

WRRRI Announces Two Grant Programs Deadlines Fast Approaching

This year the New Mexico WRRRI will provide funding for two separate grant programs: the WRRRI Seed Money Research Program, and the USGS Western Regional Competitive Grants Program. Researchers interested in submitting proposals for either program must hold tenure-track positions at a New Mexico university.

The WRRRI Seed Money Research Program is designed to provide funds for projects having the potential for attracting more substantial outside funding if the initial research proves successful. Investigators who are beginning their research careers are encouraged to submit proposals, as are investigators proposing new or novel approaches to solving water resources problems.

Proposals from any academic discipline must identify a significant water resources problem and address a proposed solution. Research may be applied or basic, and projects with a high degree of policy relevance are strongly encouraged.

Categories to be given highest priority in the selection process include water conservation, planning and management; atmospheric-surface-ground-water relationships; and water quality.

Typically, the maximum award per project is \$25,000 a year in direct

costs. Funding is awarded for one year at a time only. Subsequent funding will be considered after an evaluation

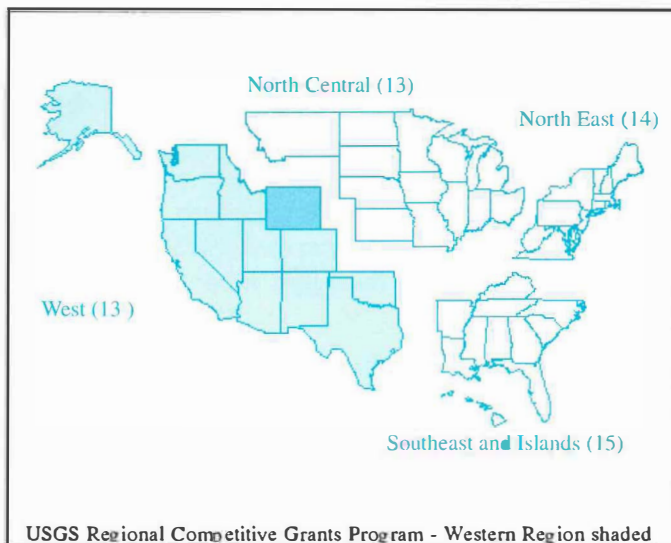
New Mexico is in the Western Region along with 12 other states.

The USGS Western Regional Competitive Grants Program focuses on finding solutions to regional water resources problems, disseminating and applying research results, and assisting in the training of scientists in relevant water resources fields. Potential investigators from New Mexico universities must submit their proposals through the New Mexico WRRRI which in turn submits proposals to the western regional lead institute, Wyoming. To be eligible, a proposal must involve substantial collaboration among two or more states in

the Western Region.

Projects should have a preferred start date of September 1, 1996 and cannot exceed 3 years in duration. Total federal funds must not exceed \$350,000 per project. Each institute's application must be matched by at least two nonfederal dollars per federal dollar. The deadline for proposals at the New Mexico WRRRI is May 17, 1996.

Proposal guidelines for both programs can be accessed on WRRRI's Home Page at <http://wrrri.nmsu.edu>, or obtained by sending an e-mail request to dreeves@wrrri.nmsu.edu or calling Darlene Reeves at 646-1194.



of progress is made and diligence toward seeking outside funding is demonstrated.

The WRRRI estimates that \$100,000 will be available for this program. Project start dates could be as early as July 1, 1996, but no later than September 30, 1996. The deadline for proposals is May 6, 1996.

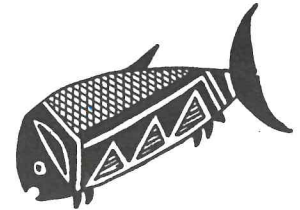
The U.S. Geological Survey has announced a new funding mechanism to support water related research for FY 1996. Approximately \$805,000 will be available for each of four regions to distribute awards on a competitive basis within the region.

