

**WATER RESOURCES of the  
LOWER PECOS REGION,  
NEW MEXICO**

**Science, Policy, and  
a Look to the Future**

Peggy S. Johnson, Lewis A. Land,  
L. Greer Price, and Frank Titus, Editors

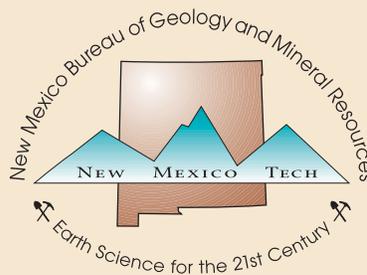
**DECISION-MAKERS  
FIELD CONFERENCE 2003**



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New Mexico Bureau of Geology and Mineral Resources  
A Division of New Mexico Institute of Mining and Technology  
2003

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## Preface

This volume was compiled for the third Decision-Makers Field Conference, organized by the New Mexico Bureau of Geology and Mineral Resources, a research and service division of New Mexico Tech. For seventy-five years we have served as the geologic survey of New Mexico, tasked with providing information to scientists, decision makers, and the general public on the geologic framework of New Mexico.

These conferences are one important way in which we accomplish that mission. In three days of focused discussions in the field, we explore issues of importance to the people of New Mexico. This year's trip to the lower Pecos River region of New Mexico focuses on water resources, for it is here that the critical water issues of New Mexico (and the arid Southwest in general) are playing out in a very real and compelling way. What happens on the Pecos River in the next few years will provide a path for solving other water crises in New Mexico—either through our success or our failure.

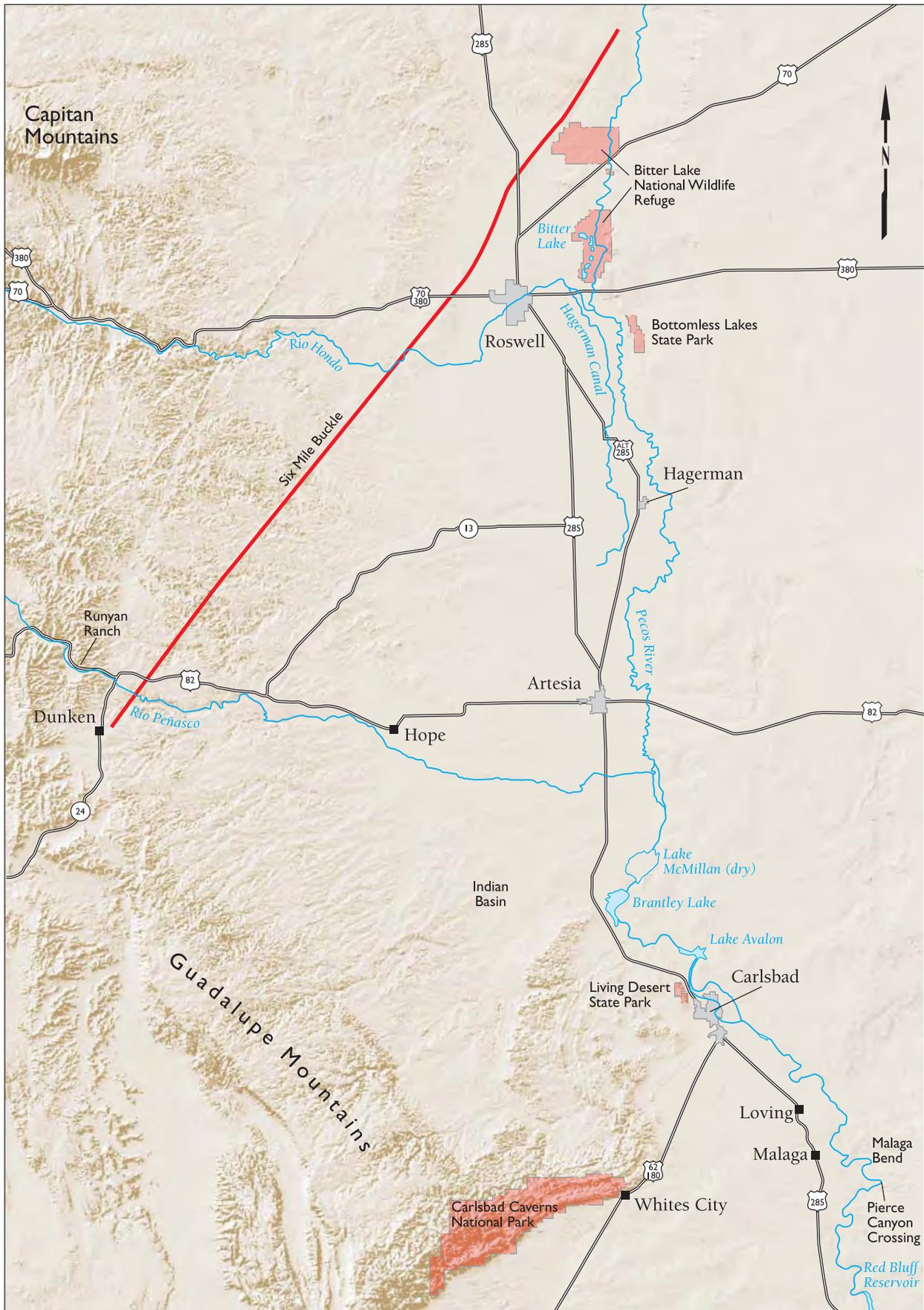
The authors of these papers were chosen based on their current positions, background, areas of expertise, or long-standing experience in New Mexico. It was our intention that they speak from a position of authority to provide the necessary background for understanding these complex issues, an understanding that is important to the general public as well as to those in decision-making positions.

