taylor, and Gary Condra; agricultural engineers Bill Lyle, Don Reddell and Joe McFarland; and soil and crop scientists Kirk Brown and Jaroy Moore.

Managing flood waters has been the topic of several Institute projects through the years. Paul Jensen, mechanical engineer at University of Texas at Austin, developed a method to be used by reservoir and river basin managers in their complex decisions. His computer models include uncertainties of weather and demand in the management of systems for reliable water supply and protection against floods. The models developed by Jensen and two students working under him are frequently used by the Texas Department of Water Resources, the state agency for water planning.

The Institute is currently funding two flood management studies. Phil Bedient, professor in the Rice University Environmental Science and Engineering Department, is evaluating the effects of stormwater detention in the Houston area. Vulli Gupta, civil engineer at the University of Texas at El Paso, holds a grant with the Institute to evaluate prediction methods of flash floods.

Institute research has also included competition for water by various users. A study completed this year by Heyward Ramsey, environmental engineer at Texas Tech University, found that municipal raw water can first be used for cooling in power generation, then treated for municipal use.

A current project directed by Larry Mays and Gerard Rohlich, professors in the University of Texas at Austin Civil Engineering Department, is funded to study water demands of new and alternate sources of energy. The research will identify energy potential and competing water uses in areas where new energy facilities may be located.

Four 1980 projects studied various aspects of water quality in the state. Two of the research projects made possible by Institute funding were (1) measurement of synthetic organics in drinking water supplies and (2) contaminant movement in underground reservoirs. These were directed by Texas A&M University professors, Bill Batchelor of the Civil Engineering Department and Don Reddell, Agricultural Engineering Department.

Other water quality research analyzed the impact on stream quality of timbering in East Texas and recreational development in the Guadalupe Mountains. Bob Taylor, Texas A&M University agricultural economist, conducted the forest stream analysis. Texas Tech University researchers, Ernest Fish, Department of Park Administration and Landscape Architecture and Marvin Dvoracek, Department of Agricultural Engineering, studied the quality changes in the Guadalupe Mountains.

Future Concerns

Research at Texas Water Resources Institute will probably never eliminate "gully washers" or "scorching summers." It is not likely to spread rain or crystal clear water evenly across the state either.

The Institute program will, however, continue to help Texans protect and manage their most valuable resource. Hopefully this program will postpone or eliminate entirely the topic of one last cartoon: The one depicting a thirsty Texan trying to trade all of his tremendous resources for one drink of water.