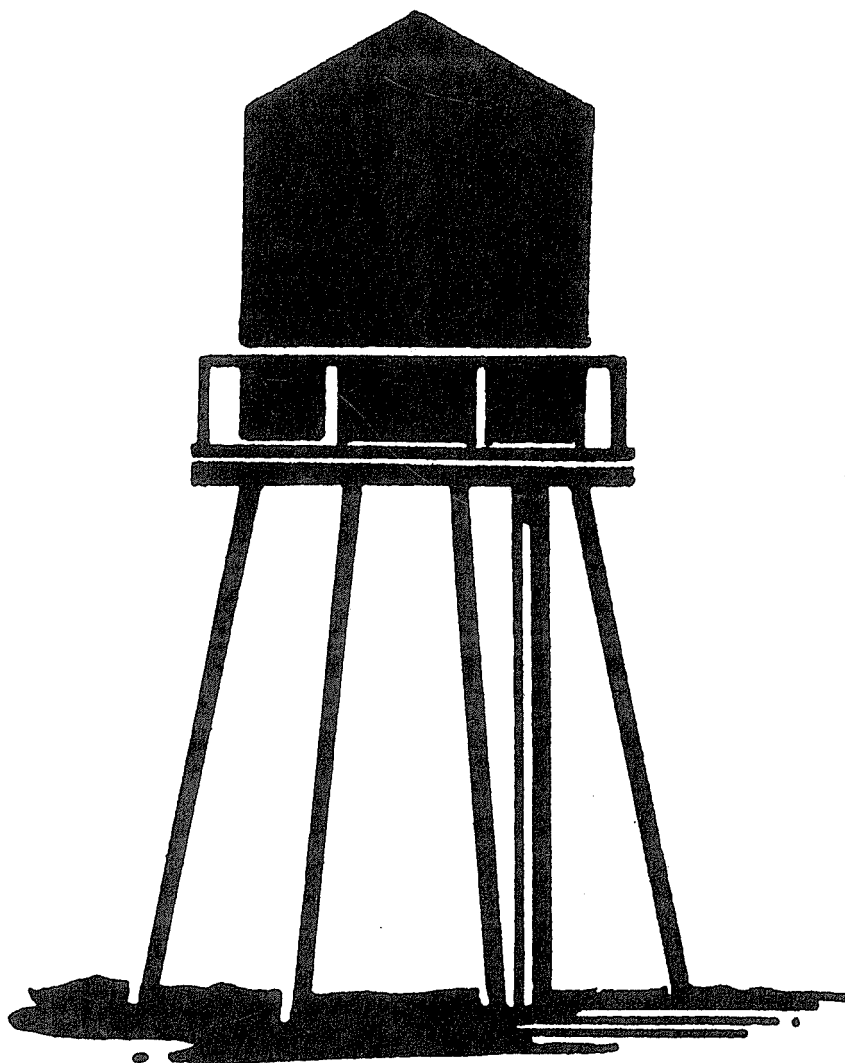


February 1989

WRRRI Report No. 238



Proceedings

**33rd Annual
New Mexico
Water Conference**

WATER PLANNING FROM THE TOWN UP

New Mexico Water Resources Research Institute
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WRRRI Report No. 238

WATER PLANNING FROM THE TOWN UP

PROCEEDINGS OF THE
33RD ANNUAL NEW MEXICO WATER CONFERENCE

*THE HILTON OF SANTA FE
SANTA FE, NEW MEXICO
OCTOBER 27-28, 1988*

New Mexico Water Resources Research Institute
New Mexico State University
Las Cruces, New Mexico 88003

February 1989

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PREFACE

In the spring of 1988, the New Mexico Water Conference Advisory Committee met to discuss topics and speakers for the 33rd Annual New Mexico Water Conference. Committee members suggested the conference this year focus on the water planning process in the state, with an emphasis on local, public participation. What local and cooperative efforts are currently underway? What about efforts at the regional level? How and to what extent does the public participate in water planning? How are conflicts worked out among the various competing interest groups? Does a "bottom up" approach to water planning provide for an effective statewide plan? These were among the questions this year's conference participants would try to answer.

The first session was devoted to planning efforts at the local level. John Folk-Williams set the tone for the conference by defining the terms "planning" and "consensus," and providing the essential steps in a consensus-building process. Another presentation dealt with public welfare values and their role in the reallocation of water from rural to urban uses. An informative and entertaining presentation was given by the president of an energy industry and the city manager with whom he cooperated in establishing his business. The role of water planning in the economic development of the state, and the state's new position in the Bureau of Reclamation's Upper Colorado Region, were provided also.

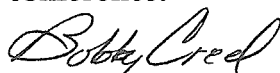
The second session provided an overview of regional and state planning. The chairman of the Interstate Stream Commission discussed the ISC grant program which provides funds to communities to do their own water planning. The Eastern High Plains plan and the Santa Fe area plan were offered as examples of regional planning. The role water planning activities plays in the uses of state trust land resources was outlined.

The featured speaker at this year's banquet, Roderick E. Walston, Deputy Attorney General of the State of California, enlightened his audience with his extensive knowledge concerning the impact of the public trust doctrine in water planning. Having argued six water cases before the U.S. Supreme Court, Mr. Walston is well-versed on this issue.

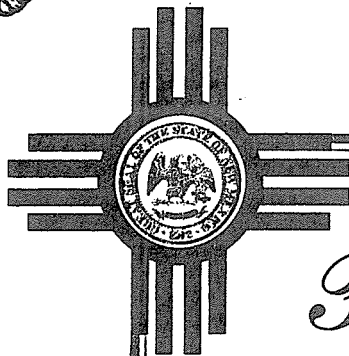
The final session was devoted to planning efforts at the state level, the influence of agricultural practices on water quality planning, and a look into the future, as projections for water supply and demand to the year 2030 were discussed.

As in the past years, we devoted time to a panel discussion which brought together participants representing various water interest groups. The panelists responded to questions from the moderator. This lively exchange allowed for audience participation.

The water conference this year confirmed the need for forums of this type. It was clear from the discussions that there are problems to be solved and representatives of all interest groups must be involved in these discussions. We look forward to next year's conference.



Bobby J. Creel
Acting Director



Proclamation

GARREY CARRUTHERS
Governor of New Mexico

WHEREAS, WATER IS THE LIFE BLOOD OF THE STATE OF NEW MEXICO, AND THE STATE'S FUTURE SOCIAL, ECONOMIC AND CULTURAL DEVELOPMENT DEPENDS ON A CONTINUING SUPPLY OF WATER OF GOOD QUALITY; AND

WHEREAS, THE NEW MEXICO WATER CONFERENCE HAS ANNUALLY FOCUSED ON WATER RESOURCE PROBLEMS, HOSTING 33 ANNUAL CONFERENCES AND 2 SYMPOSIA; AND

WHEREAS, THESE CONFERENCES AND SYMPOSIA WOULD NOT HAVE BEEN POSSIBLE WITHOUT THE TIRELESS EFFORTS OF THE WRRI STAFF; AND

WHEREAS, Ms. LINDA G. HARRIS, WRRI INFORMATION COORDINATOR, HAS DILIGENTLY AND PROFESSIONALLY COORDINATED THE LAST 7 CONFERENCES AND 2 SYMPOSIA; AND

WHEREAS, Ms. LINDA G. HARRIS, WILL BE LEAVING THE WRRI TO PURSUE OTHER CHALLENGES; AND

WHEREAS, TO ACCORD OFFICIAL RECOGNITION OF HER EFFORTS IN INSURING THE SUCCESS OF THESE CONFERENCES;

NOW, THEREFORE, I, GARREY CARRUTHERS, GOVERNOR OF THE STATE OF NEW MEXICO, DO HEREBY PROCLAIM OCTOBER 27, 1988, AS:

"LINDA G. HARRIS DAY"

IN NEW MEXICO.

ATTEST


REBECCA VIGIL-GIRON

SECRETARY OF STATE

DONE AT THE EXECUTIVE OFFICE
THIS 25TH DAY OF OCTOBER, 1988.

WITNESS MY HAND AND THE GREAT
SEAL OF THE STATE OF NEW MEXICO.



GARREY CARRUTHERS
GOVERNOR





Tom Bahr, Secretary of the Energy, Minerals and Natural Resources Department and Director of the Water Resources Research Institute, presented Linda Harris with a Proclamation from Governor Garrey Carruthers declaring October 27, 1988 as "Linda G. Harris Day." After seven years with the institute, Linda will be leaving to establish her own publishing business. The staff of the WRRI wish her the best of luck. She will be missed!

33rd Annual New Mexico Water Conference
WATER PLANNING FROM THE TOWN UP

*The Hilton of Santa Fe
Santa Fe, New Mexico*

THURSDAY, OCTOBER 27

8:30 - 8:40 **Welcome**
 Bobby J. Creel, Acting Director
 New Mexico Water Resources Research Institute

SESSION I: PLANNING AT THE LOCAL LEVEL

Session I Moderator:
William C. Bennett
Environmental Services Division Manager
Albuquerque Environmental Health Department

8:45 - 9:20 **Planning and Consensus**
 John Folk-Williams
 President
 Western Network

9:20 - 9:40 **Water Planning and the U.S. Bureau of Reclamation**
 Clifford I. Barrett
 Regional Director
 U.S. Bureau of Reclamation

9:40 - 10:10 **Break**

10:10 - 10:30 **Rural to Urban Water Transfers: Protecting the Public**
 Welfare
 Helen M. Ingram
 Professor of Political Science
 University of Arizona

- 10:30 - 11:00 **Water and Wastewater Planning and Industry**
 Ben G. Henneke, Jr.
 President
 Energy Fuels Development Corp., and
 Mike Obrey
 City Manager
 Portales
- 11:00 - 11:25 **Water Planning and Economic Development**
 John Dendahl
 Secretary
 New Mexico Economic Development and
 Tourism Department
- 11:25 - 1:30 **Lunch**

**SESSION II: PLANNING AT THE REGIONAL, STATE AND
 FEDERAL LEVELS**

Session II Moderator:
 Charles T. DuMars
 Professor of Law
 University of New Mexico

- 1:30 - 2:00 **Regional Water Planning in New Mexico**
 Albert E. Utton
 Chairman
 Interstate Stream Commission
- 2:00 - 2:30 **Regional Water Planning in the Eastern High Plains**
 Leland D. Tillman
 Executive Director
 Eastern Plains Council of Governments
- 2:30 - 3:00 **Break**
- 3:00 - 3:15 **Regional Water Planning in the Santa Fe Area**
 Tony Mayne
 Executive Director
 Santa Fe Metropolitan Water Board

3:15 - 4:00 **Water Planning for State Trust Land:
Protecting the Availability of Water Resources**
Arthur J. Waskey
Legal Division Director
New Mexico State Land Office, and
John C. Tysseling
Chief of Economic and Policy Analysis Unit
New Mexico State Land Office

BANQUET
7:00 p.m.
Mesa Ballroom
Hilton of Santa Fe

7:30 **Public Trust Impacts on Water Planning**
Roderick E. Walston
Senior Deputy Attorney General
State of California

FRIDAY, OCTOBER 28

SESSION III: THE DEMAND SIDE OF WATER PLANNING

Session III Moderator:
Bobby J. Creel
Acting Director
New Mexico Water Resources Research Institute

9:00 - 9:15 **The Necessity for Water Planning**
Tom Bahr
Secretary
Energy, Minerals & Natural Resources Department

9:15 - 9:45 **Reconciling Agriculture's Needs with Water Quality**
A. Ann Sorensen
Assistant Director
Natural and Environmental Resources Division
American Farm Bureau Federation

9:45 - 10:15 **Projections for the Future**
Robert R. Lansford
Professor of Agricultural Economics
New Mexico State University

**PANEL DISCUSSION: SPECIAL INTERESTS
IN WATER PLANNING**

Panel Discussion Moderator:

Tom Bahr

Secretary

Energy, Mineral and Natural Resources Department

10:30 - 12:30

Panelists

**Herbert A. Becker
Assistant U.S. Attorney
Office of the U.S. Attorney
Albuquerque**

**Tom W. Davis
Manager
Carlsbad Irrigation District**

**Vickie L. Gabin
Special Assistant Attorney General
New Mexico State Engineer Office**

**Maxine S. Goad
Water Resource Specialist
New Mexico Environmental Improvement Division**

**Wilfred Gutierrez
Commissioner
Chicos Ditch Commission
Acequia de Garcias**

**Cleve E. Matthews
Land Operations Manager
Sandia Peak Tram Company**

**James Mitchell
Director
Citizens' Equal Rights Alliance**

**Phillip Wallin
Director
River Network
Portland, Oregon**

SPEAKERS



Tom Bahr is the secretary of the New Mexico Energy, Minerals and Natural Resources Department. His current interests focus on recent water court cases and their implications to water and natural resource policy and management in the western United States. Prior to his cabinet appointment, he was director of the New Mexico Water Resources Research Institute. He previously served as director of the Interior Department's Office of Water Policy under the first Reagan administration. He is a native of Wisconsin and received his undergraduate degree from the University of Idaho and a master's and doctorate from Michigan State University.



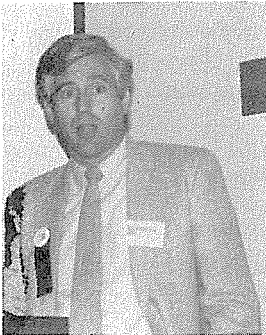
Clifford I. Barrett has been the regional director of the Upper Colorado Region, U.S. Bureau of Reclamation, since 1981. The region embraces parts of seven western states. His 32 years with reclamation include responsibility for policy development, planning and operation of water resources in the 17 western states; direction of reclamation's widespread program of foreign activities and its youth program. He serves on the board of directors of the newly formed American Water Foundation. He has a B.S. degree in civil engineering from the University of Denver and is a registered professional engineer. In 1975, he was selected to participate in the Department of the Interior Fellows Program and is a graduate of the Federal Executive Institute. He also is retired from the U.S. Army Reserves.