We tried to achieve a balance of topics, issues, and voices, providing historical background, a look at current issues, and some idea of the directions that future science and policy might take. We asked individual authors to provide facts rather than opinions, but such papers invariably reflect to some degree the views of their authors. Those views do not necessarily represent the voice of the New Mexico Bureau of Geology and Mineral Resources or our partner agencies.

Although it is not our intention to lobby for specific legislation or press for change in one direction or another, it is our belief that sound policy-making must be based on sound science. Problem-solving is facilitated through open discussion and, ultimately, a thorough understanding of the problem. Our hope is that these conferences—and this guidebook—represent a step in that direction.

-The Editors

Map of Field Trip Area



# An Introduction from the State Geologist

Peter A. Scholle, *New Mexico Bureau of Geology and Mineral Resources*

This year's Decision-makers Field Conference is the third in our ongoing series of meetings that deal with geological and hydrological issues in New Mexico. These conferences are designed to provide New Mexico decision makers with the opportunity to see, first hand, the influences and impacts of natural phenomena and human actions on our resources and landscapes. The conferences also provide an opportunity for participants to hear, see, and interact with leading scientific and technical experts from a wide range of partner organizations, who present material essential for an understanding of the relevant issues and their potential solutions. They are the authors of most of the papers in this volume. We strive to present a balanced program and to educate rather than lobby for specific legislation. Having said that, however, we and our many partners hope that the information presented, contacts made, discussions engaged in, and continued interactions after the trip will lead to useful legislation for New Mexico.

This year's meeting, on water issues in the lower Pecos River region, highlights some of the most important and contentious issues in New Mexico's future. The Pecos has always been a "difficult" river—prone to extremes of flow, from mere trickles at some times to massive, dam-destroying floods at others. Yet the surface and subsurface waters of this basin were the essential resource that drew people to this region in the first place. These waters, along with petroleum and potash, have been the principal source of most of the wealth generated in southeastern New Mexico since those early days. Today a wide range of interests are competing for those limited water resources, including traditional farming and ranching, municipal needs, a growing dairy industry, the water demands of native and non-native vegetation in riparian and higher-elevation watershed areas, the need to protect endangered species, and, of course, the ever-popular Interstate Compact- and Supreme Court-mandated water deliveries to downstream users in Texas. The situation is further complicated by current drought conditions that, if they are indeed part of a predicted drought cycle, may extend into the next several decades. Finally, there are the difficulties inherent in administering water allocations under the "prior usage" water laws of the West. These laws make water conservation difficult and lock in place historical pat-

terns of water usage that are sometimes quite inefficient.

