

Projects receive nearly \$300,000

The WRRI's Program Development and Review Board has selected 13 projects for funding in the 1984-85 fiscal year for a total value of \$291,400. The average value of a project is \$22,415. The board made the selection from 36 submitted proposals. Last year, 31 proposals were submitted with 12 receiving grants.

This year also represents increases in total and average funding. In FY 1983-84, the total value of granted proposals reached \$255,985 for a project average of \$21,332.

NEW PROJECTS

- *Pilot-scale Studies of Spirulina Cultivated on Brackish Groundwaters of New Mexico.* Barry Goldstein, New Mexico Solar Energy Institute.

- *Surge Flow Irrigation on Closed Borders to Conserve Water.* Robert B. Hulsman, agricultural engineering, NMSU.
- *Stream-Aquifer Interaction: Influence of Variably Saturated Subsurface Flow.* Raziuddin Khaleel, geoscience, NMIMT.
- *Projections of Water Availability in the Gila/San Francisco and Lower Rio Grande Surface Water Basins to the Year 2010.* Brian McDonald, Bureau of Business and Economic Research, UNM.
- *Water Resources Archive Project.* Darlis A. Miller, history, NMSU.
- *Quantification of Ground-Water Recharge Rates in New Mexico Using BOMB-36 C1 as a Soil-Water Tracer: Phase I.* Fred M. Phillips, geoscience, NMIMT.

- *Somatic Cell Selection for Genetic Improvement of Water Use Efficiency in Crop Plants Using Alfalfa as a Model System: Phase I.* Gregory C. Phillips, horticulture, NMSU.
- *An Investigation into Water Use and Salinity Effects upon Trickle Irrigated Grape Production in the Southern Basin and Range Province of New Mexico.* Peter J. Wierenga, crop and soil sciences, NMSU.
- *Ground-Water Basin Parameter Estimation and Simulation Under Uncertainty: Phase I.* John L. Wilson, geoscience, NMIMT.

RENEWALS

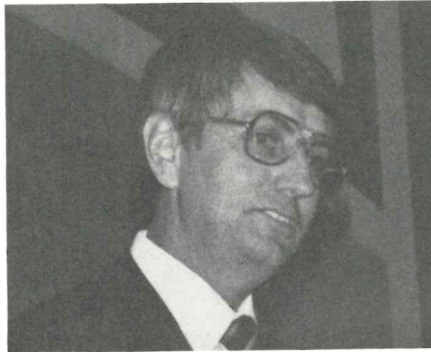
- *Biosorption of Heavy Metal Ions from Water.* Dennis W. Darnall, chemistry, NMSU.
- *Analysis, Assessment and Environmental Fate of Hazardous and Toxic Organic Compounds in Waters Generated by Activities of Natural Gas Industries in New Mexico.* Gary A. Eiceman, chemistry, NMSU.
- *Maximum Utilization of Rainwater and Limited Irrigation Water Under Semiarid Conditions.* H. D. Fuehring, NMSU Agricultural Science Center at Clovis.
- *Field Study of Natural Ground-Water Recharge in Semiarid Lowlands.* Daniel B. Stephens, geoscience, NMIMT.



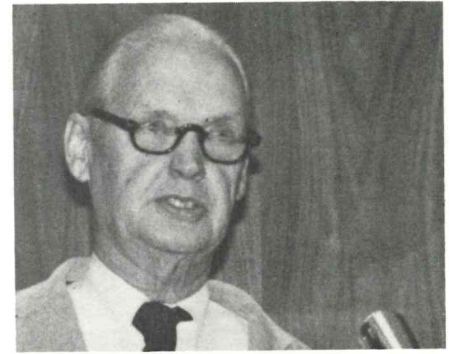
Greg Phillips, horticulture, NMSU, inspects alfalfa sprouts, which will be a cell source for research on improving water efficiency. The cell culture project recently was funded through WRRI.



In New Mexico, some water quality degradation is permitted so long as it is not harmful to future users. This approach allows beneficial use of water by adequately protecting future users without unduly restricting the activities of dischargers. — Bruce S. Garber, attorney, Albuquerque.



My great fear is that because of an abdication of state responsibilities and a crisis in water which we may soon reach, someone will decide we need a national water law; that the federal government should adjudicate and manage water resources. That would be chaotic. — Garrey Carruthers, assistant secretary, Land and Minerals Management, Interior Department.



