



Symposium Set for February



The WRRRI takes to the road February 15, 1985, with a one-day symposium on "Water and Science." The symposium will be held at the New Mexico Institute of Mining and Technology's Macey Center, Socorro, New Mexico.

The symposium will cover scientific advances in water resources from three perspectives. First will be presentations on weather modification, including snowmelt forecasting and flood control.

Scientists who have conducted research on water conservation will be talking about their experiments in conserving water through irrigation engineering, irrigation management and plant selection.

The third view will be represented by speakers with expertise in ground water recharge. Their discussions

will cover natural and artificial recharge, chemical and physical aspects of recharge, and the impacts of recharge on industry and agriculture.

The symposium does not take the place of the 30th Annual New Mexico Water Conference. Scheduling conflicts and the notorious

New Mexico spring windstorms convinced the institute to move the conference to the fall. The 1985 conference will be held in October.

A symposium program and registration form will be mailed later. For more information, call the institute at (505) 646-4337.

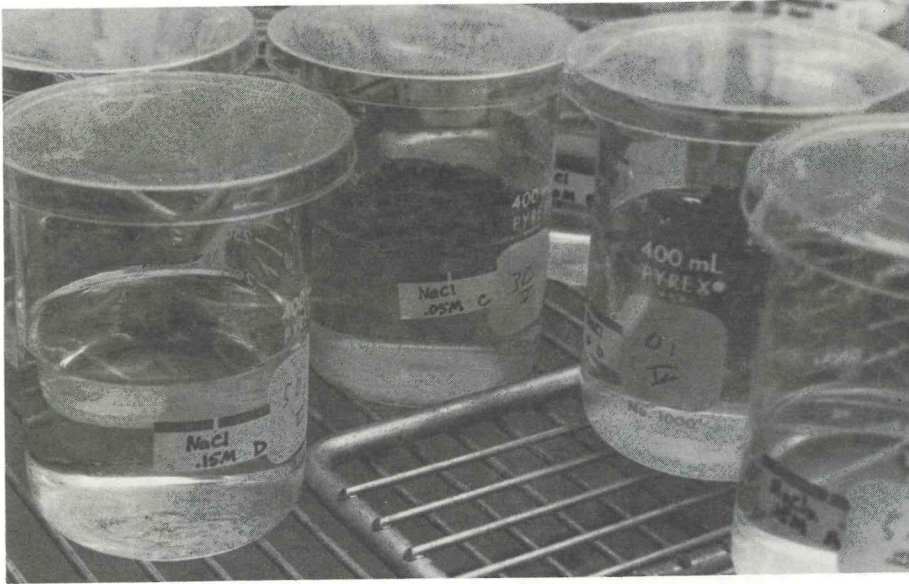
New Proposal Deadline

The institute's annual research program proposal deadline has been moved up to **Feb. 1, 1985**. For guidelines, contact the institute. The new date is due to new federal program deadlines.



Cooks Tom Bahr (left), WRRRI director, and Terry King, NMSU fishery and wildlife department, fried enough catfish to feed 250 people attending the Roswell Test Facility fish fry recently. The fish were the results of a research project using saline water to grow catfish. The appreciative crowd heard talks about research at the facility and toured algae and shrimp growing ponds. The WRRRI, the city of Roswell and the Roswell Chamber of Commerce sponsored the fry.

Fern and Algae are Profitable Partners



Azolla ferns are kept in growth chambers where light and temperature can be carefully controlled. Other ferns are being grown in water pots in UNM's greenhouse.

A University of New Mexico researcher is taking another look at an aquatic plant he "abandoned" nearly two decades ago.

Gordon Johnson, a plant physiologist in UNM's biology department, first worked with the *Azolla* fern while at Oregon State University, but dropped the research when he came to New Mexico in 1965.

However, he renewed his research on *Azolla* when others considered using New Mexico's saline water for hydroponics. "It was logical that the fern fit into the picture because it fixes nitrogen," he said. The tiny water fern, which groups in thumbnail-size clusters, works in partnership with blue-green algae to produce nitrogen. In turn, nitrogen is converted to amino acids and proteins for plant animal production.

Johnson's research, which is funded through the Water Resources Research Institute, involves testing *Azolla's* salinity tolerance and its ability to fix nitrogen in saline water. New Mexico has about 15 billion acre-feet of saline ground water, but most of it is too salty for irrigation.

Johnson said *Azolla* itself does not fix nitrogen. Instead the fern depends on algae to do the work. He explained that algae, which

thrive in warm, still waters, live in the tiny cavities that pock the underside of the floating fern.