Clearly, the future of the lower Pecos River basin depends on rational and effective use of the scarce water supplies available in this arid region, with an eye not just on current users, but also on the needs of future generations. The consensus agreement recently reached by most of the competing parties in the lower Pecos River basin is certainly laudable, and vastly preferable to drawn-out conflict, expensive legal action, and decisions made by river masters, federal agencies, or judicial courts. The consensus agreement on the Pecos has been widely praised; it has been held up as a model for dealing with water issues in other parts of the state and indeed throughout the arid Southwest. Yet, in some senses, the agreement is not a very satisfying solution. For one thing, it involves the State buying back (on a voluntary basis) senior surface water rights of farmers and ranchers—an expensive scheme that is paid for largely by taxpayers from other areas of the state. It's a plan that may have long-term negative impacts on the productivity and economic base of the lower Pecos region and on its pastoral agricultural and ranching character. Although the consensus plan correctly recognizes the fact that water is a finite resource and that surface and subsurface water supplies are inextricably linked, it does not really address the efficiency of water use or the possibilities of finding additional water. It is essentially a status quo agreement that brings supply and demand back into balance mainly by addressing demand, and then only overall demand, not the savings that could be realized within the demand sector.

Perhaps we can do better. I believe that we should also be taking at least a fraction of the kinds of dollars being put into water-rights buybacks and investing them in both applied research and the implementation of positive solutions developed through that research. Such an approach eventually may allow resumption of the economic growth of the lower Pecos region, mainly through more efficient use of known water supplies, but also through development of currently untapped water resources. That requires not just scientific study, but also legal clarification of water ownership issues (particularly in the area of deep, saline waters, in particular those waters co-produced during a variety of energy-related activities). It may also require legislative

incentives for the adoption of desirable but expensive water conservation or desalinization practices. Here, in no particular order, are some possible areas for further research and implementation:

- Uplands watershed management practices, especially forest thinning programs and other management issues related to water yields from headwaters areas;
- Salt cedar control and other riparian habitat management technologies;
- Improved drip irrigation and sub-plow-level irrigation systems or other technologies to achieve current or improved crop yields with less water use;
- Modeling of the effects of more efficient agricultural irrigation practices (with less return flow to rivers) on future in-stream water quality;
- Evaporation reduction technologies applicable to surface reservoir storage in desert areas;
- Improved understanding of optimal areas for temporary underground storage and later recovery of water;
- More accurate and cost-effective methodologies for monitoring of ground and surface water use;
- Delineation of moderately saline and highly saline ground water supplies throughout the region, coupled with a better understanding of their hydrogeology (especially recharge rates and the potential effects of withdrawing water from those units);
- Research on cleanup and productive use of waters associated with petroleum production (co-produced waters), dewatering of coalbed methane areas, CO<sub>2</sub> sequestration, and other subsurface energy-related programs;
- Clarification of water-rights issues associated with co-produced waters;
- Research on more effective techniques of desalinization coupled with clarification of water-rights issues in this area, and incentives for establishing desalinization facilities;
- Modeling of methodologies for (and effects of) the disposal of saline brine residues from future desalinization programs;
- Legislative research into programs that would allow real water banking and water conservation without jeopardizing water rights. The buying, selling, and leasing of water rights is only part of banking. Savings are the essential core of most banking systems, and in the case

of water banking this should include allowing injection of water into aquifers for subsurface storage as a productive use or being able to save, as well as sell or lease, water conserved through efficiencies in agricultural or industrial practices.

Certainly some work (in some cases substantial work) has been and is being done in all these areas, but generally not at a scale or pace commensurate with their importance to the critical water needs of New Mexico. It is my personal hope that this trip will not only elucidate the water problems on the lower Pecos, but will show participants two additional things: there is much we still don't know in many areas critical to proper water management, and research investigations to date have shown at least some promise in many of the areas listed above. But it will take substantially more scientific and technical study in many fields, and by many organizations, to bring that promise to fruition. New Mexico has the research talents in its national labs, its research universities, and in its private industry to solve collaboratively many of these problems. As in all such ventures, however, such research takes time; we should embark on that journey as soon as possible. Science and technology will not supply all the answers, but legislative, judicial, or technical decision making in the absence of good scientific information rarely produces the best results—the kind of results New Mexico requires in this area of critical needs.

Although it is impossible to guarantee that money invested in scientific research will produce positive results, it does appear to me to be a prudent investment, which may yield a future of at least modest growth for the region. The alternative is to continue relying simply on buyouts and reduced economic expectations, first here on the Pecos, and later, along the rest of New Mexico's major rivers.