Although water law is primarily state law, there are large federal implications under the U.S. Constitution with respect to the Indians, in treaties, interstate compacts, Supreme Court decisions and congressional allocations. — Robert Emmet Clark, professor emeritus, University of Arizona Law School.

1984 Water Conference



An NMSU meeting of the Idaho Alumni Association? No, its NMSU President Gerald W. Thomas receiving a plaque of appreciation from Ralph Stucky, former WRRRI director, and Thomas Bahr, WRRRI director. Thomas was the keynote speaker at the Water Conference. All three are University of Idaho graduates.

El Paso stirs action in Congress

Action on the El Paso water suit is underway on two fronts. U.S. District Judge Howard Bratton is hearing arguments from both sides in light of New Mexico's new law granting water export under certain conditions, while New Mexico's congressional delegation is pushing national legislation aimed at settling the dispute.

After an April 24 hearing in Albuquerque, in which both sides restated their positions in the case, Bratton gave El Paso 15 days to narrow its arguments and New Mexico an additional 15 days to respond. He said the two sides were not meeting "head on" with their arguments.

On May 11 El Paso filed the requested briefs, which contended

that New Mexico laws amount to a "policy of limiting exports to keep water within the state for irrigation agriculture." El Paso also said New Mexico's recent two-year moratorium on ground water export is "aimed directly at El Paso." New Mexico is required to respond to these arguments by June 1.

Meanwhile in Washington, New Mexico's five-member congressional delegation agreed to support a bill designed to halt interstate water disputes. The bill would prevent a state from taking water from another state unless authorized by interstate compact, an act of Congress, a U.S. Supreme Court action, or consent of the state holding the water.

The delegation hopes to gain

support from states with problems similar to New Mexico's, particularly the Great Lakes and Columbia River Basin regions. The need for congressional action was recommended by the Water Law Study Committee, which was created by the 1983 New Mexico Legislature.

In the United States, about 4.2 trillion gallons of precipitation fall each day as rain, sleet and snow. Two-thirds, 2.8 trillion gallons, evaporates. Another 1.3 trillion gallons fill rivers, streams and lakes. That leaves a mere 61 billion gallons a day to drain into underground aquifers.



Further definition of federal water rights, especially Indian claims, will be required before the certainty of investment attributed to the prior appropriation system and interstate compacts can again be the cornerstone of economic development in New Mexico.— V. Phillip Soice, executive assistant, Water Resources, Public Service Company of New Mexico.



The basic argument in the 19th century was that the Indians owned more land than they could use. The development of the laws then, was a process of first defining what the Indians had and then finding an orderly way of taking it away from them. Do you have to do much more today than cross out land and write in water? — Sam Deloria, American Indian Law Center, Albuquerque, N.M.



We western states have somehow missed the vital idea of reserving water for the future. We need to assert our state reserved rights by negotiating compacts and, where necessary, appropriating out of the water market sufficient water to meet the needs of future generations.— Charles T. DuMars, professor, University of New Mexico Law School.



Interior has been trying to encourage negotiation of the disputes over water in the West, principally those involving the federal reserved right on Indian reservations. It makes good sense to bring flexibility to the negotiating table, addressing these management and conservation issues and put some of these disputes to rest.— Larry Jensen, associate solicitor, Energy and Resources, Interior Department.

The 1984 Water Conference proceedings, "Water Law in the West," will be out by mid-summer. Registrants will receive a free copy; other copies can be ordered at \$5 each. The conference videotape also should be ready by mid-summer. The video fee will depend on production and editing costs. The institute will fill requests for the proceedings and the video as they are available.

Bipartisan vote resurrects research bill

On March 23 the House, following the Senate's lead, voted 309-81 to override President Reagan's veto of the water research bill. The bill authorizes water resources funding of \$36 million a year for the next five years. Of that, \$10 million is for water institutes, \$20 million for matching grant research and \$6 million for technology development.

Reagan's budget cutting veto was defeated in a bipartisan move that marked only the fourth time he had lost a veto fight. Supporters of the bill said it would provide a catalyst to attract state and private money into water research.

"The Office of Management and Budget (OMB) is always looking for places to slash budgets," said Thomas G. Bahr, WRII director,

"but sometimes they are not fully informed of the consequences of their actions. The veto sounds like the OMB gave the president some bad advice."

