

divining rod

Vol. XII No. 4

New Mexico Water Resources Research Institute

December 1989

Pecos River Settlement: Why We Won

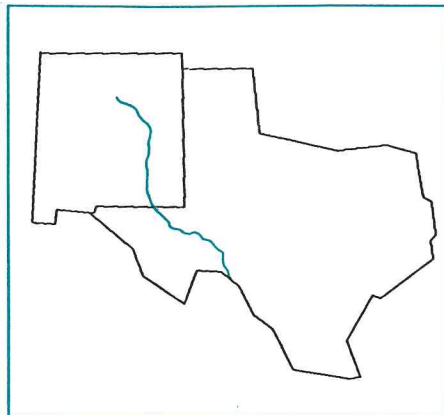
The \$14 million judgement awarded Texas in the Pecos River settlement marks the first time that one state must pay another state for a river compact violation. However, the state of New Mexico is pleased with the result. Fourteen million dollars is much less than the \$1 billion Texas asked for at one point in the suit and provides less of a hardship than would the repayment of the 385,500 acre-feet of water Special Master Charles Meyers determined New Mexico owed Texas for the years 1952-1986. The August 9 settlement surprised some after only a two-week hearing before Special Master Monte Pascoe.

Henry Bohnhoff, one of New Mexico's attorneys in the case gave an overview of the settlement during the 34th Annual Water Conference. In what Bohnhoff termed "an unusual move," Pascoe gave attorneys an indication he would favor New Mexico in the case's settlement.

Bohnhoff explained, "First he indicated he was not willing to give Texas the water, because it would be extremely wasteful to shut down numerous New Mexico farmers in order to gain only a very small benefit. Second, he told us that he was not inclined to grant damages based on New Mexico's gain, because there had been no showing of bad faith." Pascoe also indicated he would award "fairly significantly" less than the \$51 million Texas claimed," said Bohnhoff.

Texas' experts testified that farmers in the Red Bluff Water Power Control District would have made \$51 million in profits if the water had been delivered to Texas. They also claimed during the thirty-four-year period farm-

ers in New Mexico made \$1 billion in profits and asked the Special Master to award damages based on their gain. New Mexico countered that its farmers would lose \$85 million if it had



to deliver the extra water over a ten-year period, compared to the \$2.5 million Texas farmers could make by using the additional water. New Mexico economists also testified that Texas farmers would have made only about \$8 million because of the irrigation problems farmers face in the Red Bluff District.

Bohnhoff explained there are three problems confronting the farmers. The first is a 70 percent carriage loss from the state line to the farms--only about 6 cubic feet of water per second would reach the farmers' headgates. The second problem is salinity. Near the Texas border at Malaga Bend, the brine accretions naturally increase the river's salinity. The maximum amount of salt allowable in irrigation water is 2500-3000 ppm. "The average salinity of the water Texas could have expected to receive, even had New Mexico

delivered the extra water would have been about 7000 ppm," reported Bohnhoff. The third problem the district faces is the Pecos' extreme variability in flows. "New Mexicans have that problem, too," explained Bohnhoff, "but it was exacerbated for Texas by the fact that Red Bluff Dam, as far as we could figure out, has never been used to even out the flows of the river in Texas. The water comes down, and next year it's released to the maximum extent possible."

"The bottom line was, faced with these natural problems, the Texas farmers never could make much of a profit from Pecos water, while New Mexico farmers can," Bohnhoff told conference participants.

In this issue

Speakers at the 34th Annual New Mexico Water Conference gave excellent talks focusing on southeastern New Mexico. We'll present some of the ideas discussed in this issue.

Landfills and recycling: we'll hear more later 2

The Pecos adjudication . . . 3

EID makes ground-water quality awards 4

Technical report briefs . . . 5

Aquifer, Rio Grande hydraulically connected says USGS report 6

Landfills--A Water Quality Issue

Governor Garrey Carruthers told participants at the 34th Annual Water Conference that "water quality will be the issue of the 1990s very simply because failure to protect water quality is the same as fighting with Texas over water."

He explained that either Texas will fight with New Mexico to take away its water or "we'll degrade water such that we will not be able to use it anyway and therefore, it makes no difference whether we're fighting with Texas or whether we're fighting with ourselves over protecting water resources."