# Lessons from the Pecos River

Frank Titus, *New Mexico Bureau of Geology and Mineral Resources*

**T**he saga of water exploitation in the Pecos River Valley is a classic. The tensions, manipulations, grandiose planning, engineering failures, political domination, personal successes, failures, and management judgments and misjudgments occurred on a grand scale. It is a century-long water-development tale out of the old West. But New Mexicans might wish to view it as a water-management wake-up call. It would have been wise 15 years ago, when the U.S. Supreme Court issued its 1988 Amended Decree in *Texas v. New Mexico*, to see it as a harbinger of uncomfortable things to come. We weren't ready to limit ourselves then. Now a great Southwestern drought threatens to reach historic proportions. We may be late in starting, but if we fail to extract useful intelligence from Pecos River history, we will be short sighted indeed.

We twisted the tiger's tail on this river, and the beast bit us. It was a real bite. I'll guess that the cumulative out-of-pocket costs to the people of New Mexico will add up to more than one hundred million dollars. That's part of the down side. The up side includes the cumulative value of crops we've grown on thousands of acres for more than five decades, with water that many have argued God surely intended to be ours. One can't help noticing that the cumulative economic benefit is nearly all in the past, and flowed to the state through the people of the Pecos Valley; most of the cost will be paid in the future, and likely by all of the people of New Mexico. If so, this will be a precedent for addressing other regional water problems.

## THE FRAMEWORK

The Pecos River, with its headwaters high in the Sangre de Cristo Mountains of northern New Mexico, provided surface water for irrigation and other development in the Carlsbad area as early as the late 1800s. Shortly thereafter, farmers near and west of Roswell discovered the prolific and highly pressured aquifer in what became known as the Roswell artesian basin. This aquifer, capable of artesian flows (no pumping required) of thousands of gallons a minute from well heads, became the source for great agricultural development upstream from Carlsbad. Later it would become clear that these awesome irrigation wells

intercepted ground water that, under natural conditions, fed the flow of the Pecos River, lying miles to the east of the westernmost artesian wells.

In 1948 New Mexico and Texas signed an interstate compact, agreeing on the amount of water the river must be allowed to carry on into Texas. This annual obligation is based on the measured amount passing the Fort Sumner river gage, plus the "flood inflow" from tributaries between Sumner Dam and Red Bluff Reservoir, on the Texas state line. Accurate calculation proved elusive. Nevertheless, for 33 years New Mexico was judged to be short in its annual deliveries to Texas. A lawsuit filed by Texas was heard by the U.S. Supreme Court, which ruled in 1988 that (1) New Mexico owed 14 million dollars for water not delivered in the past; (2) New Mexico must never again be short in its deliveries under the compact; (3) Texas' interpretation of river flows would prevail; and (4) a River Master, appointed by the Supreme Court, would ensure that the terms of the decree are met.

The combined effects of the current drought, and the failure (until recently) of all parties to agree on how to share the burden of annually delivering sufficient water to Texas, has threatened New Mexico's ability to comply with the Supreme Court decree. Non-compliance being risky, even foolhardy, Tom Turney and Norman Gaume, then state engineer and interstate stream engineer respectively, threatened the painful consequence of a "priority call" on the Pecos River and the Roswell artesian basin to force negotiation of a "consensus plan." That exercise, forcefully driven by Mr. Gaume, was finally agreed to by the parties on March 25, 2003.

## THE CONSENSUS PLAN OFFERS HOPE

The consensus plan is a tough agreement among New Mexicans that specifies how they will ensure that water owed every year of the future to Texas will be delivered to Red Bluff Reservoir. The plan, born under duress but accepted by negotiators and their constituents alike, seems at this late date to be the only way out of a water controversy long in building. That is, the only way out if we want to keep some semblance of water control in the hands of New Mexicans rather than ceding it to the river master, an outsider,

then through him very likely to the U.S. Bureau of Reclamation. So, for this river at this time, with its people and its history, this appears to be the right solution.

Does this mean that it's over, that we've won, and can go on to other issues? Not by a long shot. It would be well for the people of New Mexico to join with the people of the Pecos River valley in following this story to its end. The decision makers and people of the Pecos Valley must now implement the plan to which they've agreed. Then likely it will be all New Mexicans who will pay for the settlement, or, if it fails, likely pay for whatever final arrangement prevails.