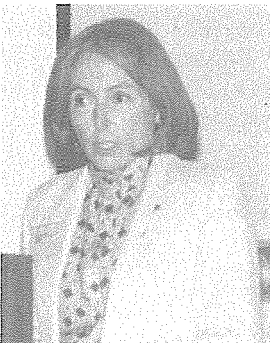
John Dendahl is the secretary of the New Mexico Economic Development and Tourism Department. Before taking this position, he was president of the First National Bank of Santa Fe. He also has interests in real estate development. Previously, he held a number of positions with Eberline Instrument Corp., a leading designer and manufacturer of radiation monitoring systems. The Santa Fe native was graduated from the University of Colorado in 1961 with bachelor's degrees in electrical engineering and business administration. He was a member of the 1960 United States Olympic Ski Team and was national collegiate skiing champion that same year.



John A. Folk-Williams is president and founder of Western Network, a non-profit group based in Santa Fe. The organization specializes in conflict management and research concerning natural resource and environmental problems. Educated at Harvard, he is the author of Water in the West, The Upper Rio Grande: A Guide to Decision Making, and numerous reports and articles on dispute resolution in the natural resources field. As a trainer, he has conducted frequent workshops on negotiation skills, strategic planning and cross-cultural communication.



Ben G. Henneke, Jr. is president of Energy Fuels Development Corp., Portales. The \$30 million plant is the largest ethanol production facility in the Rocky Mountain region. He has been involved in the coal and ethanol industry for the past 14 years. He is a member of Energy Advocate, an informal group of businessmen who travel the nation speaking on America's energy challenge. Henneke, a native of Tulsa, Oklahoma, received a B.A. in history from Yale University and an M.B.A. from Harvard Business School. He also has served in the U.S. Army.



Helen Ingram is the acting director of the Udall Center for Studies of Public Policy in Arizona. She also is the book review editor of the American Political Science Review. She is the author of Patterns of Politics in Water Resources Development: The Case of New Mexico's Role in the Colorado River Basin Bill and co-author with F. Lee Brown of Water and Poverty in the Southwest. She was born in Colorado, has a doctorate from Columbia University and teaches political science at the University of Arizona.



Robert R. Lansford is a professor of agricultural economics and water resource economics at New Mexico State University. While at NMSU he has participated in 22 interdisciplinary research projects and was appointed as the coordinator on 16 interuniversity-interdisciplinary research projects. In 1975, he received the Distinguished Research Award in the College of Agriculture at NMSU. He also has served as an expert witness in water rights, and Indian and Pueblo Indian legal cases. He holds a B.S. in agricultural education and an M.S. in agricultural economics from NMSU and a Ph.D. in agricultural economics from the University of Minnesota. He is a native of Rincon.



Tony Mayne is executive director of the Santa Fe Metropolitan Water Board where he initiates and directs all operational and technical programs for the board. He also is responsible for the long-range planning of the Santa Fe region's water resources. Before taking that position in 1987, he was the regional engineer-project director of the Association of Central Oklahoma Governments where he was responsible for all aspects of managing several major water quality studies. A native Texan, Mayne holds a B.S. in electrical engineering and a master's of civil engineering from the University of Houston and a Ph.D. in civil engineering from the University of Oklahoma.



A. Ann Sorensen is the assistant director, Natural and Environmental Resources Division of the American Farm Bureau Federation where she covers environmental issues that affect farmers. Her specialties include agricultural biotechnology, integrated pest management (IPM), pesticide issues, and ground water pollution. Previously, she was an IPM specialist with the Texas Department of Agriculture and also worked at Texas A & M University on social insect behavior and physiology. She was born in California and received a B.A. in biology from the University of California at Santa Cruz, and a Ph.D. in entomology from the University of California at Berkeley.



Leland D. Tillman is the executive director of the Eastern Plains Council of Governments. That organization, which serves a seven-county area, was the initial recipient of the Interstate Stream Commission grant to prepare a regional water plan for the area. The group also is working with local and federal funds for the advance planning on construction of the Ute Reservoir pipeline project. He holds a B.A. in journalism from Eastern New Mexico University. He is actively involved in farming operations. Both his grandfathers were homesteaders in eastern New Mexico.



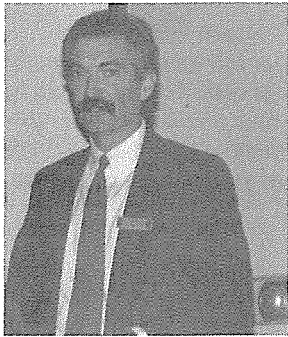
John C. Tysseling is chief of the Economic and Policy Analysis Unit at the New Mexico State Land Office. His responsibilities there include water resource policy, energy policy and energy regulatory intervention initiatives. Prior to this position, he was an economist with the Bureau of Business and Economic Research at the University of New Mexico. He is the author or co-author of numerous water resource analyses, including investigations of water rights markets in the western states and water demand forecasts for specific hydrologic regions of New Mexico. He holds a Ph.D. in economics from the University of New Mexico.



Albert E. Utton is chairman of the New Mexico Interstate Stream Commission. He also is director of the International Transboundary Resources Center and professor of international law at the University of New Mexico. He teaches international law, natural resources law and water law. He has written and edited numerous books and articles on the law of natural resources, including Pueblo Indian Water Rights. He is a graduate of the University of New Mexico and was a Rhodes Scholar at Oxford University.



Roderick E. Walston is senior deputy attorney general for the state of California. He has argued six water cases before the U.S. Supreme Court, including California v. United States and the Mono Lake case. He is head of the Natural Resources Section, San Francisco Office of the California Attorney General's Office, the California representative to the Western States Water Council, and chairman of the Water Resources Committee of the American Bar Association. Walston is a native of Gooding, Idaho, and was graduated *cum laude* from Columbia University. He holds a law degree from Stanford Law School.



Arthur J. Waskey has been the general counsel to the New Mexico State Land Office for the past six years. In that position, he represents the commissioner of Public Lands in the El Paso v. Elephant Butte Irrigation District case. He has written and lectured on proper administration of state trust lands and their relationship to water. He holds a J.D. degree from Lewis and Clark Law School, Portland, Oregon.

MODERATORS



William C. Bennett is the manager of the Environmental Services Division of the Albuquerque Health Department. His responsibilities cover eight environmental programs including remediation of underground storage tanks and planning for the protection and monitoring of ground water on a regional basis. He is the policy coordinator for the city's ground water protection policy effort and is on the steering committee for the city's water resource management plan. He also is on the governor's Ground Water Advisory Committee. Previously he was with the New Mexico Environmental Improvement Division for 14 years. The Colorado native received a B.S. in biology from Colorado State University and an M.S. in biology from the University of New Mexico.



Bobby J. Creel, acting director of the New Mexico Water Resources Research Institute, administers an annual research budget of some \$1 million. His experience in resource economics includes more than 25 research projects. He was one of the New Mexico researchers on the \$6 million regional High Plains Ogallala Aquifer Study. He holds a doctorate from the University of New Mexico in resource economics and bachelor's and master's degrees from NMSU in agricultural economics. Creel is a native New Mexican who grew up on a ranch near Ruidoso.



Charles T. DuMars, professor of law at the University of New Mexico, has served as chairman of the New Mexico Water Law Study Committee. He is the author of numerous articles on water law and water rights and is the co-author of Economic Impacts of Alternative Resolutions of New Mexico Pueblo Indian Water Rights. He is a member of the Western States Water Council, the Board of Trustees of the Rocky Mountain Mineral Law Institute, and the American Bar Association Natural Resources Committee. He received a bachelor's degree from the University of Oregon and a law degree from the University of Arizona.

PANELISTS

Herbert A. Becker, the assistant U.S. attorney for the District of New Mexico, serves as a trial attorney in cases involving civil matters with emphasis on water rights and Indian land issues. Before coming to New Mexico in 1980, he was the assistant U.S. attorney for the District of North Dakota and an attorney for the Department of Justice assigned to the Land and Natural Resources Division, Indian Resources Section. He holds a B.S. in business administration from the University of North Dakota and a J.D. from Texas Tech University.

Tom W. Davis is the manager of the Carlsbad Irrigation District. Previously, he was employed by the U.S. Forest Service for 15 years. He holds a B.S. degree from Oklahoma State University.

Vickie L. Gabin is the special assistant attorney general for the State Engineer Office. She has been involved with Texas v. New Mexico and the Pecos River Compact case, and currently handles the stream system adjudication and miscellaneous water rights matters in the Roswell and Carlsbad areas and in the Rio Hondo stream system. She received her J.D. from the University of New Mexico School of Law and was a law clerk and staff attorney for the New Mexico Court of Appeals.

Maxine S. Goad, water resource specialist, has been working in water pollution control for the New Mexico Environmental Improvement Division since 1974. She was principal draftsman and one of the principal developers of the New Mexico Water Quality Control Commission regulations to protect ground water quality. As program manager for the Ground Water Section, she was responsible for the implementation of these regulations from their adoption in 1977 until 1985. Her present duties include working on coordination of programs to protect ground water quality, and development of improvements to these programs. Prior to her work at the EID, she was with Los Alamos National Laboratory. She received B.S. and M.S. degrees in physics from Stanford University.

Wilfred Gutierrez is commissioner of the Chicos Ditch Commission and the Acequia de Garcias and chairman of the Acequias del Norte and the Velarde Project Steering Committee for Acequia Rehabilitation. He is a lifelong resident of Velarde where he is a part-time fruit and vegetable farmer. He also has worked 34 years at Los Alamos National Laboratory where he is an electronics technician.

Cleve E. Matthews is land operations manager of Sandia Peak Tram Company, a real estate development firm based in Albuquerque. He is in charge of all land operations and is responsible for the development of services from site feasibility through land acquisition, architectural and engineering design and construction. He also is the operations manager of the Sandia Peak Utility Company, an investor-owned water utility serving approximately 1,400 customers. He is a graduate of the University of Nebraska and has a master's degree from Boston University. He has been responsible for the development of more than 30 residential subdivisions in New Mexico and West Texas. He also has served on the governor's Ground Water Quality Advisory Committee.

James L. Mitchell is the director of the Citizens' Equal Rights Alliance, a group concerned with Indian water rights claims. He is a *pro se* defendant in the Jemez River Basin water legal suit. He is a member of the New Mexico Farm and Livestock Bureau. He is retired from the Bureau of Land Management where he was a realty specialist, and holds a B.S. in range management from Utah State University.

Phillip Wallin is the director of River Network, Portland, Oregon, an organization that trains grassroots groups in the techniques of river protection. Prior to taking that position, he lived in New Mexico for eight years where he was president of the Rio Chama Preservation Trust, a group working to obtain permanent protection of the Rio Chama from El Vado to the Abiquiu Reservoir through the Wild and Scenic Rivers Act. For 15 years he also was vice president of the Trust for Public Land, a land conservation organization. He holds a B.S. from Stanford and a J.D. from the University of Chicago.



Panelists from left to right: Herbert Becker, Tom Davis, Vickie Gabin, Maxine Goad, Wilfred Gutierrez, Cleve Matthews, James Mitchell, Phillip Wallin and Moderator, Tom Bahr.

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PLANNING AND CONSENSUS

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I have been asked to speak about two subjects that don't get very good press: planning and consensus. Planning is often thought of as something hopelessly academic or dangerously socialistic. Consensus is thought to be wildly impractical, clearly inefficient or simply impossible. I hope that by linking the two, we might be able to see some good in them. In fact, I think the combination is powerful, not at all impractical and actually a key to some important changes going on in our governmental system.

Planning can be thought of as a process for discovering goals and generating options to meet them. In the last several decades we've seen some dramatic changes in our approach to planning. In the 1920s, 30s and 40s, planning was done on a grand scale in the water resources field. Either because of an excess of prosperity or sheer desperation, people had faith that government could predict the future, that the future would submit to our designs and that whole river basins could be engineered for social betterment. There were sweeping plans, such as Pick-Sloan which called for 107 water projects, the irrigation of millions of acres, the generation of millions of watts of electricity - all having a dramatic impact on a region comprising one sixth of our country. And that plan was enacted into law. There were others as well, for the Tennessee Valley and the Columbia basin, most memorably.

These plans are known in the field as "rational." It was mind over matter in those days, and there was a fearless conviction that planning from the top down could really solve the big problems in society. In the last few decades that has changed, and I think the change has to do with a loss of a feeling of certainty. We're not so sure about the future, we're not sure government will help us, and we're not sure the resources will be available. There is a multitude of interests trying to influence government, and to

meet these interests planning has become more reactive and adaptive. Smaller projects for local areas, incremental changes, step by step movement are the order of the day. It's less imperial, more human scale.

And that sets the stage for looking at consensus. This word has two common meanings. Popularly, it refers to broad acceptance of a policy or plan. There is no formal way to measure this. We use opinion polls and surveys, but mostly we know that something is widely acceptable if no one invests the time and energy to fight it. But there is a more formal meaning of consensus that I want to concentrate on here. It means a form of decision-making based on the achievement of unanimity. Everyone in the process agrees.