41st Annual New Mexico Water Conference

Integrated Water Resources Management: Northwestern New Mexico as a Case Study



September 19-20, 1996
San Juan College
Farmington, New Mexico



Integrated resource management is the new paradigm of the 90s for water resources planners and managers. Watersheds are being considered the basic unit for water resources planning with its host of complex issues demanding the expertise of professionals from a wide range of disciplines.

For the first time in water conference history, we'll head to the northwest corner of New Mexico to discuss how integrated water resources management is working in that part of the state.

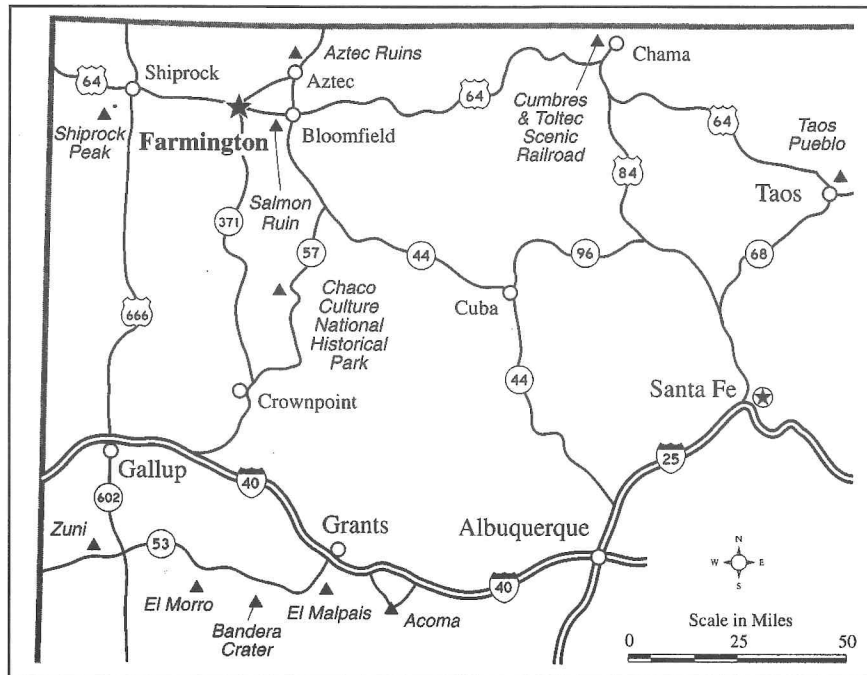
On Wednesday afternoon, September 18, tours will be offered of local facilities such as the Navajo Indian Irrigation Project, the Arizona Coal Generator Plant, and Meridian Oil's produced water reinjection facilities. We'll hopefully be able to take advantage of fall weather and picnic along the banks of the Animas River on Thursday evening.

The conference will begin on Thursday morning and conclude Friday at noon. Conference sessions will be held in the new Fine Arts Center of San Juan College, located on a scenic 600-acre tract in northeast Farmington. Several local hotels will provide government rate accommodations.

Topics to be discussed at this year's conference include the history of water management in the Colorado River Basin, overview of current regional water issues, geology and hydrology of the region, impact of the Colorado River on surrounding states, fish recovery efforts on the Colorado River, panel discussion of endangered species issues, regional water planning, San Juan/Chama diversion issues, Animas/La Plata project, Indian rights claims on the Colorado River, the extractive industries and water, economic impact of the mining industry in the region, regional drought concerns, and regional water conservation.

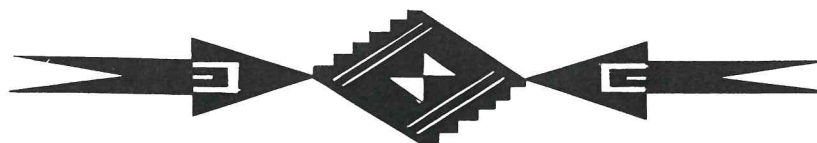
This year's registration fee for the day-and-a-half conference and optional tours is \$100 for those registering before September 3, 1996, \$125 for those registering after September 3. Student registration is \$30 before September 3, \$40 after the September 3 deadline. The registration fee includes lunch and dinner on Thursday, all breaks, conference materials, and a proceedings to be mailed to participants in the spring.