### THE PLAN—AND SOME QUESTIONS ABOUT IT

To predict final success or failure of the consensus plan, some important questions need answers:

- Will willing sellers for 6,000 acres of Carlsbad Irrigation District land come forward, so their land can be bought by the state and dried up?
- Will willing sellers for 12,000 acres of water rights above Brantley Dam (mostly from the Pecos Valley Artesian Conservancy District) be there when we need them?

These are two features of the consensus plan. Two other key features are that wells in the artesian aquifer will be provided to yield up to 20,000 acre-feet of ground water a year into the Pecos River itself to ensure, right from the start, that the required Texas water deliveries can be made; and that the Carlsbad Irrigation District will comply with its agreement not to intercept this augmented river flow and divert it for irrigation. There are other important questions which are not in the Consensus Plan:

- Will the land offered by "willing sellers" be priced reasonably? If not, what do we do?
- Will the state legislature provide the funds necessary to carry out the plan? It will be very expensive.

### WAS THERE A BETTER WAY?

The answer may depend on how far back in time you want to go. If it's only five or 10 years, the answer is probably no; if it's to the 1950s or '60s, it might be yes. That choice of time frame isn't random. By the 1960s irrigation development in the Roswell artesian basin was widespread and was served by a great num-

ber of artesian wells exploiting the prolific limestone aquifer. Equally important, there was ample technical evidence by then that the ground-water production was intercepting water that under natural conditions had contributed directly to the flow of the river. In fact, the Carlsbad Irrigation District had requested that a priority call be issued against the Pecos Valley Artesian Conservancy District for depleting the river upstream from Carlsbad Irrigation District. State Engineer Steve Reynolds would not agree to it.

Salt cedar eradication was one solution that Steve Reynolds and others hoped would result in more water for Texas. Tens of thousands of acres have been root-plowed, sprayed, and continue to be controlled in the Pecos Valley, but it has produced no discernable increase in river flow. While this has been an active research area, comprehensive answers to date are elusive. The general problem is that removal of salt cedars usually allows the water table to rise toward the land surface, and then direct evaporation, or whatever vegetation takes over, again removes large volumes of water.

Until recently we weren't ready to limit productive acreage. But would other technologies have solved the problem? The answer is not clear. New Mexicans have not to this day looked seriously at low-water-use crops. Neither farmers nor New Mexico State University (NMSU), the state's land grant college, and recipient of large grants from the federal government, have shown any enthusiasm for a search for high-value, low-water-use crops. With respect to the supply side of the water equation, some limited prospects for new water supplies are promising. Desalinating the brines that are produced with petroleum in many oil fields is currently being explored. Another saline water source on the Pecos is the natural spring discharge into the river in the vicinity of Malaga Bend. But while desalination may have prospects for the future, it probably will always be too costly for agriculture.

Desalination should not be mentioned without noting the highly concentrated brines that are an unavoidable byproduct. In inland states such as ours, arranging for environmentally acceptable brine disposal can add a significant cost to the process. For coastal cities in the U.S. and elsewhere that environmental problem can be managed; but New Mexico is a long way from a marine shoreline.

Other technologies that might partly mitigate our water problems are known, of course, and many should be seriously investigated scientifically. They tend to fall into categories of providing only long-term

solutions, or needing a great deal of research, or producing water only for high-value uses.

### **THE BROADER ISSUES—THE STATE’S WATER AFFAIRS**

Each of us is aware to some degree that New Mexico has water problems looming in other parts of the state. The problems on the Rio Grande are just as intense as those on the Pecos and carry the potential for a much greater economic hazard. Then there are other rivers: the San Juan, the Gila, the Canadian; and the ground water of the Hueco Bolson and other border regions.

We wasted decades on the Pecos while we hung tough, refusing to negotiate. Now, aren't we wasting equally critical time statewide as vested interests in basins under pressure fail to concede that the state's ability to manage its own water affairs is imperiled? Why can't we get started on their critical negotiation? If we are to live sustainably, within our water means, everyone will have to cooperate in belt-tightening. Isn't high-stress negotiation the best way to find fair and equitable solutions?