That sounds tough to do, but there are some powerful reasons for using consensus. The key to the process is that the rights of every participant are protected. No one will be compromised or railroaded; their consent has to be won. The obverse of this, of course, is that each participant has a veto over the decision. The process tends to work best in two contexts: one, where everyone shares common values and can reach agreement over specifics relatively easily - everyone speaks the same language; the other, where there are such sharp differences in values that no one trusts a decision of the majority to take into account the needs of the minority.

Consensus processes can't be used indiscriminately. They only work when there is a certain balance of power among the communities and institutions represented. Each party has to recognize that every other party is essential to the decision. It's like the pieces of a puzzle. You don't have what you're looking for if you leave something out. Each party in the process is there because they have some degree of power to frustrate the outcome if their needs are overlooked. You aren't invited

into a consensus process, you compel the attention of other parties by building your power to the point where you cannot be overlooked.

What are some of the reasons consensus has more prominence now as a form of planning and decision-making? There are several factors that have to do with changes we can see in the functioning of government.

This is a time when people don't want or trust government to do things to them or for them without their involvement, at least when critical community issues are at stake. They want to be part of the process because they do not believe government will protect their interests. Lois Gibbs, an organizer working on issues of hazardous waste, puts it this way: that government policies at present give a message to communities - "organize and raise hell and you'll have input - sit back, behave yourselves and you'll be ignored." The number of players with political clout is increasing.

Responding to this trend, government, bombarded with pressures from different interests groups, doesn't make the hard decisions it once did routinely. The strategy of Congress is to respond to demands for changes in decision-making by creating a general equivalence of values. Agency after agency is required to keep extending the list of values or factors it must take into consideration, but there is little guidance in how to balance one against another. There is thus a recognition of the need to broaden the basis of decision-making but no clear process on how to accomplish this.

Because so many groups are politically active, power is more fragmented than before. Instead of the sort of monolithic control of water resources that once prevailed, power over decisions tends to be shared among several agencies and constituencies. That means that each one has to involve others to achieve some kind of coalition of consensus supporting specific actions. As Jesse Jackson put it at the Democratic convention, each constituency has a small patch, and all the pieces need to be woven into a single quilt that is greater than the sum of its parts. Recognition of the limitations of power leads people to try to forge new consensus.

To move from any plan to real action takes a lot of public support. So many plans sit idly on shelves because their authors were too remote from decision-making. A consensus process can help build broad support for the implementation of plans and ensure that they take on real life in the political process. It can also help generate new ideas for meeting diverse needs, ideas that might not emerge

from a process lacking participation by all affected parties.

Consensus building also helps groups focus on their long-term relationships. In the field of water resources, the nature of the relationship among institutions and communities is often just as important as the immediate planning issue. If a foundation of good communication has been created, solving specific problems is much easier. A consensus process, which forces attention to basic problems of trust and communication, makes it possible to deal with relationship issues.

There are certainly drawbacks to consensus processes as well. Perhaps the principal problem is that they are expensive, or "resource intensive," as we say in bureaucratic language. It takes a great investment of time, energy, funds and staff, often over an extended period of time, to complete a planning process based on consensus. So it cannot be used for trivial issues but only those for which it is clearly important for all concerned to make the necessary investment.

When groups lack the resources to take full part in such a process but are still important to the outcome, this becomes a problem for the group as a whole. Government agencies, in particular, need to begin thinking about making funds and technical resources available to groups whose consent is important but who have trouble sustaining involvement in a complex process.

What does a consensus process look like? What are its essential steps? Let's briefly review what goes into it.

Goals

Perhaps the crucial point for each and every person or group thinking about consensus-building is having a clear understanding of what they want. Without goals, there is a really no way to measure success or failure, and without advance understanding of what is desired, great frustration can be created for all concerned. Proposals will be met with confused responses. Parties give unclear signals to each other about the value of different dimensions. And the process can simply break down until all sides clarify what they are really bargaining for. But it's no easy process to establish goals. Each party is usually more than one person, and that means that internal consensus must be developed - a balance achieved among the different interests of a single institution or community. Each party needs to establish its own process, not just for defining goals but for revisiting and reevaluating them as the

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process unfolds. Very likely, new information generated by the process will change attitudes and reveal new possibilities. So goal-setting is not something that happens only once; it is really an internal process for staying in touch with the varied concerns of one's own community of interest.

Parties

It is important to identify every party who would be affected by the issue and every party that has some authority to help implement a consensus decision. Without the involvement of these groups, agreement among a limited number of parties could be completely frustrated by those who were not a part of the process. The essential point is that each party has to convince the others that it has the power to interfere in the decision if its interests are not dealt with. No one can give you a place in a consensus process. You demonstrate your power to the others through litigation, political action, media work and other strategies. If you do not have that power, others will not feel the need to deal with you.

Process

Once the parties have been identified, they need to meet with each other to define goals for the process and ground rules. This is an essential step to make sure that everyone understands what the outcome of the process is going to be - will it be a written agreement, a decision by an agency, a proposed bill, a contract? Not only the form of agreement but its substance should also be agreed upon. What are the concrete achievements to be expected of the process? A clear deadline should also exist, that is, a time beyond which definite costs will be imposed on the parties if they do not arrive at a consensus agreement. The process itself should be designed carefully to meet the needs of all parties, and representation of all the interests at the table requires great attention. How many members of each party should be involved? Can some parties be represented indirectly? Each party must specify the scope of its negotiating authority. At what point in the process must negotiators return to their constituents for ratification - what are the limits of authority of the people at the table?

Issues

When these procedural issues have been taken care of, the parties can identify the key issues. This

part of the process involves an attempt to get beyond the publicly stated positions of each side to understand the interests that each is trying to meet. Only when those underlying interests are understood can an agreement be crafted capable of meeting the needs of all parties and forming the basis of a consensus decision.

Information

As issues are identified, the need for technical information will become apparent. This is a crucial phase in building consensus. Typically, information is obtained by individual parties and introduced in the process to prove or disprove the contentions of one side or another. This approach means that technical information will be viewed only as an adversarial tool. It is possible to introduce it as a tool for the entire process, serving the needs of all parties, but only if the group as a whole can agree on the need for information and on a provider who is trusted by all to handle it in a helpfully impartial way.

Options

Perhaps the most exciting part of the process is generating options to meet the needs of the parties. If the preceding steps have worked well, the interests of each side, the issues it is concerned with and the information needed to solve problems will be before the group as an agreed upon baseline capable of yielding solutions. Rather than have each side put forth its own proposal, it is helpful if the group can agree to work on a single proposal as the basis of meeting all needs. That way it is easier to avoid the polarization that arises when each side defends its proposals against all others.

Agreement

The selection of one option as best suited to meet the priorities of all parties is an important moment, but the agreement must be carefully drafted so that there is a concrete text embodying all elements of the consensus decision. The agreement should be such that it fosters long-term relationships and gives attention to the need for orderly dispute resolution mechanisms in the future.

Implementation

After consensus has been reached by a group, very likely constituent agencies and communities will

have to ratify the agreement. If the interests of those groups have been well represented, this should be no problem. If they have not, then the agreement will, in effect, be renegotiated in the arena of ratification, which could be a state legislature, a tribal council, the Congress of the United States, or a combination of many different agencies. Implementation of the agreement itself will also depend on cooperation by these groups so it is essential that the agreement have clear mechanisms for funding and be based on established authorities or else provide for a joint approach to a legislative body to secure these.

Monitoring

Agreements arrived at by consensus will not be static because the needs of the parties will evolve over time. It is important to monitor the process of implementation to identify issues overlooked during negotiations that might require revisions to the original agreement or the use of dispute resolution mechanisms. Usually good relations among the parties are a key element in implementation, and monitoring can help sustain dialogue to provide early warning of problems. Monitoring also brings each party back to a consideration of their goals for the agreement. As these are altered in light of new circumstances, new needs relating to the agreement may also be defined.

In New Mexico, there are further special considerations that should be mentioned. Most important, consensus processes often occur with groups of different cultural backgrounds. These can be ethnic differences between Indians, Hispanics, Anglos, Blacks; regional differences between agricultural and urban communities or institutional differences stemming from the fact that many professionals spend their careers in large agencies that provide a distinctive way of thinking and approach to values that may clash with those of other agencies or communities.

These differences are especially important if there has been an issue of dominance among the groups, if one has had power over others, or there is a perceived history of unfair relations among the groups. There can be a legacy of hostility and resentment about differences in power which can color everything that goes on in the process, though it may never be a subject that is on the table. That kind of background can undermine a process because of the deeply rooted suspicion and mistrust that guide participants. It has to be possible, under these conditions, to get that hidden feeling out in

the open. The process will not undo past history, but participants can at least acknowledge that this has affected contemporary relations, that the feelings are valid and that they are a part of the current reality. If such feelings cannot be expressed, it is likely that continuing suspicion will make real agreement quite difficult, if not impossible.

In New Mexico, one also has to deal, as in many western states, with a complex interaction of many levels of jurisdiction in responding to water issues. Federal and tribal governmental units have as much involvement as state agencies and the local entities created under state law. A consensus process can very likely not get underway if the parties are trying to focus on jurisdictional issues solely. Often, these disputes arise from a direct competition over the governmental authority to exercise certain powers and may have to be resolved through litigation.

Generally, it takes some overriding policy goal concerning water to put the jurisdictional issues into perspective. If the different levels of government can agree that cooperation on water for the purpose of joint economic development is the top priority, for example, then the jurisdictional issues will not be allowed to undermine that policy decision. It is important not to take as the subject of a consensus process, especially regarding planning for water resources, something which is essentially a legal dispute that can only be solved in the courts.

To summarize, this is a time of change in the way government makes decisions. The trend is toward more public involvement and the consideration of values that have never been part of the process before. Making decisions by consensus is probably not the final answer - it is, as I have said, a process requiring a great investment of time and energy - but it is an important tool right now that can help build productive relationships, especially in the context of planning. Planning through consensus may just help rebuild trust in public institutions. It can certainly accustom those institutions to dealing with the public in a positive way. The use of consensus is not something impossible or academic. It is intensely political and intensely practical.

WATER PLANNING AND THE U.S. BUREAU OF RECLAMATION

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Today marks a milestone of sorts for the reorganization of the Bureau of Reclamation. It is also a special moment for me personally because it is the first formal appearance I have made in New Mexico as regional director of the newly expanded Upper Colorado Region of the Bureau of Reclamation.

This past summer we implemented the consolidation of most of New Mexico into the Upper Colorado Region. It has been a summer filled with learning about New Mexico's projects and water issues, meeting water leaders, and brushing up on my Spanish language skills.

Assuming the responsibility for Reclamation's activities in New Mexico is a special privilege for me. I am well aware that this state is one of the true birthplaces of irrigation in North America. Long before the farmers along the Animas and Vermejo Rivers inspired William Smythe in 1890 to carry the standard of irrigation to Nebraska, the early inhabitants used the waters of the Rio Grande to grow their crops. I marvel at the fact that irrigation systems are as ancient as habitation in New Mexico. Many remain in service today, and rehabilitation of those systems with great sensitivity to their historic character and values is just one of our challenges.

Through planning and construction efforts, reclamation has played an integral role in the development of New Mexico's water resources. In the early 1900s, we worked closely with irrigation districts on the Pecos and Rio Grande. Carlsbad Project Reservoirs on the Pecos and Elephant Butte Reservoir on the Rio Grande were important elements of the irrigation projects that were planned, and developed, and are still in productive use today.

The list of Reclamation projects also includes the Tukumcari Project on the Canadian River; the Vermejo Project farther up in the Canadian Basin; the Fort Sumner Project on the Pecos; and the Hammond Project on the San Juan.

Reclamation and Corps of Engineer planners developed the basis for the Flood Control Act of 1948 that provided for flood and sediment control and river maintenance that continues today from Velarde to Elephant Butte and Caballo. In northwest New Mexico, Reclamation planning is also evident as seen at Navajo Reservoir and the Navajo Indian Irrigation Project. The San Juan-Chama Project, constructed in the 1960s and early 1970s, was a result of decades of planning and cooperation between Reclamation and state and local leaders. Also, we have completed construction of Brantley Dam, which is now in the initial filling process. We anticipate dedicating that facility early next May.

I'd like to address some of our current challenges here in the "Land of Enchantment." But first, I should bring you up to speed on where we stand in the reorganization and redirection of the Bureau of Reclamation. The results of that reorganization will affect how we do our upcoming work.

I take a lot of pride in both the thoroughness and speed with which the reorganization has occurred. In many ways, what we accomplished defies the so-called "Law of Bureaucratic Motion." Within the space of one year, we examined the history, current workload, and future needs of the Bureau of Reclamation in harmony with the nation's water development and management needs. We organized to meet those challenges, and actually moved offices and people to put the organization in place to do the job.

The bottom line is that management and most of the policy functions of the bureau are now headquartered in Denver while the commissioner and a small support staff remain in Washington. In addition, we have centralized our high cost technical skills staff in a common talent pool, reducing costs and duplication for each region and field office.

In Denver, we now have Deputy Commissioner Joe Hall who serves as the chief operating officer of Reclamation. In addition, there is an assistant

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commissioner for resource management, an assistant commissioner for engineering and research, and an assistant commissioner for administration and liaison.

You may be assured that management of all Bureau of Reclamation activities in the field, be it planning, construction, or operation and maintenance, will continue at the local and regional level. Denver will only supply the support as it is needed. Your contact will remain with our field office managers.

With those organizational items behind us, let's look at what all this has done for you. We think we can do a better job, quicker, and at less cost than before. We have a goal to continue to plan for and build authorized projects, and maintain our historic relationships with the water and power communities while looking to expand our relationships with the rest of the public. We will:

- seek to modernize and improve efficiencies of older systems;
- seek to automate more effectively and otherwise improve efficiencies at bureau-operated power plants;
- work in partnership with the water users to manage water resources more effectively;
- work with the states to manage, effectively develop, and conserve ground water sources;
- turn federal systems over to the water and power users to operate and maintain.