A conference agenda and registration information will be mailed to *Divining Rod* readers this summer and will be available on the WRRRI home page: <http://wrrri.nmsu.edu>.



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USGS Issues Reports

The U.S. Geological Survey has published the following New Mexico related publications since the last issue of the *Divining Rod*.

Copies are available for inspection at the USGS District Office in Albuquerque (4501 Indian School Road NE, Suite 200). The Water Resources Research Institute reference room also has the reports on file. They may be ordered from the USGS, Federal Center, Box 25286, MS 517, Denver, CO 80225. You may call (303) 236-7476 for price information.

Geochemistry of ground water in the Gallup, Dakota, and Morrison aquifers, San Juan Basin, New Mexico by W.L. Dam (WRIR 94-4253) - Ground water from the Gallup, Dakota, and Morrison aquifers in northwestern New Mexico was collected for chemical analysis between 1986-1989. Water from 38 wells was sampled to examine the natural conditions of the water and determine chemical reactions between the water and the rocks. Predominant chemical ions in the water near the northwestern edge of the San Juan Basin were calcium bicarbonate in the Gallup aquifer and sodium bicarbonate in the Dakota and Morrison aquifers.

Chemical and hydrologic data indicate that water enters the Morrison aquifer at numerous locations, including near Sanostee, New Mexico, and flows to springs near the San Juan River in the Four Corners area.

Geohydrology and simulation of ground-water flow near Los Alamos, north-central New Mexico by P.F. Frenzel (WRIR 95-4091) - This report describes the results of a

study of the relative effect of renewing or retiring the Guaje well field, one of several well fields that supply Los Alamos. Of concern was the effect on water levels in the Buckman well field, which supplies the city of Santa Fe.

Two possible alternative plans for replacing the Guaje well field production were investigated. In the first, the Guaje field would be renewed with four new wells replacing the existing production wells in the Guaje field. In the second, the Guaje well field would be retired and its former production would be made up by additional withdrawals from the Pajarito Mesa and Otowi well fields.

Using a ground-water flow model, the USGS estimated that, after 20 years of operation, water levels at Buckman well field might be about 2 feet higher if the aging wells in the Guaje well field are replaced than if the Guaje field is retired and its production is shifted to the other well fields that supply Los Alamos.

Plan of study to quantify the hydrologic relations between the Rio Grande and the Santa Fe Group aquifer system near Albuquerque, central New Mexico by D.P. McAda (WRIR 96-4006) - The USGS and the City of Albuquerque are studying the hydrologic relations between the Rio Grande and the aquifer to improve understanding of the groundwater and surface-water resources.

The aquifer in the Albuquerque area is hydraulically connected to the Rio Grande, and any depletion of riverflow caused by pumping must be offset to maintain the flow. Because the depletion of flow is small in comparison to the total flow of the river, it cannot be directly measured and therefore must

be calculated. Preliminary estimates indicated that about 40-50% of Albuquerque's groundwater pumping in 1994 was replenished by water from the Rio Grande.

"Because the depletion of riverflow caused by pumping is not directly measurable, we have designed data collection programs and tests that can be used to evaluate scientifically how well the river is connected to the aquifer," said author Douglas McAda. "Each study element in the program is prioritized on the basis of the importance of the information in improving our understanding of the river/aquifer interaction."