In dealing with water quality, Carruthers sees landfills as one of the greatest threats to the state's water quality. Of the solid waste regulations which went into effect May 14, he said, "I don't know why we waited so long to acknowledge that landfills are creating so many problems for ground water resources."

These regulations to bring landfills up to par reduced the number of landfills in the state from approximately 240 to 130. Carruthers remarked that those landfills which closed weren't being properly run and there was "suspicion on the part of county commissioners and mayors that if not closed quickly, you'd be subject to cleanup costs and fines." But he maintained many of

those remaining landfills are "very poorly run and endanger the ground water of the state," and added that several are on the EPA Superfund list.

Environmental Improvement Division Head Richard Mitzelfelt observed there had been some transition problems including continued use of sites which have been closed. Other problems entail bulk containers which are not large enough to contain the waste and illegal dumping in arroyos.

The solid waste regulations also brought a lawsuit by the Municipal League and the Association of Counties against the state to obtain a stay of the regulations.

Roswell Mayor Bill Brainerd, one of the local government leaders involved in the lawsuit, said he believes local governments "are put in a terrible bind, because we have all these mandates coming down from the state and from the federal government, with absolutely no ability to implement them or pay for them." According to Brainerd, this was the reason a constitutional amendment passed several years ago, which says that if the state mandates an increase in local government services or facilities, it must provide a means to pay for the increase.

Brainerd explained, "the essence of that lawsuit is not that we need better

landfills or that the cities are not willing to do what's necessary to bring those things into compliance, it's a test of that constitutional amendment."

Many local government representatives think the state should raise taxes to cover the costs of cleaning up landfills; the governor thinks local gov-

See Landfills, page 4

Recycling Wave of the Future

In addition to more landfill legislation during the upcoming legislative session, we can also expect legislation on recycling to be discussed. The EPA has set a goal to recycle 25 percent of the nation's garbage.

EID head Richard Mitzelfelt told Water Conference participants, "This issue on recycling is being wrestled with right now by the governor's task force on solid waste management and the legislative interim committee on the environment, land use, and solid waste management. We do expect that we'll have a bill with some mandates on recycling coming up in the next legislative session."

Governor Carruthers has appointed a task force on recycling which he says will work to encourage recycling in New Mexico and begin the education process. "We have a lot of products that can be recycled, but in our state for some reason, I think in part because we don't have the demand structure here, we don't have enough of it to create a new industry."

Recycling is one way to keep landfill costs down. In 1965, New Mexicans threw away 2.65 pounds of garbage per person per day. In 1986, that figure was up to 3.58 pounds per person per day, due in large part to the disposable society we have become.

How do the new solid waste regulations protect ground water?

According to Richard Mitzelfelt, Environmental Improvement Division director, the new regulations provide for the following:

- A permit process which addresses ground-water protection issues and provides for detailed applications and review, including public input
- Stringent site conditions
- Ground-water monitoring for all facilities that can potentially impact ground water
- A requirement that operators must be on site when the landfills are open
- Random inspection of loads by the operators for hazardous wastes

Pecos River Adjudication: 33 Years and Still Pending

The thirty-three-year-old Pecos River adjudication is the longest pending water litigation in New Mexico. It is important not only for this reason, Peter White, general counsel for the

Quite a bit of law governing water rights and adjudication rights in New Mexico has arisen out of this suit.

Peter White

State Engineer Office, told 1989 Water Conference participants, but also because: "There have been eighteen New Mexico Supreme Court opinions that have been written on matters of appeal from decisions of district court in this adjudication suit. So quite a bit of the law governing water rights and adjudication rights in New Mexico has arisen out of this suit."

First filed in 1956, the suit, now known as the Lewis case, was initiated by the state and the Pecos Valley Artesian Conservancy District to adjudicate rights in the Roswell basin. Two years later another suit was filed by the state and PVACD to adjudicate water rights of the Hagerman Irrigation Company and about 100 water users on the canal. White said the two cases were consolidated in 1965 in order to have a comprehensive adjudication, allowing the two groups of defendants to challenge each other's rights and other rights within the basin.