In return for this protective environment, the algae take nitrogen from the air, and "fix" it into a usable form. In this symbiotic relationship, the fern absorbs nitrogen escaping from algal cells.

The renewed interest in the miniature manufacturing plant comes about because of the fern's value as a green manure. Johnson said *Azolla* contains 5 percent nitrogen, which is comparable to nitrogen-fixing legumes such as alfalfa. The increased costs for petroleum based fertilizer also has sparked interest in the fern, which is fueled by solar energy.

Azolla grows worldwide, but it is particularly abundant in warmer climates. "The fern is very easy to grow," Johnson said. "In Asia, it is grown in paddies alongside rice plants. The California rice industry also is looking into this possibility." He explained that when the fern is grown in conjunction with the rice, it provides nitrogen directly. *Azolla* also can be grown in the paddy first. In this case, when the paddy is drained, the fern residue is left behind as manure.

The same principle could be used in New Mexico. Here, *Azolla* could be grown as an interim

crop in soils where salts are being flushed out. "*Azolla* could be enriching the soil with nitrogen at the same time the salts are being eliminated," he said. Another New Mexico prospect for the fern may be as food for fish. "We know that the fern is suitable for animals, but we don't yet know about aquaculture," Johnson said.

Johnson is approaching his research from two angles. He has collected salt-tolerant native ferns growing along the Pecos River and the Rio Grande south of Albuquerque. And he has taken plants from fresh water habitats and is growing them in saline water.

These test batches are now multiplying in potted ponds in a university greenhouse. Both the salt-tolerant and fresh water survivors will be tested for their nitrogen-fixing abilities. Johnson said he expects the first results by next May.

WRI Reports

#156 *Bibliography of Dissertations and Theses on Water and Water-related Topics from New Mexico Institute of Mining and Technology* - Myers, R.G. and R.P. Herman - November 1982

#15 *New Mexico Water Rights* - Harris, L. G. (Copy charge \$2, no limit) - August 1984

What We Meant...

To order the New Mexico Bureau of Mines and Mineral Resources proceedings from the Water Quality and Pollution Symposium, Hydraulic Report 7, please write to the Publications Office, NM Bureau of Mines and Mineral Resources, Campus Station, Socorro, NM 87801. Please do not send checks to Dr. William Stone as reported in the last Divining Rod.

Water at Issue

Allies Converge in Water Battle

After four years of jousting over the rules of the game, the real action in the New Mexico-El Paso battle finally has begun. The New Mexico state engineer will referee a contest that now involves 2,387 participants.

"From September 1980 when El Paso first applied for the well permits until the State Engineer Office administrative hearing Oct. 31, everything has been devoted to defining rules," said Thomas G. Bahr, institute director. "Now, the state engineer is acting on the request."

Since 1980 the rules have been disputed in U.S. District Court and rewritten by the New Mexico Legislature. New Mexico law at that time prohibited export of its ground water across state lines. In applying for permits for 326 wells in southern New Mexico, El Paso issued a legal challenge to that law. The federal court struck down the export ban in January 1983.

New law changes rules

The New Mexico Legislature responded the next month with a new law that allowed export under certain conditions. In August 1984, the new law was ruled constitutional. "This set the stage for the administrative hearing," said Bahr.

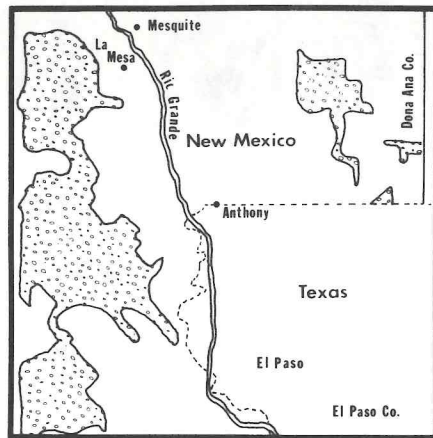
The August ruling also opened the door to additional protests. According to State Engineer Steve Reynolds, when El Paso filed the well applications in 1980, the law allowed individuals to protest only if they believed their existing water rights would be impaired. However, under the new law, protests also are allowed if granting the permit is perceived as being detrimental to the public welfare of New Mexicans or contrary to water conservation in the state.

Reynolds said that at the Oct. 31 hearing, the list of protestants totaled 2,387. The list is not as formidable as it appears. "Hundreds

of the original protestants have agreed to have a lawyer speak for them as a group. This greatly simplifies our communication," he said. Groups must be represented by attorneys, but individuals may represent themselves.