We are now putting the new planning organization to the test in New Mexico. Current planning efforts being carried out in our Albuquerque office include the Eastern New Mexico Water Supply study; the Alamogordo Water Supply study (both added to Reclamation's fiscal year 1989 program with the strong support of the New Mexico congressional delegation); and studies where Reclamation is supplying technical assistance to the state. An ongoing study of the salinity control options on the San Juan River is a part of our Colorado River Water Quality Improvement Program.

Early in this talk I referred to the historic development of water in New Mexico and our involvement with those systems. Reclamation is privileged to work on the rehabilitation of the acequias in northern New Mexico under the Velarde Community Ditch Project. This program came about because of the efforts of the New Mexico congressional delegation. Some of these canals are over 300 years old and still doing the job the Spanish settlers built them to do.

So far we have designed and constructed seven diversion dams to replace rock and brush structures

that had to be rebuilt each year. Soon we will proceed with work related to rehabilitating the acequias and in-line structures. During all this, water has continued to be delivered. We are very aware of the historic aspects of the acequias and we are doing our best to preserve their character while improving efficiencies. There are currently nine acequias which involve over 500 landowners.

Our partnership with the New Mexico Interstate Stream Commission (ISC) in the middle valley of the Rio Grande has resulted in significant water salvage projects. Today this cooperative agreement continues with special emphasis on improving drainage features in the Bosque Del Apache National Wildlife Refuge and the La Joya State Waterfowl Refuge. These efforts, fully funded by the state, will increase water conservation and improve waterfowl management.

We have another interesting, and unusual, activity going on here. The state of New Mexico has identified the need at Santa Cruz and Costilla Dams for some safety modifications. As you know, those are state facilities. However, Reclamation, under contract to the state, is providing modification designs and handling construction activities. Our experience and expertise has been made available for the state of New Mexico to draw upon and we are more than happy to assist. The design work on this project is coming from our Denver office while construction supervision for Costilla is provided by our office in Alamosa, Colorado, and at Santa Cruz, New Mexico by our field office in Espanola.

Both are interesting jobs. At Santa Cruz, there will be a roller compacted concrete section built on the downstream side of the concrete arch dam to reinforce the arch and to allow the maximum probable flood to overtop safely the dam. Bids will be opened November 10th for that job.

Costilla Dam is now under construction. There we are removing the upper 40 feet of the dam and replacing it with an impermeable material. Also, the spillway will be replaced and the outlet works rehabilitated. I am also pleased to report that we are making progress toward completing the Navajo Indian Irrigation Project in San Juan County.

As you will probably remember, Reclamation is actually acting as the construction agent for the Bureau of Indian Affairs (BIA). Money is contained in the BIA's appropriation rather than Reclamation's. Congress seems to be making a renewed effort to finish the project. In the FY 1989 budget, Congress requested \$11 million, up from the 1988 request of \$3.5 million. When completed, the project will provide significant benefits to the Navajo

Water Planning and The U.S. Bureau of Reclamation

nation. According to information provided by the tribe, the completed project will:

- add \$875 million to the economy;
- more than double employment and trade benefits to the area;
- increase opportunities for private sector investments;
- continue development of a diverse and agriculturally-based self-sustaining economy.

By the end of this year, we will have completed six blocks totaling 60,000 acres. Next February, we expect to start construction of Block 7 with about 5,000 acres coming into production by the end of 1989. The entire project will involve eleven blocks totaling 110,630 acres.

One final project of interest is the Animas-La Plata Project. While the bulk of development activity will take place in Colorado, the positive impacts and water supply will also benefit the Farmington-Bloomfield-Blanco area too.

We went right down to the wire in getting the Indian water rights settlement legislation through Congress two weeks ago. Without it, the Animas-La Plata Project would have been in serious trouble. All of you in the New Mexico water community who assisted in that intense effort are to be congratulated. We still need to get contracts in place with the Indian tribes, along with an escrow agreement with the state of Colorado for its cost-sharing funds, but we have cleared what was probably the most difficult hurdle.

The impact of Reclamation projects is vivid. Cities and towns have reliable water supplies; Indian pueblos and reservations have economic development opportunities through irrigation projects; and irrigation districts have prospered. The 1986 (latest) figures show 205,000 acres of irrigated land produced \$136.8 million worth of crops on Reclamation projects in New Mexico.

Regardless of how we are organized, our commitment to this state is unwavering. Also, we pledge to place emphasis on local input and participation to meet your needs. In concert with that goal, is a pledge to continue to work together to seek ways to manage our projects more effectively.

One way Reclamation is meeting that goal is by fulfilling a congressional mandate to ensure proper water deliveries under the terms of the Reclamation Reform Act or RRA as it is commonly called. This year, agricultural water users were notified through their districts that failure to comply with reporting requirements would result in reassessment of charges for water at the full-cost rate plus interest as well as the shutoff of water in

extreme cases. By enforcing the law, Reclamation is conserving water for authorized users. The latest information I have indicates that compliance with the law is widespread with only minor problems to iron out.

The next major step in meeting RRA objectives is to develop and implement approved water conservation plans prior to the 1989 irrigation season. These plans are mandated by Congress and, quite frankly, the public is demanding significant conservation in lieu of new major water developments. Failure to provide good conservation management over time will only play into the hands of those who question the wisdom and need for water projects.

This past year we worked to help the nation better manage its fiscal resources by recouping funds for the treasury through the liquidation of existing loan portfolios under three separate loan programs. Nationally, we had a target to move \$130 million worth of loans off the bureau's books. We topped that by \$62 million with a final total of \$192 million.

Reclamation is now providing its planning, engineering, design, contracting, and construction expertise to the Environmental Protection Agency's (EPA) Superfund Program. We have six projects in our region. Also, we have two ongoing projects underway to do the same type of work for the Air Force, including one such project in New Mexico at Kirtland Air Force Base. We have recently signed an agreement with the U.S. Geological Survey and the Bureau of Mines to provide significant problem solving talent to many hazardous waste situations.

Similar to the EPA programs for technical assistance, Reclamation is prepared to assist other interior agencies as they deal with surface water, ground water, and other resources associated with federal lands. For instance, we have recently completed a memorandum to provide technical assistance to the National Park Service.

Finally, I'd like to recognize that for both you and me, the reorganization of what was the old southwest region into the Upper Colorado Region has created the opportunity for new personal and professional working relationships. Many of you know me from the work we've done together on San Juan River issues. Others of us have never met but have a long history of relationships with the former region. While we are making and renewing friendships, let me suggest that we continue to build upon the cooperative spirit that has for so long existed between Reclamation and the people of New Mexico.

Clifford I. Barrett

Let me assure you that I have given the highest priority to making the reorganization work. Internally, my staff and I have worked hard to make sure within the employee ranks there are no "them and us" relations between the two old regions. I also pledge my commitment to make sure we give you, our constituents, our very best efforts in planning and managing water resources. My office door at the regional office, and all our doors here in the field, are open to you. I am excited to work with you as we continue in an historic partnership to make the quality of life better for all of New Mexico's citizens.

RURAL TO URBAN WATER TRANSFERS: PROTECTING THE PUBLIC WELFARE

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INTRODUCTION

New and expanding urban uses of water in today's new era of reallocation and transfers threaten to undermine some important community values associated with water. Current mechanisms employed to transfer water from rural to urban areas often erode the courtesies that have underpinned the spirit of sharing, trust, and mutual adjustment that has been essential to water matters in an arid land. Further, the means chosen to transfer water away from rural areas has threatened valued rural cultures and lifestyles. In this presentation, I will explain how and why some public welfare values have come to be threatened and what these values are, and then suggest some possible avenues through which protection of these values might be assured.

CHANGING FORUMS FOR WATER DECISIONS

Flawed though the decision-making process clearly was in the era when large scale federal water development was relied upon to serve new and expanding uses, the political process required to legitimate projects contained some mechanisms that no longer exist to protect public welfare values. For instance, areas of origin in water transfers could block projects that failed to protect their interests. If people did not feel they had a voice in decisions or an adequate share in the benefits, they could oppose the project. As Congressman Wayne Aspinall, who was a master of old style water politics used to explain it, regions desiring a water project needed to forge a united front at the grass roots and the agreement needed to be projected to state and federal levels. Opposition at any level could well signify defeat. Proponents of projects were needed to build support in a variety of settings. Disgruntled interest groups had multiple opportunities to block

projects. The forums in which decisions were made about water were typically dominated by a few fairly narrow interests, but the competition among available projects was such that opposed projects were shoved out of the pipeline leading to authorization and funding. There was every incentive for project sponsors to bargain with interests groups claiming a stake in the project.

Now that the development era is over, the rural and urban interest groups, who used to combine in coalitions behind water development projects are frequently pitted against one another in competition for a limited water supply. The contest is uneven and, more importantly, is being played out in ways that may be damaging to public welfare and long-term stability in water management. Not only do urban areas have the predominance of economic and political power, they also are highly organized. Municipal water departments are usually insulated from public accountability and operate as semi-autonomous businesses. In contrast, the parties with whom they bargain in water sales are often individual farmers. Even if such farmers get a satisfactory price for their water, the rural area residents not party to the transaction experience loss of tax base, a decline in economic productivity and loss of control over decisions about the future for which water is a fundamental asset. Yet in a market framework where a city bargains with individual farmers, there is no forum in which broader rural community interests can be brought to bear on decisions.

WATER COURTESIES

In an arid region, water decision rules include the observance of a number of mutual courtesies

that assure a relatively smooth process of allocation. A good neighbor is one who put his or her headgate down on time. Water is not wasted. Maintenance of the irrigation system is a community obligation. No one in a desert goes without water for domestic use, and nomadic desert tribes from the earliest times have rigidly observed the courtesy of maintaining common wells and extending travellers immunity from attack at oasis sites. It runs against time-honored courtesies to hoard water or to deprive others of use unnecessarily. The sharing of shortages in times of drought is an institution firmly established in informal practice.

Elwood Mead (commissioner of the Bureau of Reclamation from 1924 - 1936) said that until such mutual obligations were accepted at the turn of the century "there was either murder or suicide in the heart of every member of Western irrigation communities." Western water wars have become the stuff of history and story books because of the mutual trust water users have that the system will operate "fairly" to protect everyone's interest. Without this mutual trust, none of the forms of interaction, including government regulation and market transactions, can take place.

The manner in which a number of rural to urban water transactions have come about in recent years has tended to undermine the mutual courtesies or spirit of comity in water. Rather than having prior information or opportunity to comment upon and act with regard to water transfers, rural residents find out about water transfers after decisions have been made. They are presented with a *fait accompli*. It is inferred from the generally behind the scenes negotiations that neither thorough consideration of third party or community impacts nor community sentiment has been taken into account. Because the members of rural communities or their representatives are usually not invited to participate in transfer decisions from the beginning of the process, it is not surprising that rural communities doubt that community values related to water will be taken into account.

COMMUNITY VALUES ASSOCIATED WITH WATER

The contemporary emphasis in water policy evaluation is upon efficiency, and the commodity value of water is highly salient. In Water and Poverty in the Southwest, Lee Brown and I argue that water has a broader and more fundamental community value that is closely tied to public

welfare. It is not possible within the time constraints of this brief presentation to explore thoroughly, as we do in the book, the components of community values. I can, however, list some concepts, and give a general notion of their meaning.

Opportunity

In the West, if land has a water right it has a future, even if currently populated only by sagebrush, tumbleweed and prairie dogs. A place without water is believed to be done for, regardless of its other assets. To have a future, members of the community must believe that there is a way to satisfy their core community values. In some rural areas, water use by agriculture is essential to the community's vision of itself and its future. The independence and self-reliance of the individual farmer, the laid-back rural lifestyle, the lack of government controls and regulations, and closeness to the land and its productivity are essential to the community's vision of itself and its future. Ample, inexpensive water that can be used in agriculture is fundamental to the pursuit of these values, and the loss of water is the foreclosure of the community's option to realize these values.

Dependability and Security

Maintaining a secure supply of water has been a driving objective in western water politics. "First in time, first in right" grew out of the need for people to know that their access to water was going to be sufficiently secure to warrant investment. If access to water is believed to be insecure, not only will businesses and residents not move into a community, but people will be loath to make the public commitments necessary to keep county and town governments and school boards running.

Participation and Control

Historically, water has been far too important to communities to entrust its availability and management to decision-makers or forums removed from local participation and control. According to Maass and Anderson, who studied six irrigation communities in the U. S. and Spain, even when water projects were constructed by national bureaucracies, locals aggressively asserted their authority over actual project operations. Rural areas are following a long tradition when they resist incorporation into regional water management organizations in which they can be easily outvoted. The

Rural To Urban Water Transfers: Protecting The Public Welfare

organizations often must depend upon urban areas for water supplies.

MECHANISMS FOR PROTECTING COMMUNITY VALUES IN WATER

The reallocation of water through markets offers enormous advantages in terms of flexibility and efficiency. It would not be advisable even if it were possible to satisfy growing urban uses of water through new water development. However, market mechanisms may be accompanied by public procedures to protect the public welfare and community values. New Mexico Statute 72-12B requires that the public welfare standard be incorporated into permitting procedures involving appropriations, transfers and changes of location of water use. This law provides the vehicle and framework through which the state can go beyond the simple requirement of beneficial use to look at broader environmental and social implications of water allocations. Ample precedent for this development exists in other states, but even if no other state had yet moved in this direction, New Mexico's long history at the forefront of water management provides its own example for innovation in water law when the public interest requires.