In 1966 a partial decree was filed--partial because it did not determine the rights of the United States. However, it contained "some fairly significant water administration or water management provisions," White observed. The decree gave title to ownership of rights of approximately 1900 of the defendants. It also prohibited illegal uses of water. Any use of water without a court order authorizing that use could be illegal and could be enjoined before the court. Finally, the decree required that all defendants install water meters on their wells and make annual reports to a water master.

In 1974 the case was enlarged again to include all water right claims within the Rio Hondo system. The Rio Hondo and its tributaries are sources of recharge to the Roswell basin and appropriations from the Rio Hondo system could affect adjudication rights in the basin. The system includes water right claims of the Mescalero Apache Tribe, the Lincoln National Forest and over 400 individuals.

In 1978 the case was enlarged a third time to include all water rights within the Pecos River drainage basin. This stemmed from a 1976 request by the Carlsbad Irrigation District for the state engineer to administer the Pecos River system according to the doctrine of prior appropriation. CID claimed it was not receiving as much water adjudicated to it by the 1933 Hope Decree because of upstream users who had later priority dates than the district had. The district's rights date back to 1887. Since 1950, CID has had a shortage of about 45%. The district makes up the shortage by using ground water.

Due to the significant shortage, in

Shutting down junior rights is not responsive to meeting needs on the Pecos. . . .

Fred Hennighausen

1982 the state engineer requested the district court expedite proceedings. The court entered an order whereby all water right owners in the Pecos River basin holding right priorities after 1946 could be prohibited from using their rights. The 1946 cutoff date was chosen because a study indicated if water right holders with priority dates later than 1946 were barred from exercising their rights, the CID might begin to receive the amount of water to which it was entitled. A significant increase in water supply would be realized if the post-1946 rights are terminated--this involves about 18 percent of the irrigated acreage in the Pecos River basin, according to White.

It could be another decade or more before rights in the Pecos River basin are adjudicated. The adjudication of rights within the CID most likely will begin this winter. Those holding post-1946 rights will have an opportunity to challenge water rights in the district before the junior rights are prohibited from future use.

Fred Hennighausen, a Roswell attorney who was district supervisor in the Roswell State Engineer Office for twenty-four years, spoke at the water conference about the outlook for future water use in Pecos stream system. He told the group, "Shutting down junior rights is not responsive to meeting needs on the Pecos....Strict priority administration in my view would result in gross inequities."

Hennighausen sees the need for overall planning and "for people to start working together up and down the river system as a group, whether it be an overall conservancy district or just the individual water user groups working together." He proposed the area begin looking at measures such as storage of water and evaporation suppression that might be taken to help alleviate shortages.

Hennighausen suggested "timing releases between reservoirs to take advantage of depth and reduce surface area," thus minimizing evaporation; possibly implementing underground storage of surface water which could be released at a constant rate to downstream users; additional salt cedar eradication; and perhaps pumping wells adjacent to the Pecos River with compensation to the well owners.

Information for this article was taken from the speeches by Peter White and Fred Hennighausen given at the 34th Annual Water Conference, "Pecos River Water Rights Adjudication" published by the State Engineer Office and Water in New Mexico: A History of Its Management and Use by Ira Clark.

EID Awards Progressive Organizations for Water Quality

The New Mexico Health and Environment Department's Environmental Improvement Division awarded its first annual Ground Water Quality Awards to three businesses which have shown excellence in their efforts to protect ground water. The three organizations are Romig Dairy, Browood Homeowners' Association and the City of Albuquerque's Double Eagle Soil Amendment Facility.

The Romig Dairy north of Las Cruces has been run by B. J. Romig for forty years. Dairies have been required to submit waste water discharge plans to the EID since 1977 because of their potential to contaminate ground water with nitrates. Romig has taken actions beyond the discharge plan requirements by upgrading his disposal facility and has maintained a good record fulfilling the self-monitoring requirements of the discharge plan.

The water which is used to wash Romig's 300 cows twice daily is pumped into two holding ponds where the manure is allowed to settle before the remaining water is siphoned into a larger pond. After the manure dries in the holding ponds, it is spread as

fertilizer in nearby fields. The waste water also is recycled for irrigation after it is diluted.