Chemical analyses of ground-water samples from the Rio Grande Valley in the vicinity of Albuquerque, New Mexico, October 1993 through January 1994 by D.W. Wilkins, J.L. Schlottmann, and D.M. Ferree (OFR 95-773) - This report provides water sample analyses collected from October 1993 through January 1994 from 36 wells in 12 well nests located near the Rio Grande along Paseo del Norte, Montaño Road, and Rio Bravo Boulevard. Laboratory analyses included dissolved solids, major ions, nutrients, total organic carbon, trace elements, and volatile organic compounds. Water quality types by major-ion composition were calcium bicarbonate (found in most samples), sodium sulfate, calcium sulfate, and calcium sulfate chloride. Nutrients, ammonia, orthophosphate and zinc were detected in most samples, and organic carbon, arsenic, and barium were detected in all samples. Determining the location of zones of poor-quality water will assist local water managers in locating future water-supply wells.

Researchers improve wastewater processing method

From Karen Koch, WERC, NMSU

Two environmental engineers have developed a process that uses oil-munching microorganisms to cleanse water of petroleum pollutants. The process, developed by Gilbert T. Tellez, an EPA engineer and Nirmala Khandan, an NMSU civil engineering professor, has immediate application in the petroleum industry.

For every barrel of oil produced, the petroleum industry generates an average of eight to 10 barrels of wastewater, amounting to 11.7 billion barrels of polluted water in the United States annually, according to EPA reports. The polluted water presents a serious threat to the environment and its disposal increases the cost of producing oil.

During crude oil exploration and production, large volumes of fresh and brine groundwater are recovered and separated. After extracting oil, petroleum companies usually inject the wastewaters back into the ground or directly into the ocean.

"Wastewaters contain dissolved compounds (such as petroleum hydrocarbons) from the oil/gas, making them unusable and hazardous to the environment," Tellez said.

The cost of hauling and reinjecting this wastewater varies from \$1.25 to \$1.75 per barrel according to Tellez. Many independent oil companies spend up to \$300,000 a month to haul and reinject produced waters. By contrast, the process Tellez and Khandan have developed costs about 20 cents per barrel, is natural and has minimal effects on the environment.

The current water disposal practice is not completely environmentally safe. Contamination of drinking water is possible due to injection well leakage, and spills can pollute surface water. The new process is natural and biological. Naturally occurring microorganisms, in simple terms, "eat" the pollutants in the water. The microorganisms consume and break down petroleum hydrocarbons into water, carbon dioxide and other harmless substances in either fresh or high-saline waters.

Oilfield wastewater in southern New Mexico is high in salt content that will often kill microorganisms, but Tellez has developed an acclimation process so they can tolerate the high salt content.

The cleanup process is cost-effective and simple and can be done on site. The contaminated groundwater is pumped into a series of biological treatment units where

the microorganisms are grown. A final treatment unit with a high level of microorganisms completes the final petroleum hydrocarbon removal.

Tellez has demonstrated the treatment process at Hobbs at greater than 99 percent hydrocarbon removal. The process results in an average of 0.001 milligrams per liter of total petroleum hydrocarbons at completion, a significant improvement on allowable EPA standards. In some areas, the treated water can be used for irrigation or surface water discharge.

Tellez began his research with Dr. Khandan in 1989 and received his doctorate in environmental engineering at NMSU in 1994. He has received support for his research from the Waste-management Education and Research Consortium. Dr. Khandan received a two-year WRRI award for developing and field-demonstrating a novel air-stripping process for energy-efficient removal of organic contaminants from groundwater.



Field demonstration of the wastewater processing method developed by Gilbert Tellez and Nirmala Khandan. Photo by Nirmala Khandan.

Reports Available

Water 2010: Four Scenarios for 21st Century Water Systems presents four thought-provoking descriptions of the challenges that may face municipal water systems in the early 21st century, depending on how several important but unpredictable “driving forces” play out in coming years. It is available from the Rocky Mountain Institute for \$9, plus \$2.50 shipping and handling. For more information, call (970) 927-3851.