WATER AND WASTEWATER PLANNING AND INDUSTRY

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The authors describe their experiences in planning and developing a private industry in Portales, New Mexico. Mr. Ben Henneke, President of Energy Fuels Development Corporation, provided his perspective as he worked with the city in locating his corporation. Mr. Mike Obrey, City Manager of Portales, relates the city's experience in dealing with an incoming industry. The trials, tribulations and eventual success of this cooperative effort are discussed. A video of the presentation is available on loan from the Water Resources Research Institute. The following is a transcribed and edited version of the presentation.

HENNEKE: I would like to apologize to you because Mike Obrey and I are the least qualified speakers you will hear during this two-day conference. We've had no long experience, no education, nor even any abilities in the area of water management, water rights or anything else relating to water. What I want to provide you with is a brief, totally different kind of approach to site selection planning from a purely industrial perspective. Mike Obrey will fill you in on the process of negotiating and cooperating, from a city's standpoint, in an economic development project.

In 1980, while I was living and working in Tulsa, Oklahoma, I was approached by a former employer to look at the ethanol industry and determine whether or not it made sense to open a plant. At the time I was running a coal industry; it was going terribly and I was pretty bored so I took his offer. The result was what is now called the New Mexico Grain Power Inc. in Tucumcari, New Mexico.

This industry is a 3-million gallon a year ethanol correction facility. The site selection process had been nationwide and we ended up, and I'm still not completely sure why, in Tucumcari. In selecting a

site, we were looking for, among other things, raw material availability. To run an ethanol plant, water is a crucial raw material. Water is crucial for the processing of raw materials and for mixing with grain to make the liquid which becomes beer. Ethanol is then distilled from the beer. The distillation process creates a very expensive water disposal problem. A key part of an ethanol plant is the water disposal system.

In 1980, and later in 1983 and 1984, we began looking for sites which had adequate agricultural water for an ethanol plant. Last year's drought makes it abundantly clear how important it is for a processing plant to have adequate agricultural water. As a truck receiving plant, we are dependent on local crops for supply and we need water for our own processing.

I didn't really take water planning very seriously at Grain Power in 1980. Through a series of misunderstandings among the engineers, the city, and myself, we located this plant in an area which only had about 15 feet to the water table and was permeable. That is not a smart place to put the plant because every time you spill something it goes out onto the ground and impacts the water table, which in turn alerts the Environmental Improvement Division.

Because of a misunderstanding between a farmer and the city manager, we were moved from the original site and nobody gave any consideration to the availability of water at the new site. We were moved to an area where our waste water would go directly to a sewage plant that had just been built. That was a brilliant stroke of luck, we thought, because we'd be able to blame our smell on the sewage plant. An ethanol plant smells a little bit like a bakery; yeasty with a kind of whole wheat

smell. We thought it would be great to be able to blame any worse smells on the sewage plant because everybody knows sewage plants smell. The problem that occurred there was inevitable. Being roughly 100 yards from the sewage plant, any time the ethanol plant had a spike of wastewater it would hammer the treatment plant.

In the old theory of always trying to fight the last war and making sure you are paying absolutely no attention to the future, Energy Fuels came to Portales to site a new plant thinking we could work out all the old problems. Energy Fuels uses about 150,000 gallons of water a day that goes into a cooling tower. Some of the water is processed and almost all processed water is recycled as it goes into wash downs and cleanups. Any plant using 150,000 gallons of water a day is going to put out a waste stream that is made up of biocides from the water cooling tower, water-treatment chemicals emitted from the coal-fired and gas-fired boiler, all of which are very standard in any industrial use. Nearly every factory or industry has a cooling tower or needs some sort of steam and therefore, water treatment.

Occasionally, dumping of alcohol occurs. We spend a lot of money trying to make alcohol and normally you would not want to put alcohol in the sewer. However, you would be amazed what any set of operators can achieve on any given day at two o'clock in the morning as far as which valve gets opened and which valve gets closed. If you have alcohol being distilled and sewers open, I can assure you, at some point, there will be alcohol in the sewer. Mike can tell you what he said to me one morning after we ruined the sewage plant by dumping alcohol.

Wash down material is periodically put into the sewer. That wash down material is essentially oatmeal, not a chemical, not a heavy metal, not mining materials, nothing very exciting, but it is oatmeal. If a town full of people were to eat oatmeal in the morning and simultaneously go to their garbage disposals and scrape out their bowls, that oatmeal would cause a lot of excitement at the city treatment plant. Energy Fuels also has had spills as the result of an operator lifting a gate instead of closing a gate or an operator saying, "Gosh, this tank was supposed to have been emptying for the last twelve hours. I forgot, but I sure can't tell anybody, so maybe I'll just go ahead and send this straight to the sewer."

OBREY: Portales is like every city in New Mexico in that we are extremely anxious for industrial recruitment and out-of-town business referrals. Our

experience with Energy Fuels taught us that we couldn't handle the business when we got it. We spent most of our time doing remedial work preparing the infrastructure of the city to deal with businesses like Energy Fuels. I honestly never considered that Ben would dump alcohol because I assumed he was trying to sell the stuff and any dumping would be accidental.

I think I was the first person Ben met from Portales. At the time, I was Director of Community Development. Energy Fuels was partially funded with an Urban Development Action Grant (UDAG) through the Community Development Program of the U.S. government. The grant required that Ben and I work together from the beginning and that has been the key to our success. Ben and I have always communicated well. If a problem arose, we'd call each other and get it solved. The main ingredients were patience and communication when working with an industry like the ethanol industry. Our ability to communicate well became especially important to me when I became city manager because I had to solve the problems I created while I was Director of Community Development.

I think every city manager acts as if he or she knows how a plant, such as Energy Fuels, works. They don't. I didn't, but I do now. Ben's engineers, some of the finest in the field, provided the city with all kinds of data that weren't correct. Our engineers provided Ben with all kinds of data that weren't correct. We've had to manage largely through good communication and patience with one another. We think Ben's proud but we can still fight a little bit when we think he's at contract level or above. He thinks he's way below but we debate that constantly. The key is patience and communication.

I think with the exception of Tucumcari, Energy Fuels is the only ethanol plant that discharges into a municipal sewer system. It cost the city about a million dollars to upgrade our sewer facility but we were happy when it was complete. Portales had made the mistake of spending money hiring people for economic growth, giving them a valuable piece of property in our industrial park, and not providing them with necessary resources like electrical or natural gas capacity. We really were not prepared for growth but largely through Ben's patience and a lot of his money, we now are prepared. Focusing on growth is what I've been doing since I became city manager thanks to Ben coming to Portales.

HENNEKE: Mike and I will go through the process of establishing Energy Fuels in Portales. Energy Fuels came into town and gave the city 24 hours to

sign what was called the "seduction resolution." This agreement was part of the UDAG process, a very weird process, which unfortunately is one of the federal programs that was cut in the last few years. The process begins with the UDAG office announcing that it is ready to accept new projects. A company then has about 20 days to do four years of work.

We immediately needed data from the city. We had selected Portales as our site largely in a vacuum because one of the things I've learned about site selection is to never let the town know about you or you'll never get off the phone with all the people who will want to talk to you about why their town represents a unique and perfect opportunity. Because of this lesson, the city staff had never seen much of us. We certainly had not seen much of them. Upon arriving in Portales we asked the city for data for the federal planning process. All of this information had to be accumulated in 36 hours; there was plenty of time for careful review!

Knowing the Ogallala aquifer was underneath the ground, we began looking within a fifteen mile radius of Portales. We knew the water quality varied and didn't mind drilling four or five wells to find good water. When you are spending \$30 million to develop a plant, you can afford to drill several wells. We were unconcerned about not having enough water for the operation.

Due to a combination of oatmeal, alcohol, and biocides, the sewage situation was a much more difficult problem. Once in awhile you will get a spill of alcohol that kills all your bugs and consequently the sewage system will not process the oatmeal. Or alternately, if biocides are put into the water cooling tower due to an operator's error, you not only throw away \$15,000 worth of water treatment chemicals, you kill the bugs needed to eat your oatmeal.

We went to the city with these concerns and asked if they could provide us with water and handle our wastewater. The city responded affirmatively as they were desperate for economic development opportunities. We did not take advantage of the city because we were not aware just how desperate they were.

OBREY: One of the reasons the city of Portales has been so patient with Energy Fuels is that the company spends \$45,000 a day buying grain from local farmers. There are other spinoffs: we have more people driving trucks bringing stuff and hauling stuff away from the plant than I thought was possible. It is an industry that's absolutely

compatible with our community and it's worth our investment.

Prior to Energy Fuels locating in Portales, there were 3 one-million gallon capacity ethanol plants located outside the city limits and not connected to our systems. Indirectly they were connected to the city because they bought cooperative water from us. Those three plants were using about 15 million gallons of water a month. The city itself used about 3 1/2 million gallons of water a month so we did not feel the plants' use was excessive. We are more fortunate than most places on the eastern side of the state because we have a little more water available to us. We probably will be in the Ute project later but the ethanol industry was tailor-made for Portales.

HENNEKE: Energy Fuels and the city signed a 27-year contract. This was not required by government regulations. The length of the contract was determined by my birth date and the fact that I would be 65 when it expired. We had no other reason; we didn't know how long to make it. Studies indicate the reservoir might be there in 27 years or it might not. Certainly the plant was designed for a lifetime of something over 10 or maybe 20 years. Mike and I, in a spirit of camaraderie, pulled that number out of the air.

The negotiation process for the water took a long time because the engineers, being unsure and conservative, padded the request for fear that there would not be enough water. The city, knowing its water system was at capacity, now had an opportunity to expand. Energy Fuels was willing to provide, and did provide, \$ 150,000 toward a million dollar expansion of the water system in Portales. Because I did not believe the engineers' estimates, I layered some additional conservatism on top. I initially negotiated for a certain amount of water and sewage capacity. Mike Obrey, who was present during most of the discussions concerning our water and sewage needs, wanted some slack in the water and sewage capacity for future development. The result of this process was an overtaking of the capacity, even though, theoretically, we had four times the capacity in the city sewage system than we thought we would need.

The process of developing a water and sewage contract had a beneficial effect on the project as well as the city. The city obtained a fairly substantial increase in capacity. The consequence for Energy Fuels was a better understanding of the company's goals. Both parties also developed an understanding of the other's needs. If I had not gone through this

process, we may have drilled a well and developed our own sewage system independent of the city. There have been other important outcomes: Energy Fuels has put a demand on city streets and roads far in excess of what we originally planned, as 40 to 50 trucks a day go in and out of our plant. Because the city staff was intimately involved in water planning, they had some ideas as to when paving of an area would be necessary. Using the water allocation process as a way to get parties talking to each other, before there is a problem, has been very useful.

The signing of the contract was also beneficial because it imposed limits on what Energy Fuels was allowed to do. Other industrial users were "grandfathered" in. That is one reason why the city was at capacity, although, on paper, the system should have been at about half capacity. Mike and his staff were able to go back to the users and gradually encourage them to set limits on what they would dump. The end result of the entire planning process for Energy Fuels is that although our operations are messed up on a daily basis, they are better than they might have been otherwise.

OBREY: Southwest Cannery is also located in Portales and is a pretty large water user. Problems with sugar water and biocides had been present for a long time but no one had paid much attention. In deciding upon a fee for Energy Fuels, we looked at what we had charged Southwest Cannery. The city had charged the cannery \$50 a month for years and the fee had been raised to \$52.95 a month a short time ago. It did not seem fair for Energy Fuels to be paying the rates that we wanted while Southwest Cannery was not paying their fair share. Now Southwest Cannery pays us about \$3,500 a month, which is probably just at cost. Working with Energy Fuels allowed us to act more responsibly with all industry in Portales.

WATER PLANNING AND ECONOMIC DEVELOPMENT

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ABSTRACT

I imagine that nobody here doubts the existence of a close relationship between water resources and economic development, and their inseparability in any comprehensive planning that involves either. However, somewhat less agreement might exist among us as to what economic development implications follow from a particular outlook for water resources. And, too, quite spirited debates have been known to spring up over some essentially non-economic effects -- cultural and other "life-style" values come to mind -- of various water resource use alternatives.

Is usable water in New Mexico diminishing such that economic development is likely to be foreclosed in the future? Probably not. Though that answer is not premised on the possibility, "development" could lead to making brackish ground water usable; the quantity held in New Mexico is equivalent to about 2,000 years' flow of the Rio Grande.

In economic terms, a typical unit of usable water in New Mexico is becoming more expensive. Some believe that other social costs will rise as water use changes, for example, changes associated with transferring water from the small farm to an urban water system

What are some of the water supply costs, leaving social values aside, that must be reckoned with in planning for economic development?

- Protection or remediation of water quality. It is a generally accepted premise that protection costs less than remediation. What is not so clear in each instance, and what water and economic development planners need to include in the pictures they create, "Who pays and when?" The user who is compelled to discharge clean water won't readily agree that it is less costly for him than for a downstream user (or the government!) to remediate his pollution.

This is especially true if the remediation expenditure is to be deferred.

- Diversion and transportation systems. Ours is not the first civilization to enjoy the perceived benefits of transporting substantial quantities of water long distances. It is likely that ever-grander systems will come into use in the future; before they do, one may be sure that significant economic development planning will have been involved.
- Conservation practices. Limiting water use to necessary minimums is not the only meaning of the term "conservation." Return flow systems are another example, but they imply the additional cost of transportation back to a water source.