Bahr said the nation cannot af-

ford to abandon fundamental research. "Research is an investment, not an expenditure. Without research, America would not have achieved its status as the world's technological leader."

WRII publications ready

Misc. #15 - *New Mexico Water Rights* - Harris, L.G. - March 1984

#174 - *Irrigation Evaluations and Improvements in New Mexico to Conserve Water and Energy* - Hulsman, R.B. - September 1983

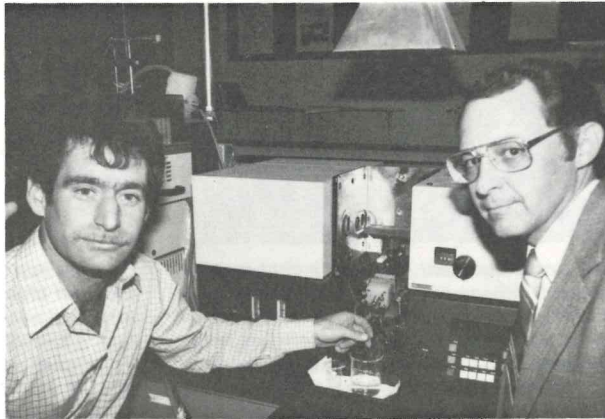
#171 - *The Effect of Moisture Stress on Corn Production in the High Plains* - Sammis, T.W. - May 1983

#169 - *Proceedings of the New Mexico Water Resources Research Institute Symposium, "Water Quality in New Mexico"* (Copy charge: \$5) - June 1983

#160 - *A Simplified Test for Solar Water Purification* - Redman, C.M. - March 1983

Algae cleans up metals

Graduate student Ben Greene (left) and chemist Dennis Darnall go over results from the atomic absorption spectrometer, which is used to analyze metal concentrations. Greene recently won the student research competition at the 1984 Water Conference.



Just when high tech is in vogue, chemistry researchers at New Mexico State University are taking a "low tech" approach to cleaning up polluted water. They have found that certain metals have an affinity for algae, the stuff of slimy ponds, and will stick to the surface of the green cells.

Chemist Dennis Darnall, who heads the research project, said low tech also means low cost. "Industry now uses a petroleum based resin to collect the metal residue from smelting and mining. The resin costs \$90 a pound, while algae costs only 20-50 cents a pound," he said.

Algae is a bargain because of New Mexico's low tech natural resource—the sun. Solar energy fuels photosynthesis, which produces algae rich in proteins and carbohydrates. Previous research at NMSU proved New Mexico could support large scale algae produc-

tion.

Darnall, seeing the potential of algae in his research, applied to the New Mexico Water Resources Research Institute for a \$2,500 pilot project on metal binding in algae. Results from that project lead to a \$25,000 one-year grant to pursue his findings. In April 1984 the Bureau of Reclamation awarded Darnall \$124,143 for a full scale research program on biosorption of heavy metal ions.

Biosorption is a chemically logical process, at least to a chemist. Metal ions, which are water soluble, are either positively or negatively charged. Algae cells, in turn, are made up of hundreds of side chains of carbohydrates, proteins and other organic materials, each possessing its own chemical charge. Darnall explained that metal ions have an "affinity" for these side chains and bind with them on the cell wall.

"We knew that fungi and bacteria could bind metals, and we thought algae would too. Sure enough," he said, "the metals bound like gang busters." In experiments running cadmium and lead solutions through an algal column filter, binding was complete within two minutes. Binding works even better when the algae cells are dead, possibly because the ions can group closer together along the cell wall.

Through reversed logic, the researchers found they could break the metal/algae bond by lowering the pH of the solution. In acidic solutions, protons are stronger competitors for bonding sites and disrupt the equilibrium of the metal/algae interaction. In less than a minute after the pH is lowered, the metal ions drop away.

Darnall said discarded metal ions can be recycled. The algae cells also can be reused in filters. The researchers just have to take care that the acid solution used to break the bonding is not so strong it digests the cell.

Now that the researchers know metal ions will bind to algae, they are determining the best conditions for binding a variety of metal ions to different algae species. In the process, they also will study the effects of saline water on binding and binding reversal.

Their ultimate goal, said Darnall, is to "customize" the algae cells to recover heavy metal ions from various waste waters while keeping their low tech model inexpensive.

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