New groups that have elected to protest on the grounds of public welfare include New Mexico State University (NMSU), the State Land Office, the city of Alamogordo, Lincoln County, the Farm Bureau and the U.S. Army Corps of Engineers.

In its protest, NMSU, by resolution of its Board of Regents, took the position that El Paso's proposed ground water withdrawals



Shaded areas are where El Paso has applied for permits to drill wells.

will increase water shortages in the area and hinder the university's ability to exercise its public trust responsibilities.

The university stated those responsibilities as maintaining quality education, promoting knowledge through research, and advancing public service programs. Specifically, NMSU said the proposed wells would jeopardize the university's substantial geothermal resources.

Land office protests

"The university," said Bahr, "is concerned with how the case directly affects the interests of the university and its growth." He said the interest would be the same if someone proposed developing a strip mine in the center of the campus.

The State Land Office protest was filed on the grounds of protecting the interest of public trust lands. Lee E. Peters, assistant attorney general for the land office, said the areas in dispute contain 270,000 acres of state trust lands.

According to Peters, the federal government sets strict requirements for protecting special trust lands from damage. "If water is removed and can't be used for irrigation or municipal uses, that impairs the value of that land," he said.

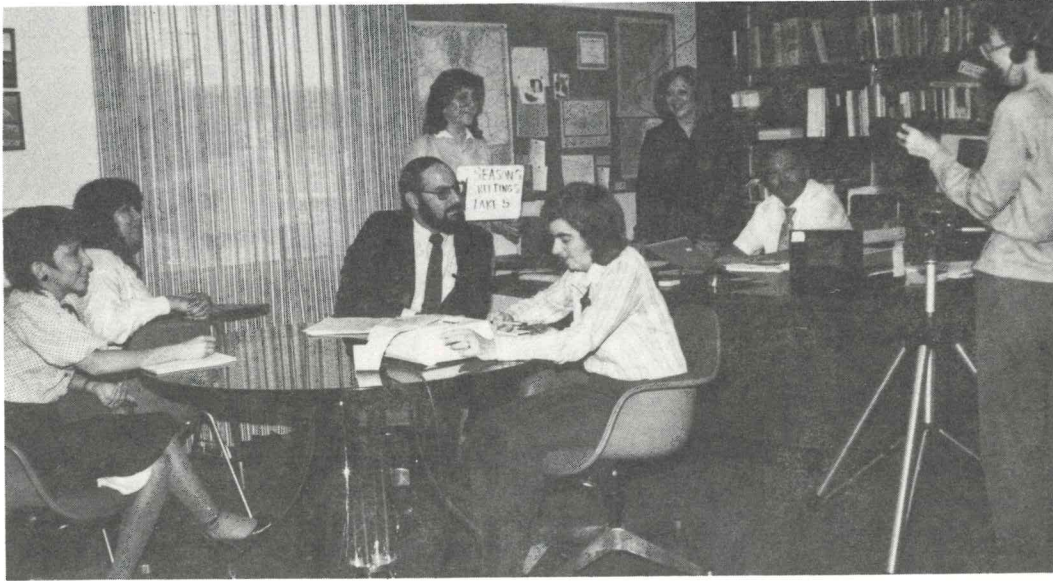
Peters explained that the protection is necessary to the public welfare because income from public trust lands supports New Mexico's public schools, universities, and correctional institutions.

Timetable ordered

Reynolds, who previously served as an advocate for New Mexico, now becomes the impartial judge in the administrative hearings. In this role as referee, he has ordered both sides to come up with a timetable for presenting their cases at the formal hearing. El Paso contends it is ready now, others say it will take them three years. If all parties cannot agree, Reynolds will set the schedule for them.

Depending on the outcome of the state engineer's ruling, the application procedure could follow a route through appeals and hearings that could end up at the New Mexico Supreme Court, the final authority over state water law.

Season's Greetings



In the holiday episode of "Life at WRRRI," the cast has interrupted a busy staff meeting to discuss holiday plans. At the desk is Tom Bahr in his role as director, supervised by Diane Prince playing his administrative secretary. Seated at the table is the reports/layout typist played by Janice Apodaca, student clerical aide played by Edna Telles, and assistant to the director played by Peter Herman. Keeping tabs on the holiday budget is the administrative assistant, played by Darlene Reeves. At the camera is information specialist Linda Harris who is assisted by work study student (and key grip) Jacqueline Rodriguez. Look for the movie at theaters near you during the holidays. Season's Greetings!

**Thomas G. Bahr, director, New Mexico Water Resources Research Institute
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