Most of you are aware that Governor Carruthers initiated a five-year economic development planning process, and that a draft plan has now been submitted to him. He has also appointed an economic development and tourism commission, charged, among other things, with reviewing and approving this plan and providing subsequent annual updates. Preparation of the current draft plan included a good deal of public participation. Views and ideas were solicited from a wide variety of individuals and groups. The commission will now broaden that public participation by conducting meetings around the state, open to full public participation.

I assure you that the draft plan, while a great beginning, needs considerable additional work. For example, there are gaping holes where highly important subjects are lightly discussed or omitted altogether. Water is one of those subjects. I believe the entire discussion of water consumes only two-thirds of one page in a 99-page document! Worse yet, the document submits as fact the following rather dubious claim: "Recent studies indicate that the demand for water-based recreation is nearly

John Dehdahl

insatiable and therein lies the greatest economic value for the state's water supply." I don't mean to minimize the pleasure or value of water-based recreation, but "greatest economic value" might seem to some an exaggeration. Omissions and exaggerations in policy statements lead to bad public action. We need your help in fine-tuning this New Mexico five-year economic development plan, so I hope you will request copies from my office. Read and think about it, at least the parts in which you have interest and expertise, and participate in the public meeting process that will make the document truly useful to you and your state government.

REGIONAL WATER PLANNING IN NEW MEXICO

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How do we plan for the water future of New Mexico? How do communities plan for the future? How do we assure that communities have the water necessary for their growth and development in the future? Many communities in New Mexico are hard pressed for their present water supplies and do not have the answers to questions of what water supplies they have, what water supplies they will need for their future growth and development, and more importantly, where they will find that water.

If we look to the southeast corner of the state, we find many communities facing an uncertain water future. Some of their water supplies have been contaminated by oil and gas operations. Many of the communities are small and dispersed and are going to need to find some mechanism for working together to acquire common water sources and distribution systems.

If we move farther north on the eastern side, in the Union, Harding, Quay, Guadalupe, Curry, Roosevelt County area, we find communities facing increasing needs for water, facing out-of-state demand, and facing the need to band together to meet their water future needs.

If we move to our western border with Arizona, in the McKinley County area, we find those communities with practically no surface water supplies and limited ground water supplies.

We also have a complex mix of jurisdictions with state lands, federal lands, Indian lands, and private lands. How does Gallup provide for its future? How can it provide a secure water supply for its future growth and development?

If we move south down that New Mexico-Arizona border area to the Grant County region, we again find limited water supplies available. In some areas in the region, water cannot be used outside the house for such things as gardens and lawns.

Many communities are hard pressed, and as if that were not enough, the courts have raised the prospect of out-of-state demand. We had thought that "our" water was "our" water, and that we could plan for our water futures based upon water available within the state borders.

The courts in the Sporhase case have largely erased state borders. There are exceptions, but nonetheless, the language of the courts is extremely narrow. We once thought that the laws of man, that is, laws of the state of New Mexico would protect us at the state boundary, but the courts have largely told us that now the laws of man will not protect us.

Then, if the laws of man will not protect us, surely the laws of economics will protect us from out-of-state demand. We had thought that it was just too expensive for surrounding communities in surrounding states to reach into New Mexico, develop water and transport it out-of-state. But, economic studies now tell us that we cannot take much solace in the laws of economics either. Economic studies tell us that it is economical for water to be acquired in New Mexico and transported through pipelines to surrounding states.

With the prospect of increasing demand, both in-state and out-of-state, how do we as the state of New Mexico help communities secure their water for their future needs? To help answer these questions, the legislature in House Bill 337 in 1987, inaugurated something new for New Mexico. It started regional water planning. This plan basically authorizes the Interstate Stream Commission to make grants to communities to do their own water planning, to do their own water studies, to hire the specialists to determine how much economic growth they are likely to have, and to project what their population growth is likely to be. With those

estimates in hand, they will determine what water will be needed and where they can obtain it.

The New Mexico water plan could be characterized by two key phrases or key concepts. One is "bottom up" and the other is "partnership." The New Mexico plan, unlike those found in some states, is not a state dictated plan, where the state plans for the community from the top down in a centralized fashion. Rather it is a bottom up plan, in which communities themselves are provided the wherewithal to band together in regions to determine what their water needs will be for the future.

Therefore, that brings in the second concept of partnership. State funds are used to allow communities to do their water planning. So we have a partnership between the state and the local communities using a bottom up concept. As a result of that 1987 appropriation of only \$150,000, the program was begun with water plans being initiated in the eastern plains region of Union, Harding, Quay, Guadalupe, Curry, DeBaca, Roosevelt and eastern San Miguel counties. The San Juan Water Commission also has their study underway as does the Santa Fe Metropolitan Water Board.

In 1988, the legislature provided \$250,000 to continue the program. The good news was that \$250,000 was provided by the legislature. The bad news was that the response for that funding exceeded \$1.6 million. The Interstate Stream Commission held hearings in September and considered these proposals from every corner of the state, and faced hard decisions in selecting regional water plans to fund. We now have regional water planning in the beginning stages in the southwest council of government area: Catron, Grant, Hidalgo, and Luna counties, the southeastern New Mexico area, the Gallup area, the north central New Mexico economic development area centered in Taos county, and the Mora-San Miguel Water Plan. So we are underway.

There is much more to be done. There are many areas still to be funded and more money will be sought from the upcoming legislature to extend the effort. Regional water planning in New Mexico is underway. Regional water planning in New Mexico is alive and well.

Some might ask "Is this going to be just another report that will gather dust on the shelf?" And that certainly is a possibility, but it is an unlikely reality. City commissioners, county commissioners, mayors, and public works directors around the state are now constantly being faced with the necessity of making decisions about their communities future. What economic development are we going to have?

What economic development can we have? Are we going to have sufficient water to encourage that new industry to settle in our community and provide jobs for our children? How do we provide for the population we already have? Those decisions are a matter of everyday decision-making in this state. With these water plans available, with the information, and with the data that they contain, communities around the state of New Mexico will not have to deal in the dark, but will be able to plan for their futures with greater knowledge, certainty, and security.

REGIONAL WATER PLANNING IN THE EASTERN PLAINS REGION

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The Interstate Stream Commission's (ISC) Regional Water Planning Program addresses the critical need for a water resources planning and development process in New Mexico. The program is a "bottom up" approach and includes public participation by local "stake holders." In the Eastern Plains area, that includes eight county commissions, 22 incorporated municipalities, dozens of unincorporated communities, a major defense installation, eleven acequias, several mutual domestic water associations, one major private water utility, a conservancy district, an irrigation district, eight soil and water conservation districts and nearly 85,000 residents.

We recognize that without the new regional water planning authorities, a state water plan would likely be well-conceived, but might not have the necessary local support to make implementation possible. This is where the very positive benefit of regional water planning occurs. The law requires a voluntary agreement based on hydrological and political interests in common.

The law also requires public access and participation. The education of the public will have considerable benefits as we seek consensus on solutions to regional and local water problems based on a clear understanding of the problems, issues and opportunities.

The unique aspects of our regional water planning effort include:

1. The eastern region is a large geographic area: 18,500 square miles in three drainage basins in eight counties. The area has two rivers, four major reservoirs, five declared water basins, and a declining ground water situation in the Ogallala and related aquifers.
2. Having seen some of the contract work performed under other funded ISC water planning grants, I am aware that our effort was the first to attempt to do the work in-house. We are fortunate to have the assistance of

Orlando Pacheco, a civil engineer with more than 20 years of water planning experience.

3. We are utilizing a steering committee, the Eastern Plains Council of Governments board, the Resource Conservation and Development Area Council board, and local governments in the planning process.
4. Community and county level public hearings based on local interest and support will be held. At least four public hearings, and possibly ten, will be scheduled.

There is a growing awareness of the strategic importance of water in the growth and development of New Mexico. Entities within the eastern region have been working cooperatively for more than five years to address common water issues and problems. Our collective responsibility to address water problems is compounded by the great diversity of situations and needs in our region. We also recognize the complex legal and regulatory framework in which we operate.

I will outline some of our biggest problems and some possible solutions. Our draft recommendations are designed to optimize the use of available water resources and extend the life of the aquifer to meet current and projected water needs of the region.

Some of the water problems in our region are beyond the control of local authorities. The Guadalupe/DeBaca county area provides an example. The Pecos River in this area has multiple problems: 1) shortages based on lack of rainfall (yield); 2) water quality problems, primarily salinity from natural causes; and 3) legal problems, specifically, the impact of court decisions on how to meet the Pecos water debt to Texas.

Court decisions could have a very detrimental impact on agriculture and the overall economy of this part of the region. The water quality problems would be very expensive to correct. Fortunately,

some of the other problems can be addressed locally or in partnership with the state.

Our single most pressing long-term problem is providing an adequate supply of water for municipal and industrial purposes in most of Quay, Curry and Roosevelt counties. Everyone knows that we are mining our ground water in the area. The sobering fact: the eventual exhaustion of the Ogallala aquifer is inescapable. It is not a matter of if, it is a matter of when. Based on available information and studies, assuming no major changes in current agricultural practices or technology, the sole-source aquifers in most of the area will be virtually gone by 2020. This will result in a reversion to dryland farming for the most part, and it will have significant economic consequences. Our plan addresses this inevitable problem and discusses ways to mitigate its impact.

The Ute Water Development Plan is the centerpiece of our Regional Water Plan. It involves the construction of a major pipeline, pumping plant, and regional water treatment facility utilizing 18,400 acre-feet of water. The project would deliver treated water for municipal and industrial purposes to nine communities and Cannon Air Force Base, which has 70 percent of the region's population.

The primary leadership for this project is the Ute Water Commission, the joint powers agreement entity established to plan and develop this project. The commission has received considerable support and encouragement from many groups including the ISC, the state engineer and his office staff, the Bureau of Reclamation, Senators Pete Domenici and Jeff Bingaman, and the private water utility serving Clovis, the New Mexico American Water Company.

The history of this project dates back to the decision by the legislature in the early 1960s to invest state funds in the construction of Ute Reservoir. The project impounds water consistent with the provisions of the Canadian River Compact. For nearly 15 years, as many as 14 cities worked together to deliver water as far south as Jal. However, the original plan had fatal flaws.

The new "abbreviated" project is clearly feasible. The preliminary appraisal level cost estimate indicates that communities will pay about \$2.50 per thousand gallons to deliver treated water. This is an increase over what most are now paying, but affordable as a long-term solution.

We don't want to plan this project to death again. We plan to make it happen. The Bureau of Reclamation has received a special appropriation to complete more detailed cost estimates and detailed engineering on the Ute Pipeline Project.

We need to thank Cliff Barrett and the Bureau of Reclamation staff for the partnership approach they are taking on this and other efforts important to New Mexico. We have found the Bureau staff in Salt Lake City and the staff of Albuquerque to be very receptive and responsive to local consensus and interests on the Ute Project.

The project will require creative financing from a number of sources. Privatization of the operation and maintenance of the system is being seriously considered. The use of wind power for pumping the water is also being evaluated. This could turn a major problem into an asset contributing greatly to our efforts at economic diversification.

Aside from the Ute Project, our regional plan considers other issues, problems and needs. With help from local communities in our area, we are making a deliberate effort to upgrade all the municipal water systems in the region. This will require better capital improvements planning at the state and local level, and a greater emphasis on improved operations and maintenance.

We are working closely with the Infrastructure Development Assistance Program at the University of New Mexico to provide training opportunities in this area. The impact of the new Safe Water Drinking Act standards are of concern to us. We are also suggesting that each community establish a 40-year plan to help assure an adequate supply.

Local governments are being encouraged, individually and collectively as a region, to establish locally controlled and managed water conservation strategies. Locally controlled conservation is essential if we are to be effective stewards of our limited water resources.

Although regional water planning law and regulations do not specifically require it, we feel that any regional water plan would be incomplete without a water preservation strategy. Water quality is considered a high priority, not because we have extensive water quality problems, but because we recognize that prevention of water contamination is much more economical than cleanup of polluted water. We currently have an Environmental Protection Agency Superfund site at Santa Fe Lake near Clovis and the remediation costs will be expensive.

A side benefit of our water planning activities has been our participation in other activities like the Governor's Water Quality Advisory Committee. The final report to the governor is now being completed, and we hope it will bring about serious discussion in the legislature, elevating this issue on the state's public policy agenda. It is very apparent

Regional Water Planning in the Eastern Plains Region

that local governments and local soil and water conservation districts must exercise, to a greater extent, their authority under existing laws. County governments in particular must increase the use of subdivision regulations to protect water quality, particularly in vulnerable areas.

Without local communities taking interest and responsibility in their water future, I foresee a state enforcement alternative. This could be combative, divisive and ultimately unproductive. A cooperative partnership seeking compliance would be preferable.

Another activity which has contributed greatly to a broader understanding of our water problems was the Second New Mexico Town Hall meeting in Angel Fire this past summer. Important recommendations were made and have been published. I hope you all get a copy and review it carefully.

There is much more to be done in our water planning region and throughout the state. The limited funding for regional water planning provides a mechanism for local participation and leadership. It is crucial that these efforts continue. Our problems and needs are diverse while our agencies and institutions are fragmented. We appreciate the opportunity to work with all of the organizations now in place. Their work is vital. Our participation on an informed basis is even more critical. We hope our regional water plan makes a positive contribution to these efforts.

REGIONAL WATER PLANNING IN THE SANTA FE AREA

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I want to thank you for the opportunity to address the 33rd Annual New Mexico Water Conference. My talk this afternoon is divided into three sections as follows: a history lesson to put the Metropolitan Water Board (MWB) in perspective; regional planning for Santa Fe and Santa Fe County, i.e., what we are doing with the Interstate Stream Commission grant; and an assessment of the status of both the study and the MWB.