Layperson's Guide to Water Transfers & Marketing explores the historic role of water transfers, explains the laws that regulate water marketing, defines various types of transfers and discusses issues of groundwater and transfers. It profiles case studies, including the Drought Water Bank and current water marketing programs. The guide, published by the Water Education Foundation, is available for \$5, plus shipping and handling. Call (916) 444-6240 for information.

Video released

The greatest threat to America's drinking water supplies—nonpoint source pollution—is documented in a new half-hour educational video released by the Oregon State University Extension Service. “We All Live Downstream” examines urban and rural runoff and the problems it creates for surface and groundwater. The video was taped primarily in Oregon's Tualatin River basin but the program has implications for nearly every watershed in the country. The video costs \$30 (including shipping). To order, call (541) 737-0803.

Upcoming Conferences

- ✿ **Ecological Risk Assessment** - May 12-15, Portland, OR, Water Environment Foundation
- ✿ **North American Water and Environment Congress '96** - June 22-28, Anaheim, American Society of Civil Engineers
- ✿ **51st Annual Conference of the Soil and Water Society: Rocky Mountain Rendezvous: Renew Yourself in the High Country** - July 7-10, Keystone Resort, CO, Soil and Water Society
- ✿ **Watershed Restoration Management** - July 14-17, Syracuse, American Water Resources Association
- ✿ **Third International Symposium of the International Society for Environmental Biotechnology - Global Environmental Biotechnology: Approaching the Year 2000** - July 15-20, Boston
- ✿ **UCOWR-'96: Integrated Management of Surface and Ground Water** - July 30-August 2, San Antonio, The Universities Council on Water Resources
- ✿ **Fifth International Conference on Desert Development** - August 12-17, Lubbock, International Desert Development Commission
- ✿ **41st Annual New Mexico Water Conference** - September 19-20, Farmington, NM, New Mexico Water Resources Research Institute
- ✿ **Rivertech '96** - September 22-25, Chicago, International Water Resources Association
- ✿ **32nd Annual AWRA Conference and Symposium on GIS and Water Resources** - September 22-26, Fort Lauderdale, American Water Resources Association
- ✿ **New Mexico Geological Society All Field Conference** - September 25-28, Los Alamos, Jemez and Nacimiento Mountains

Educational program issued

The Water Education Foundation has produced a new groundwater education program for secondary students. The 54-page booklet contains lesson plans and materials to teach students about groundwater

and the prevention, reduction and elimination of groundwater pollution. The lesson plans include lectures, demonstrations, laboratory exercises, games and assessment activities. For more information on these materials and other water information, contact the Foundation at (916) 444-6240.

Ongoing Water Research

Groundwater studies of the Albuquerque Basin

The latest issue of *New Mexico Geology* features four articles which focus on recent hydrogeologic studies of the Albuquerque Basin by New Mexico Bureau of Mines and Mineral Resources staff. "Depth-porosity relationships and virgin specific storage estimates for the upper Santa Fe Group aquifer system, central Albuquerque Basin, New Mexico," by William C. Haneberg, investigates the potential for land subsidence as a consequence of falling groundwater levels in the Albuquerque area. Dr. Haneberg has received funding by the WRRRI for studies on the deformation of surficial strata in response to seasonal groundwater level fluctuations.

Another article "Hydrogeochemical computer modeling of proposed artificial recharge of the upper Santa Fe Group aquifer, Albuquerque, New Mexico" by Michael Whitworth reports on computer simulations of chemical reactions that may arise if treated effluent is injected into the aquifer system as a means of artificial recharge. Dr. Whitworth currently is funded by the WRRRI for a project which attempts to verify and quantify clay-membrane induced precipitation of heavy metals in contaminated plumes in order to improve the fundamental understanding of the behavior of heavy metal transport in the subsurface.