What can we do as a state to help ourselves out of this quagmire? What can we learn from the Pecos story? Up front we should recognize that although each river-aquifer system is different, we have principles spelled out in law, and basin-specific contractual agreements, to guide statewide water management. The Pecos conflict festered, it can be argued, because we were slow to follow those principles. At the most fundamental level, we didn't meet our contractual commitments (the Pecos River compact), nor did we apply and enforce our prior-rights water doctrine.

Is there anything in the body of state water law that says we don't have to honor our compacts? Of course not. Are there words that say we don't have to honor the principles of water-right priority? Well, not exactly, but interpretations of the law have allowed acquisition of ground water rights that intercept water headed for a hydraulically connected river, thereby shorting future wet-water delivery to owners of senior surface water rights. No priority system can function that way. My own opinion is that in today's world strict adherence to priority isn't hydrologically feasible, nor, in all likelihood, politically possible. Decisions on how to change this part of the law should be made in the political realm, and the problem ought to be faced head on. It's a tough one. Not facing it places the decision process in the courts—

exactly the wrong place. Having the courts simply reinterpret existing law cannot produce a final solution.

Here are some of the other questions we need to face:

- Why doesn't New Mexico law give status of some kind to water in rivers and their riparian habitats, as does every other western state? If riparian needs aren't acknowledged, how can we be sure the state engineer will administer water rights in a way that will leave some in the rivers? Having to rely solely on the federal Endangered Species Act is a contorted, imprudent way to manage the state's environmental affairs.
- Why does the state engineer have no practical, effective enforcement authority, to be used when he finds water-rights violations; isn't this lack almost unique among state regulatory agencies? And, can the state's legal and/or political system help the state engineer devise a way to make, and enforce, critical water-management decisions even if court adjudication of rights in a basin is not near completion?

### **THE IMPORTANCE OF LEADERSHIP**

Steve Reynolds, our state engineer for 35 years, was a brilliant, self-confident man and an effective state engineer, a giant among western water leaders. He led the exploitation of New Mexico's water for the benefit of its people. But being highly supportive of growth, he also allowed heavy exploitation of water resources in the Roswell artesian basin—knowingly, I am convinced—reducing the flow of the Pecos River and thereby cutting the amount of water going to the senior surface-right owners in the Carlsbad Irrigation District. He surely knew that the state would ultimately have to deliver water under its Texas compact. But he also could calculate the economic value to New Mexico of expanding irrigation to the maximum extent possible for as long as possible, until forced to stop. Although his legacy has been an expansionist philosophy of water-resource use, his policies, which were designed to maximize growth and economic productivity, intentionally used all of the water available to the state, well beyond the point of sustainability. It gave us wealth, of a sort, and growth. But the consequences of those decisions, particularly in the face of the drought that is upon us, have now caught up with us, and we can no longer ignore the reality that the resource is finite.

We now have a new state engineer, John D'Antonio, and a new interstate stream engineer, Estevan Lopez. They answer to governor Bill Richardson, who has indicated a commitment to intelligent management of our water resources and an awareness that we face problems long in the making. Steve Reynolds inherited from the state engineers who preceded him, and passed on to those who followed, a philosophy that the engineer's job was to administer water rights in the state, not to manage the state's waters. Although this may have been practical in earlier times, it is not possible today.

Tom Turney was the first state engineer in New Mexico (1995–2002) to recognize that water-rights administration must finally and forever give way to water-resource management. He had indispensable philosophical help from Norman Gaume, interstate stream engineer (1998–2002). They named the process "active stream management." A key element in the evolution of their perceptions surely had to be the intense processes required to cut the Gordian knot of the *Pecos Valley vs. Texas* water-resource problems. Another intense problem, addressed but not yet solved, was water delivery to Texas under the Rio Grande Compact.

Messrs. D'Antonio and Lopez, I know, recognize that they cannot back away from the transition to a new water-management philosophy for the state. We wish them well. More importantly, though, all of us should be prepared to aid, educate, and encourage them to our best ability. They have been handed jobs of critical importance to New Mexico. Their recent predecessors have plowed the fields well—done their very best to move their offices into the modern world of water affairs. In fact, in this one area, I think we've made a lot of progress in facing our problems and moving toward water solutions that are pragmatic, equitable, and can help preserve the environmental charm of New Mexico.