The MWB began as an operating committee, required by the Bureau of Reclamation, made up of the local signatories to the San Juan Chama Project contract. The operating committee was to make objective, unbiased decisions related to the allocation of project water within the Santa Fe region. The federal contract suggested the formation of a metropolitan water board to succeed the operating committee, and in 1980, a city-county joint ordinance established the MWB.

The original board had the city, county, Sangre De Cristo Water Company and their collective appointees plus three elected representatives. The state statute was changed in 1985 to provide for a seven-member publicly-elected board from three county and four city districts. The 1980 Joint Ordinance still governs the board's powers and duties.

The MWB is a review, recommend and plan type of entity. We have no regulatory authority. No regulatory authority! We are an advisory body! The statute changes of 1985 gave us some limited powers to condemn, operate or own a water utility, but no revenue-raising authority. Our operating revenues come from the city, county and the Sangre de Cristo Water Company. Later, we'll discuss this potential conflict.

In the fall of 1987, the MWB applied for and received a grant from the Interstate Stream Commission for \$68,000 to do a regional water plan, i.e.,

supply and demand forecast with a forty year planning horizon. The MWB elected to have a "Request for Proposal" prepared with the idea of hiring significant consultant expertise to perform much of the technical planning work. Initial cost estimates for the project were around \$250,000. Within sixty days, we had advertised the study, perused eleven proposals, short-listed to three firms, conducted interviews, evaluated cost proposals and selected Harza Engineering and Brown, Bortz, & Coddington of Denver to act as joint technical and financial consultants.

We began our water resources study in mid-January 1988. Our budget was about \$200,000 obtained by using the state money to leverage similar amounts from the city, county and Public Service of New Mexico (PNM).

About six weeks ago we finished Phase I of a one year study. Phase I is largely an inventory document directed to demographics, demand and technical expansion alternatives. This work effort has had a very public approach including a Citizens Advisory Committee, various briefings, and two significant public meetings, which were held jointly with the MWB, city council, county commission, consultants and the public. These meetings were to provide information and serve as a question and answer forum.

Some of the general conclusions from Phase I include:

- Santa Fe is a growth area but currently growing at a slower rate than in the early 1980s.
- Currently, sufficient water has been identified to meet the demand but it requires bringing on-line several additional sources requiring large sums of money, significant ingenuity and perfecting additional rights.
- The available resources will support a regional population of about 300,000 people.

- The U.S. Geological Survey's (USGS) ground water model seems to indicate more water available and withdrawal impacts less than previously thought.
- Santa Fe water rates are among the highest in the country and per capita consumption is low reflecting significant current conservation perhaps due to price considerations.
- The greatest competitor to the existing water system is the growth of private wells, both commercial and domestic.
- Wells are economically attractive given the current water rates.
- Wells are the only source currently available outside the Santa Fe urban area due to the lack of a county regional system and the existing anti-extension policy of the city.
- Santa Fe city staff views water extension as the most convenient and effective way to limit growth to preferred areas and developers.
- County staff views the city staff view of water extensions as the most convenient and effective way to limit the county's tax base.
- There is currently no forum available for public input on how to manage the available resources.
- Indirect costs related to unwise stewardship and poorly conceived legacies have no standing in the rate-making forum.

Well, the above list contains no surprises. You might conclude that this is sort of a ho-hum situation not very different from your region.

Let's digress for a moment and investigate the environment in which we operate in Santa Fe: the city manager formerly directed the Environmental Improvement Division; the mayor was chairman of the state Democratic party; PNM is the largest utility in the state; and PNM and the city have a franchise agreement. Does this sound like everybody will always be willing to play a fair and impartial game with the board's funding and existence? Perhaps not. Your region's political leadership and climate may not differ very much from Santa Fe's.

The real issue with water resources planning at the local level is local politics, especially when an agency is dependent on funding from the local units of government, which have significant vested interests and agendas of their own.

Any agency dependent on the good will of an inherently self-interested and self-serving political body is in for real trouble sooner or later. By definition, to serve the overall public good of several units of government, an agency is put in a conflicting position with one or more of its principal financial supporters. It just doesn't work well.

Let's backtrack a little. In 1987, the MWB was a grantee of the state's Regional Water Planning Grant Program. If all the state wants out of that program is an inventory of supply and local demand, then we have largely accomplished that as we will be finished with the entire study in January. But if there is a need for continued work, whether funded locally or by the state, there may be a problem.

Originally, the MWB was looked at by the state as a capable, regionally oriented, unbiased entity to conduct this planning. If for example, the Interstate Stream Commission requests additional work of the MWB, we believe that work would need to be objective. The MWB could not play favorites with its local funding entities. The board would thereby win fewer friends and put at real risk the attempt to implement anything resulting from the study. Indeed, the MWB's existence would be at risk.

Every city council has its own agenda. Every county commission has its own agenda. Every private and maybe every public utility has its own agenda. It doesn't work to have a planning agency dependent upon the good will of these ever evolving agendas for its funding. I make no criticism of this situation, I just think we have to recognize there is a real potential problem and try to figure out how to work around it.

I believe the state needs to take one more step. That step is to insure that several funding avenues are available to water resource planning entities such as the Metropolitan Water Board. No, I don't mean a general fund appropriation directly from the state. If, as I mentioned before, the state wants more than an inventory, it must help facilitate the longevity of the planning entities by making funding options available.

These options might include: utility surcharges, development permit fees, well permit fees, wellhead pumping fees based on production volume, district taxes, and mil levy. This list isn't all inclusive but intended simply to promote thought on how funding might be made available.

Now that New Mexico has the beginnings of a good regional grant program that can meet both state and local needs, the challenge shifts to one of how the local planning needs can be served by implementing the results of the study phase. Without long-term, politically insensitive funding techniques, the citizens as distinguished from state government itself, get only a partial benefit from this grant program. What I believe is needed is a legislative initiative in the next session to provide these necessary funding options.

WATER PLANNING FOR STATE TRUST LAND:
PROTECTING THE AVAILABILITY OF WATER RESOURCES

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INTRODUCTION

The New Mexico State Land Office has recently been active in water resource planning activities throughout the state. This activity is representative of the commitment of the commissioner of Public Lands to a broadened scope of potential uses of state trust land resources.

The State Land Office's historic dependence on oil and gas lease revenues has provided a Permanent Fund asset amounting to \$2.7 billion. These assets produce investment earnings that provide approximately one-fourth of the public school appropriations and significant contributions to the appropriations made to other beneficiary institutions.

Recognizing the volatility of petroleum markets, as well as the finite nature of oil and gas resources associated with state trust lands, recent commissioners have sought to develop more fully the valuable attributes of the trust. It has always been the case that land resource values in New Mexico are tied to the availability of water resources. As the State Land Office moves to a greater breadth of potential trust land use, the commissioner must seek to insure the availability of water resources necessary to allow the development of the trust.

Thus, water resource planning has become a prominent issue for the commissioner. The commissioner's constitutional responsibility for managing approximately 9 million surface acres and 13 million acres of mineral rights (N.M. Const. Art. XIII, Section 2) provides a large range of water resource issues which could potentially affect the

value of trust lands. Careful planning for the water resource needs of the trust lands provides the basis upon which the full development potential of these lands can be realized.

Water planning for state trust lands must seek to assure that sufficient water resources will be available for current and future development needs. The need to assure the availability of water for trust resource development is general with a statewide scope, but requires concern for local or hydrologic basin-specific water resource issues. Recent experiences with several proposed developments of trust land resources have highlighted the need for aggressive water planning relating to trust lands. These development experiences, combined with pending legal conflicts relating to competing claims to water resources under New Mexico water law, are largely responsible for bringing water resource planning activities to the attention of the State Land Office in recent years.

An understanding of the Land Office's position requires the historical perspective relating to the responsibilities of the commissioner. The Land Office's current policies must also be understood from the perspective of recent efforts to develop trust land resources.

Water planning for state trust lands is premised on a presumption that water availability is critical to realizing the current and future development of the trust resources. There are several threats to the availability of water in New Mexico, which in turn threaten the planning process for state trust lands. Two of these threats, the exportation of water and

claims of federal reserved water rights, will be discussed here.

Historical Foundation for State Trust Land Water Planning

Before discussing specific water planning issues now being addressed, a little background about the State Land Office is necessary. State trust lands were granted by the United States Congress to New Mexico for the support of public education and all of the major state universities and other major state institutions. It is clear from the wording of New Mexico's Enabling Act (Act of June 20, 1910, ch. 310, 36 Stat. 557) that the trust land grant imposes upon the state, the commissioner of Public Lands and the employees of the State Land Office, fiduciary standards in their management of that land. Such standards impose two concomitant duties -- maximization of revenue from the land and protection of the land's value from waste and degradation.

Although fiduciary principles require state trust lands to be managed exclusively in the interests of the beneficiaries, proper execution of the trust by the commissioner of Public Lands and his staff is of vital importance to all New Mexico citizens. Legislative history makes it clear that Congress intended that every dollar earned from state trust lands be a dollar less in taxes the state need raise. Thus, every New Mexico citizen, even if she or he has no direct connection with one of the beneficiaries, is affected by what the State Land Office does.

Water will always be a necessary adjunct to the use and development of state trust lands in New Mexico. Whether for livestock watering, developing the commercial attributes of trust lands or injection for secondary oil and gas recovery, the commissioner's ability to maximize revenue from and protect the value of state trust lands depends on sufficient, long term sources of water for use with the land. This need exists now and must be considered perpetual, as is the trust. Therefore, water planning for state trust lands must focus on preservation of water resources for future use.

In the past, the Land Office has allowed state trust land users to acquire vested water rights, as private property rights, in conjunction with their use of trust land resources. Recent commissioners have recognized that private water rights vesting from use of trust lands is an inappropriate policy for resource management due to the loss of control over the use of a valuable property right. The State Land Office now requires that all new appropriations from state

trust land vest title to water rights in the name of the commissioner.

Because the State Land Office manages a perpetual trust, it engages in what economists describe as "intergenerational resource allocation." This resource allocation principle requires that, in managing the trust resources today, consideration must be given to both contemporaneous and future needs of the trust's beneficiaries. Thus, water planning by the State Land Office must seek to assure that water resources will be available many years from now such that the commissioner will be able to fulfill the trust purposes.

One of the problems of intergenerational resource allocation is that specific future needs may be uncertain, although the need to plan for these future resource use requirements is in no way diminished by that uncertainty. With respect to water planning requirements faced by the State Land Office, quantification of future needs and current acquisition of that quantity is unnecessary so long as there will be water and water rights available for appropriation, market acquisition or condemnation. The intergenerational resource management responsibilities of the commissioner motivates the Land Office's opposition to applications for water export and claims of federal reserved water rights. In the context of water resource planning, either water export or perfection of additional reserved water rights claims results in the elimination of water resources in New Mexico available for appropriation and beneficial use, or market acquisition, or subject to the exercise of eminent domain power, as the future development of the trust land requires access to this vital resource.

Water as a Development Constraint

The need for adequate water resources to allow development of trust land resources has been brought into focus as the result of several recent urban land development efforts by the Land Office. The Land Office is actively involved in several large scale commercial and residential land development projects. The significance of water resource planning to achieve the full market potential of these properties has been clearly demonstrated by these projects. The long-term water resource planning responsibility of the Land Office with respect to these urban land resources can be simply stated as an assurance that adequate water resources will be available for provision of reliable and cost-efficient water service to these properties.

Water Planning for State Trust Land: Protecting the Availability of Water Resources

Several years ago, a master plan was developed for a large tract of trust land near Albuquerque, a tract of more than 10,000 acres located south of the Albuquerque Airport and known as Mesa del Sol. The development of a marketing strategy for this raw land required consideration of infrastructure requirements, including provision for water and wastewater services. Water resource use constraints, among other development issues, eventually required that the property be brought to market subject to annexation by the city of Albuquerque.

Clearly, had the water resource requirements been independently satisfied, additional value could have attached to the Mesa del Sol property, corresponding to the additional development opportunities which could be associated with the property.

The sale of this property became subject to a dispute which was unrelated to water issues, and the sale was cancelled in 1987. The property, or parcels of the property, will likely be re-offered in the next several years, subject to favorable Albuquerque real estate market conditions. At the time of the future sale, the water resource constraints are likely to be issues of greater significance, and their resolution will be a matter of increased magnitude as related to the potential value of the property. Current planning activities of the Land Office with respect to the Mesa del Sol parcel are addressing the water resource constraints.

At the present time, the Land Office is also in the process of planning for the development of a large tract (approximately 10,000 acres) northeast of Las Cruces. This property is similarly situated to municipal boundaries as is Mesa del Sol; however, water resource constraints in the Lower Rio Grande Basin require the city to insist that annexed property possess adequate water rights, or be subject to a monetary charge at time of annexation to cover the city's cost of necessary water right acquisition. The value of this property will be directly impacted by the Land Office's ability to plan carefully for water resource needs, and assure that water rights are available to satisfy these needs.

Several alternatives are being actively considered in this planning process. The Land Office has sought to keep as many options open as possible, and allow the planning process to direct the water policy according to specific needs and hydrologic facts associated with the Las Cruces parcel. The planning for water resource needs has itself become a significant activity in this project. The Land Office remains open to private parties who wish to provide water resources to the development, with the caveat

that the private interest will not gain *de facto* control over the value of the project's other attributes. Until the specific water resource needs are known, and a plan for satisfaction of water resource requirements of the development are factually and legally demonstrated, the commissioner's strategy will be simply to retain the greatest flexibility in satisfying the water requirements of the property.