The issue also includes a report on patterns of naturally occurring mineralization that can clog otherwise productive aquifer units by Whitworth, Peter Mozley and Joe Beckner. A fourth paper by Daniel M. Detmer describes the ability of different aquifer zones to transmit groundwater.

Geologic mapping of Rio Grande watershed

The New Mexico Bureau of Mines and Mineral Resources recently was awarded a \$165,000 USGS grant to conduct a detailed geologic mapping of eight quadrangles located in the Albuquerque and Santa Fe areas during 1996.

Geologists and hydrologists from the NMBMMR, New Mexico Tech, and the University of New Mexico will collaborate on the mapping project which will provide up-to-date information about the geology of each of the 60-square-mile quadrangles.

Geologic maps are fundamental tools used in most earth science studies and typically also are utilized by scientists and engineers in their investigations of geologic hazards, mineral resources and waste-disposal site evaluations, development of transportation routes, and water resources and land-use planning.

Hydrologist develops subsurface barrier

New Mexico Tech research hydrologist, Robert S. Bowman, has formulated a new method of combining two inexpensive, commercially available ingredients to develop a low-cost subsurface barrier material which traps a surprisingly diverse variety of contaminants, while allowing groundwater to flow past.

Bowman and his colleagues at Tech developed the innovative, permeable barrier material by treating zeolites—a group of minerals which ordinarily are used in water softening and as adsorbents—with the surfactant HDTMA, a chemical commonly used to make mouth-washes and hair conditioners. The surfactant coats the surface of the zeolites, leaving the internal pores of the cage-like minerals open for ion exchange. Using current prices, Bowman estimates that the modified zeolite would probably cost about 25 cents a pound.

The relatively inexpensive material can be used as a subsurface barrier to limit the spread of mobile pollutants in contaminated soils, protecting downstream aquifers as well as significantly reducing cleanup costs. Bowman also notes that one surprising discovery he made in his study is that the modified zeolite even seems to trap normally difficult-to-treat chromate ions.

Commercial interests have contacted Bowman about using the modified zeolites for other purposes, as well. "For example, they could be used in a packed bed to trap contaminants as part of a pump-and-treat operation," he explains. A 15-month pilot-scale study to evaluate the permeable subsurface barrier material is planned to begin next year.

Dr. Bowman has been supported through the WRRRI on several projects, the latest of which studies the impacts of pesticides on shallow groundwater in the Middle Rio Grande Valley.

Kudos to NM Tech

U.S. News and World Report ranked New Mexico Tech's graduate degree program in hydrology among the best in the nation in its annual rankings of graduate schools.

NM Tech's hydrology program ranked as the nation's fourth best in the specialty area of hydrogeology, behind such academic luminaries as the University of Arizona, the University of Wisconsin, and Stanford University.

Meet the WRRRI staff

Over 80 years of WRRRI experience is represented by the institute's current six staff members. Director Tom Bahr came to the New Mexico WRRRI from the Michigan institute in 1978; his doctorate in limnology was earned at Michigan State University. He is involved in water issues statewide, regionally and nationally, and currently is President-Elect of the National Institutes for Water Resources.

Assistant Director Bobby Creel has been employed by NMSU since 1968, and has spent much of his time since then on the institute staff. He served as the institute's Acting Director for two years while Tom Bahr served as cabinet secretary for the Energy, Minerals and Natural Resources Department during the Carruthers administration. Bobby is the WRRRI's computer guru and recently created WRRRI's Home Page on the World Wide Web. He uses his expertise in geographic information system (GIS) technology to assist WRRRI research projects as well as local, state and federal agency personnel. Bobby earned a Ph.D. in economics from UNM.

Darlene Reeves holds the WRRRI longevity record with 22 years of continuous service. She is responsible for administering research project activities and financial operations, and for preparing several institute status reports. Darlene is an NMSU alumna, having earned a bachelor's of independent studies.