The Browood Homeowners' Association in Pueblo Los Cerros near Corrales operates a 50,000 gallons-per-day domestic waste-water treatment facility. The treated effluent is chlorinated to kill pathogens and used to spray irrigate landscapes in the subdivision with no ground water quality degradation. The effluent quality is tested monthly and two wells nearby are tested twice annually to determine any ground-water impacts.

The Double Eagle Soil Amendment Facility handles approximately 30 tons of treated sludge per day from Albuquerque's southside waste-water treatment plant at its 700-acre site. According to EID, the facility's excellent location and professional management ensure continual ground-water protection efforts.

David Brosman, assistant director of Albuquerque's Public Works Department says the site is "just a good application site" not only because it is remote, but also because there is no

off-site drainage, it is 1200 feet above ground water and has "excellent geological characteristics."

The Double Eagle Facility, located west of the Double Eagle Airport, began Phase I of its operations two years ago with an investment of approximately \$5 million by the city to build roads and obtain power as well as build the facility. Although now the facility is only a depository for anaerobically digested sludge trucked in from the waste-water treatment plant, Phase II of its operations will turn the sludge into environmentally approved compost. The compost would be sold to offset operation costs.

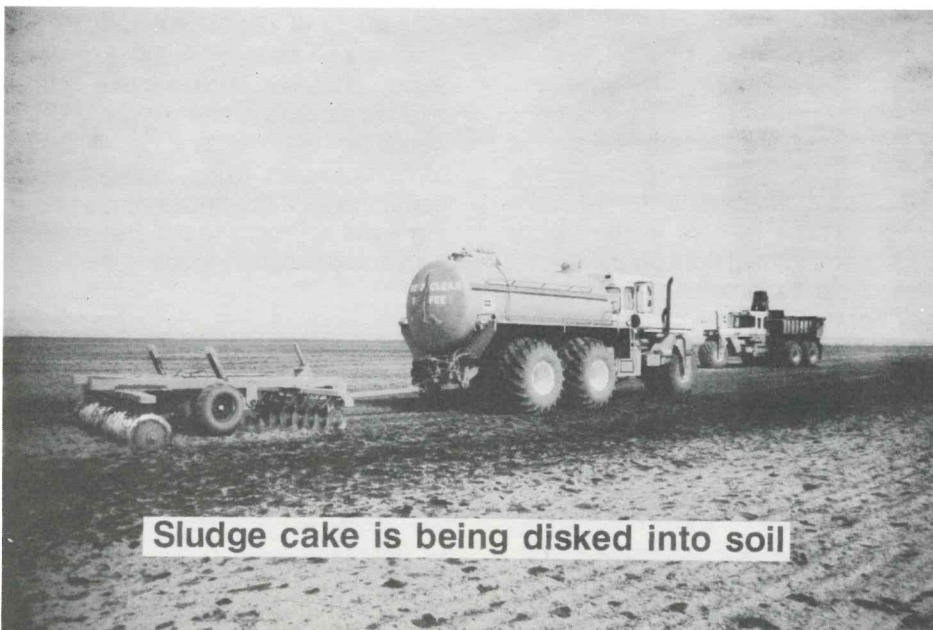
Brosman says they hope to go to bid this spring to build the composting facility, which will cost about \$8 million. It will help extend the life of the Double Eagle Facility 20-25 years by getting rid of one-third of the sludge which is now dredged into the soil.

Landfills

ernments should raise taxes. There is disagreement as to whether the clean-up should be financed by general taxes or a user's fee. "In my view," Carruthers said, "those that create most of the garbage ought to pay most of the fee."

One mayor who disagrees with Carruthers on this point is Carlsbad Mayor Bob Forrest. Forrest owns a number of tire companies in southeastern New Mexico and west Texas. He reported on something which was tried in Carlsbad:

"Someone came up with the bright idea that they'd start charging us a dollar for every used tire. So what we'd do, when we would sell a set of tires, we'd say, 'Would you like to take your old ones with you? They make good swings and things like that.' And pretty soon, tires start showing up all over the city." Forrest said finally the city decided the charge was not working--the tires needed to be in the landfill so they would not stack up in vacant lots or create places for mosquitoes to breed. "If you don't do it that



Sludge cake is being disked into soil

The photograph above shows the spreading and disking process used at the Double Eagle Soil Amendment Facility.