Since 1986, Ellie Maese Duran has been the institute's administrative secretary, assisting the director and other staff members with administrative details and special projects. She has taken several courses at NMSU and is a member of the Mesilla Valley Chapter of Professional Secretaries International.

Divining Rod editor and conference coordinator, Cathy Ortega Klett, has been with the institute for nine years. She also is responsible for producing the conference proceedings and other special reports, and editing technical completion reports resulting from WRRRI-funded projects. She earned a master's of public administration in 1986 from NMSU.

Newcomer Cynthia Rex currently is revising the WRRRI's *Water Directory: Where to get water information in New Mexico*. In addition to providing assistance and information to students, faculty

distributed WRRRI publications, run errands, and video-taped several water conferences.

Tomasina Huie is a junior majoring in mechanical engineering. She comes to NMSU from Las Vegas, New Mexico and since last summer she has been working with Bobby Creel on the development of a bibliography of water supply related information in electronic database form.

Serving as Bobby Creel's right-hand-man on GIS is John Kennedy, who's been with the institute for two years. He is in the final stages of



Clockwise from front: Darlene Reeves, Ellie Maese Duran, John Kennedy, Tomasina Huie, Michael Smelker, Cynthia Rex, Bobby Creel, Tom Bahr, Cathy Ortega Klett. Photo by Linda G. Harris.

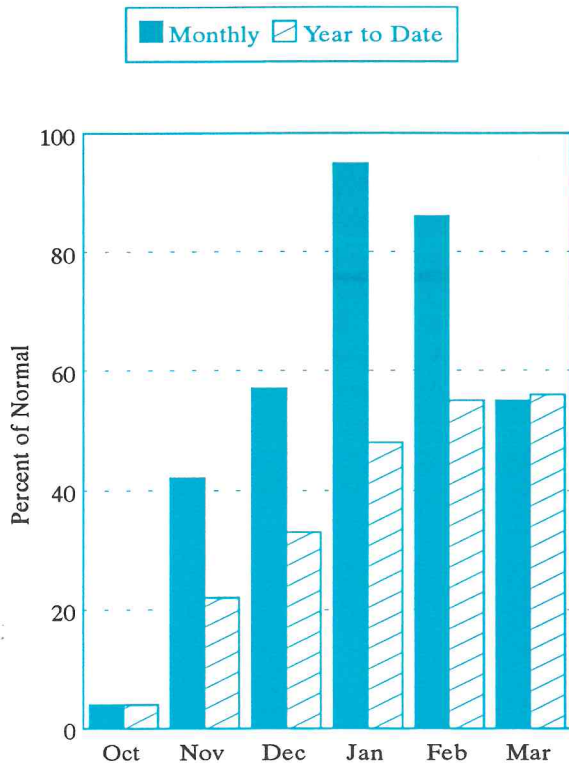
members, and other visitors, primarily through the institute's reference room, she assists with conference details, publications, maintains several databases, and provides support to other staff members. With the WRRRI since 1991, she received a bachelor's degree in sociology from the Regent's College of the State University of New York last spring after taking several years of courses while working at the institute full-time.

Four students work part-time at the institute. Michael Smelker graduates in May with a civil engineering degree. For the past three years he has

preparing his thesis for a master's degree in geology. John is working on several projects related to the Water Resources Data System and Geographic Information System databases.

The newest student assistant is Mohammad Hossan, having just started in March. He came from Bangladesh this year to work on a master's degree in computer science. One of Mohammad's primary duties is to maintain and expand the WRRRI's Home Page on the World Wide Web Internet system.

Precipitation for the Rio Grande Basin
(based on selected stations)



Source: Natural Resources Conservation Service Basin Outlook April 1, 1996

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Water Directory: Where to get water information in New Mexico

The WRRI currently is producing a new version of its water directory to be published this summer. Call Cynthia Rex at 646-1813 if your organization should be included or if you have any questions.

Tom Bahr, Director, New Mexico Water Resources Research Institute
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