See Landfills, page 6

WRRRI Technical Report Briefs

The following new technical completion reports may be ordered free of charge by writing the New Mexico Water Resources Research Institute, Box 30001, Dept. 3167, Las Cruces, NM 88003-0001 or calling (505) 646-1813.

Report No. 245: Analysis of Soil-Water Movement on a Sandy Hill Slope. By James T. McCord and Daniel B. Stephens, New Mexico Institute of Mining and Technology. October 1989.

Theoretical studies have shown variable, state-dependent anisotropy in unsaturated soils is an effective, macroscopic flow property which results from media textural heterogeneities at a smaller scale. Because direct field evidence for state-dependent anisotropy was lacking, McCord and Stephens conducted a series of tracer experiments in a natural field setting with simultaneous hydraulic head monitoring. They believe the experiments, detailed in the technical report, provide strong evidence for state-dependent anisotropy.

In addition to textural heterogeneity, the researchers found another factor contributing to anisotropic behavior which they termed "moisture-dependent variations in hydraulic conductivity." They demonstrate how this phenomena can cause texturally homogeneous materials to behave as hydraulically anisotropic media and how hysteresis in the soil moisture characteristics tends to magnify the phenomena.

A major part of the report investigates the implementation of variable state-dependent anisotropy in a numerical model of unsaturated flow. McCord and Stephens discuss the validity of the commonly used approach of handling anisotropy in variably saturated flow models and introduce a straight-forward general procedure for implementing variable anisotropy.

Report No. 246: Heat Shock Protein Expression in Thermotolerant and Thermosensitive Lines of Cotton. By Mary A. O'Connell, New Mexico State University. November 1989.

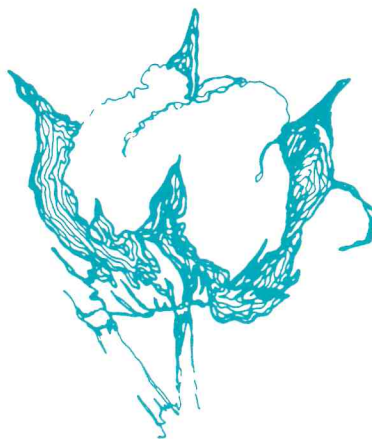
The discovery of heat shock proteins (HSPs), specific proteins which are expressed at high temperatures, has caused considerable speculation in

their possible role in plant mechanisms controlling heat tolerance. This project tested the hypothesis that differences in HSPs or in HSP expression are correlated with genotypic differences in plant heat tolerance.

O'Connell investigated the role of HSPs in the expression of heritable thermotolerance in two lines of cotton, genetically characterized as heat-tolerant and heat-sensitive. The comparisons of the cotton types were based on electrophoretic gel analysis of *in vivo* labelled proteins. No differences were observed between the two lines with regard to:

- the temperature at which HSP synthesis was induced or the temperature at which HSP synthesis was maximal
- the rates of recovery from HSP synthesis or in the duration of HSP synthesis
- the major size classes of HSPs expressed in these two lines.

Several HSPs were identified on two-dimensional gels which were expressed uniquely in either the tolerant or sensitive strains of cotton. However, O'Connell's results indicated that the differences in heritable thermotolerance observed in the lines of cotton are not the result of differences in regulation of HSP expression.



Report No. 247: New Gene Sources for Development of Agronomic Plants with Tolerances to Drought and Other Abiotic Stresses. By Glenn Kuehn, New Mexico State University, November 1989.

This project was an investigation in plant/biochemistry/molecular biology/molecular genetics directed toward saving water through the development of water conserving plants.

Kuehn identified and characterized a new gene product, an aminopropyl-transferase enzyme, in *Thermus thermophilus* HB8, a thermophilic eubacterium. This enzyme has the capacity to synthesize uncommon polyamines (which may be protectants against abiotic stresses such as drought and heat) and demonstrates an exceptionally high specific activity, even at suboptimal temperatures around 40°C. If the gene for this enzyme is isolated, cloned, and transferred to plant species, a functional protein should be expressed at temperatures experienced by plants in high-temperature environments.

Another important finding of this project was that drought-tolerant genetic lines subjected to stress conditions synthesized uncommon polyamines in significant amounts. Two uncommon polyamines were identified in alfalfa extracts and their respective chemical structures confirmed by mass spectrometry. This finding was unprecedented. It was presented in a paper written by Kuehn and two colleagues, B. Rodriguez-Garay and G. C. Phillips, which represents the first literature report of the occurrences of uncommon polyamines in a higher plant.

Currently the principle investigator is working on isolating the aminopropyl-transferase gene from *Thermus thermophilus* HB8. The availability of this gene will provide opportunities to study the consequences of uncommon polyamine synthesis in non-thermophilic microorganisms.

New USGS Reports **Rio Grande, Ground-Water System Connected**

Aquifer tests conducted at the Rio Grande near Canutillo, Texas show the river to be hydraulically connected to the shallow ground-water system, according to a report released by the U.S. Geological Survey. Edward L. Nickerson of the USGS's Las Cruces office is the author of "Aquifer tests in the flood-plain alluvium and Santa Fe Group at the Rio Grande near Canutillo, El Paso County, Texas."

Nickerson explains that water movement from the river to the aquifer is due to the hydraulic gradient between the river and the shallow flood-plain alluvium. When the Rio Grande's water level is higher than that of the aquifer, water flows from the river to the aquifer. The opposite can occur, too. When the water level of the aquifer is higher than that of the river, water flows from the aquifer to the river. Thus, pumpage from the aquifer can affect the river.

Aquifer properties such as transmissivity, storage coefficient, and hydraulic conductivity were determined for the shallow, intermediate and deep zones from a series of multiple-well aquifer tests at the test site. The report was prepared in cooperation with the New Mexico State Engineer Office, the City of El Paso, the International Boundary and Water Commission, the U.S. Bureau of Reclamation and the

City of Las Cruces. Copies may be ordered soon from Books and Open-File Reports, USGS, Federal Center, Box 25425, Denver, CO 80225, (303) 236-7476.

There are two other recent USGS reports which may be of interest to New Mexicans. "Conversion and comparison of the mathematical, three-dimensional, finite-difference, ground-water flow model for the Tesuque aquifer system in northern New Mexico," by Amjad Umari and Timothy Szeliga is Open-File Report 89-26. It may be ordered for \$6.75 from the above address. The model is an integral part of the New Mexico v. Aamodt, et al. adjudication case now in progress.

"Water Resources Investigation Report 88-4228, "Statistical summaries of streamflow data in New Mexico through 1985," by Scott D. Waltemeyer includes low and high-flow frequency analysis and flow-duration analysis for 169 streamflow gaging sites in New Mexico. Mean monthly and mean annual discharge summaries are presented as well as maximum, minimum, standard deviation, coefficient of variation, and percentage of annual runoff. It may be ordered from the above address for \$31.25 in paper and \$4 on microfiche.

Landfills

way and let everyone share in the cost, you're going to find a lot of this stuff. It's like closing the cemetery and pretty soon the dead bodies are going to start showing up all over town. You're not going to get rid of the problem and I think it's going to have to be a problem that rests with everyone," Forrest maintained.

To bring New Mexico's current landfills into compliance will cost an additional \$18 million annually. Carruthers admitted "small communities would have to pay handsomely for properly managed wastes." He predicted it will cost some small communities as much as \$96 per ton to bring their landfills into compliance, although larger cities such as Albuquerque and Las Cruces which have sufficient capacity and load would be able to cover costs.

One option to improving current landfills is to establish regional landfills. This plan was proposed by the task force on solid waste management and is one the governor has said he would support this legislative session. Under the plan, 18-20 landfills statewide would serve a population of 25,000-100,000 each. New Mexicans now pay about \$12 per ton for waste disposal. With regional landfills it would cost about \$13 per ton.

Tom Bahr, director, New Mexico Water Resources Research Institute
Leslie Blair, editor

the divining rod
New Mexico Water Resources Research Institute
Box 30001, NMSU, Dept. 3167
Las Cruces, NM 88003
(Address correction requested)

Non-Profit Org.
U.S. Postage
PAID
Las Cruces, NM 88003
Permit No. 162