Several observations can be made with respect to these two commercial development planning efforts as relates to water resources. Clearly the need for careful water resource planning is most acute where available water resources are nearly fully appropriated. Determination of water availability, under the administrative jurisdiction of the State Engineer Office, guides the allocation of water rights. The Land Office has aggressively pursued protection of its interests in water rights in recent years to assure water availability at the time of development of trust land resources.

Critical to the planning for water resource requirements is the determination of the development potential for the trust lands. Unfortunately, the trust lands with the greatest development potential are also found in areas which (generally) are also facing the greatest water scarcity constraints. The scarcity conditions require a degree of creativity in planning for the satisfaction of the water resource requirements for the future development of trust land resources. The factual bases relating to the Land Office's intervention in litigation over exportation and reserved water rights demonstrate the commissioner's effort to assure the future availability of necessary water resource requirements. Participation in the litigation described in the following section is an integral part of the State Land Office's water resource planning activities.

Litigation Impacting Water Resource Planning for State Trust Lands

The water resource planning activities of the State Land Office are inextricably linked to current litigation in New Mexico relating to exportation of water resources and federal reserved water rights claims. Exportation of water results in the physical removal of water from New Mexico; federal reserved water rights claims raise the possibility of the removal of water resources from the state's sovereign jurisdiction. In both situations, the availability of water to be used with state trust lands may be reduced or eliminated.

Because the consequences of unfavorable rulings in the litigation of these two issues could endanger the ability of the State Land Office to manage effectively state trust lands, it is necessary that the State Land Office aggressively pursue ways of countering such threats. The commissioner of Public Lands has been doing so in a legal context and believes there are sound arguments allowing the State Land Office to protect state trust lands from these threats.

EXPORTATION

Prior to 1982, New Mexico had an embargo law which simply did not permit New Mexico water to be transferred beyond our state border. In that year, however, the United States Supreme Court ruled that water was a commodity in interstate commerce and that, therefore, under the Commerce Clause of the United States Constitution, states were not allowed to prevent the transfer of water movement across state lines. Sporhase v. Nebraska, 458 U.S. 941 (1982). The New Mexico embargo law thus became unconstitutional and unenforceable. The result was that water resources once believed to be preserved for use in New Mexico became subject to transfer out-of-state.

The Supreme Court did establish, however, that a state may, in times of critical shortage, prefer and limit water use to its own citizens, thus preventing water from being exported out-of-state. Exercise of the preference and limitation is possible if a state can show that exportation would be contrary to the conservation of water within the state or detrimental to the public welfare of that state's citizens. Unfortunately, the meaning of "conservation" and "public welfare" in a water shortage context is not yet defined. Only after extensive litigation and judicial review might some standard or guideline emerge that could provide some certainty. The incomplete definition of these critical terms causes significant distortions in a current planning context, where certainty is desirable, if not necessary.

There are, however, at least three exceptions to the Supreme Court's ruling that would allow New Mexico to limit exportation of water without having to show particularized facts regarding critical shortage. These exceptions are (1) a "close means-end relationship," (2) "congressional authorization," and (3) the "market-participant doctrine."

The "close means-end relationship" exception was referred to by the Supreme Court in Sporhase:

A demonstrably arid state conceivably might be able to marshal evidence to establish a close means-end relationship between even a total ban on the exportation of water and a purpose to conserve and preserve water.

Sporhase v. Nebraska, 458 U.S. 941, 958 (1982).

The "congressional authorization" exception is a matter of judicial interpretation of congressional intent. Congress has full power over interstate commerce. If Congress authorizes a state to burden or even prevent interstate commerce in a certain commodity, then such state action is constitutionally permissible. Such congressional intent has been found where a) Congress, in legislation, "expressly stated" the state's authority, b) the court has determined from federal legislation that Congress "clearly intended" that a state be so authorized, c) legislation or legislative history indicates that Congress "affirmatively contemplated" that a state could prevent interstate commerce, or d) the courts determine that a state action interfering with interstate commerce sounds a "harmonious note" with federal legislation. As to these first two exceptions to the Sporhase ruling, they are applicable to the trust land grant based on the purpose of the trust grant and the legislative history behind it. Selected quotations from that legislative history demonstrate a close connection between water and state trust lands, and a recognition by Congress that water was necessary to any productive use of that trust land. Expressed within that recognition is the conclusion that water was necessary for fulfillment of the trust land grant purpose. The following four quotes clearly illustrate that Congress understood the necessary relationship between land and water in New Mexico:

"These lands are at present without value, and uninhabitable in consequences of the absence of water, and will never be settled up and made valuable unless by [irrigation projects]."

H. Rep. No. 3934, 50th Cong. 2nd Sess. 2 (1889).

"No subject is of greater importance to New Mexico than [irrigation]. The future of the territory depends very largely on the increase of its area of cultivated land throughout comprehensive systems of irrigation."

S. Rep. No. 1023, 52nd Cong. 1st Sess. 4 (1892).

"The arid lands are of no value to the United States; nothing can be raised upon the same; if they were offered for sale by the Government they would not bring ten cents an acre; yet they are in fact the most

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world if water is only supplied for their cultivation."

H. Rep. No. 1161, 55th Cong. 2nd Sess. 3 (1898).

"It is recognized by the committee...that practically none of these lands are worth now anything like the minimum price fixed. It is believed, however, that the advance of science, the extension of public and private irrigation projects, and the tendency toward the higher development of smaller holdings will, in the case of Arizona and New Mexico, as is the case of other States, result in a sure, although possibly slow, increase of land values."

H. Rep. No. 152, 61st Cong. 2nd Sess. 2 (1910).

The next quote, although not specifically dealing with water, but rather with prior mismanagement of trust lands, expresses the intent that the trust lands were to be protected in order to achieve their purpose:

"In view of this, as well as other circumstances, your committee believes that the grants of land made in this bill cannot be too carefully safeguarded for the purpose for which they are appropriated."

S. Rep. No. 454, 61st Cong. 2nd Sess. 20 (1910).

Although again not dealing with water, the following quote clearly indicates that Congress was desirous of having the trust grant achieve its intended goals:

"[T]he measure reported herewith remedies to a large extent the existing conditions which jeopardize and cloud the state's title to these lands, and which prevent to a large extent the realization of the purposes intended by the grant itself."

H. Rep. No. 1761, 69th Cong. 2nd Sess. 3 (1927).

In regard to the Supreme Court's "close means-end relationship" exception, there can be little argument from the legislative history that New Mexico is a "demonstrably arid state." If the purpose of a ban by New Mexico on the exportation of water was to conserve and preserve water so that the land trust purpose can be realized, the means (ban on export of water) are not just closely related, but absolutely necessary to that end result (fulfillment of trust purpose) and would therefore fall within the exception.

The second exception to the Sporhase rule, "congressional authorization," is dependent upon a clear indication that Congress intended, and thus authorized, a state to keep water within its boundaries. If such authority can be found, New Mexico

would be free from Commerce Clause restrictions. While there does not appear to be any "express statements" by Congress addressing the restriction of water exportation in order to assure water availability for state trust lands, it seems unlikely that exportation of water was a manifest notion in 1910 at the time of New Mexico's Enabling Act. But the quotes cited above easily indicate that Congress "clearly intended" or "affirmatively contemplated" that the state would be able to preserve water availability to carry out the trust land grant mandate. Undoubtedly, state action to preserve and conserve water resources for ultimate use with state trust lands strikes a "harmonious note" with the sentiments of Congress about the arid nature of New Mexico and protection of the trust land grant.

There is a third exception from the general rule prohibiting the restriction on water export that was not involved in Sporhase. This is the judicially created "market participant doctrine." It applies when the state action that might otherwise be invalid under the Commerce Clause is taken as a "market participant" rather than as a "market regulator." There have been only three United States Supreme Court cases finding this exception valid, so the precise contours of the doctrine have not yet been established. A classic case, however, approvingly applied the exception to a state action limiting sales of concrete from a state owned concrete plant, that competed in the interstate market, to instate customers during times of concrete shortage. Essentially, the Court ruled that in this capacity, the state like any other business, could decide with whom it would prefer to do business.

With state trust lands, the state of New Mexico is in the land and resource management business. It does not regulate development but, rather, competes with other land owners for the development dollar. When water resources are limited, and do not constitute enough supply for both instate and out-of-state needs, as in the case of cement, could not New Mexico restrict the transfer of water in preference for the development of its own state trust lands?

FEDERAL RESERVED WATER RIGHTS

The second threat to water planning for state trust lands is the assertion of federal reserved water rights. Very simply, those rights have been recognized by the courts as existing when Congress reserves federal public land for a specific federal

purpose. Without express language, it is implied that Congress also intended to reserve for those lands a sufficient quantity of unappropriated water, with a priority date of the date of reservation, to achieve the primary purpose of that reservation.

This presents a problem for water resource planning because priority dates and quantities claimed for such federal reserved rights may upset all established expectations. For example, an Indian federal reserved water right claim made today may include an assertion of "time immemorial" as the priority date and seek quantification based on all practicable irrigatable acres over which the tribe or Pueblo at one time asserted aboriginal title. If and when such claims are successful, changes in existing water right titles and water market scarcity conditions upset not only planning activities, but the water resource availability itself may be constrained due to the acquired control of the federal interest.

Federal reserved water rights are grounded in the recognition by Congress that land grants in the arid west were meaningless without the water necessary to achieve the grant purposes. There is an obvious parallel between this recognition and the understanding of Congress about the arid nature of New Mexico's trust lands. Indeed, certain lands ultimately transferred as trust land to the state of New Mexico may be entitled to support a federal reserved rights claim. Sections 16 and 36 in every township were originally reserved, in the Organic Act for the Territory of New Mexico, (Act of September 9, 1850, ch. 49 9 Stat 446) from the public domain for educational purposes in the Territory and later the state of New Mexico.

The importance of water to successful management of state trust lands requires further research into the relationship the New Mexico Enabling Act creates between the federal government and the state. At the very least, however, where federal reserved water rights claims may be in conflict with the proper administration of state trust lands, there is presented a conflict of implications from congressional intent. That should necessitate, at the very least, some balancing of the state trust lands' interests with those of the federal right claimants.

CONCLUSION

Water resource planning for state trust lands is now occurring in two interrelated forums. The explicit planning for trust land water requirements must address specific development opportunities, water demands and available supplies, while simul-

taneously responding to the potentially dramatic implications of judicial decisions in pending litigation. The broad intergenerational fiduciary responsibilities of the New Mexico State Land Office demand a greatly expanded scope of water resource planning consideration than is contemplated by the majority of current water planning efforts within the state. The principles of law protecting the exportation of water, as announced in Sporhase, and those establishing federal reserved water rights, are the legal doctrines which serve as the vehicle to implement important federal governmental goals set by Congress. State trust lands also serve an important congressional goal to provide New Mexico with the means of supporting public education and institutions. Considering the sincere and dedicated efforts Congress made to assure protection of the New Mexico land trust, it is unreasonable to believe that it could or should be defeated without being balanced against competing federal interests.

Trust land development is dependent upon a mirage of raw land attributes, the availability of other requisite resources (e.g., water), and an entrepreneur who can develop the available resources. Both Congress and the courts dramatically impact the potential for the trust in their guidance and resolution of competing claimed rights to water resources. The decisions affecting resolution of these issues require balancing of many concerns, while specific water resource planning must account for the dynamic legal environment. Hopefully, a balancing of these diverse interests will occur and prove successful in maintaining water resources for use with state trust lands.

PUBLIC TRUST IMPACTS ON WATER PLANNING

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Under the public trust doctrine, the state holds its navigable waters and underlying beds in trust for certain public uses, principally navigation, commerce, and fisheries. Illinois Central R.R. Co. v. Illinois, 146 U.S. 387 (1892); National Audubon Society v. Superior Court, 33 Cal.3d 419 (1983); City of Berkeley v. Superior Court, 26 Cal.3d 515 (1980). Recent court decisions have expanded the doctrine to include virtually any public use associated with navigable waters, such as recreation and aesthetics. Since the state holds public uses in trust for the public, the state cannot wholly alienate such uses, and private users cannot obtain vested rights in navigable waters that are paramount to public uses. Hence, if the state purports to grant a fee interest in navigable waters, it can revoke the fee grant.

The public trust doctrine originated in Roman law. The Institutes of the Emperor Justinian provided that water, like air, is incapable of private ownership; the resource belongs to everyone and therefore can be owned by no one. Under the English common law, the King was held to have sovereign power in navigable waters, and his sovereign power was paramount to private proprietary interests. After the American Revolution, the King's sovereign control of navigable waters was transferred to the states. Shively v. Bowlby, 152 U.S. 1 (1894); Pollard v. Hagan, 44 U.S. 212 (1845). When the Union was formed, the states surrendered to the federal government the power to regulate commerce, but otherwise retained their sovereign interests in navigable waters. The states' sovereign interests provide the foundation of the public trust doctrine, which recognizes that the states have sovereign rights and responsibilities in navigable waters.

The public trust doctrine first gained national recognition in the United States Supreme Court's decision in Illinois Central Railroad Co. v. Illinois, 146 U.S. 387 (1892). There the Illinois legislature had granted a fee interest in the Chicago waterfront

to a railroad company. The legislature later revoked the fee grant, and the railroad company sued. The Supreme Court upheld the action of the Illinois legislature, declaring that Illinois held sovereign interests in lands underlying navigable waters and that such interests were held in trust for certain public uses. According to the Court, the legislature could not alienate its trust responsibility over the lands, and if the legislature purported to alienate its responsibility, it could revoke the fee grant.

The public trust doctrine has traditionally been applied in land title disputes, in which the question was whether the state has paramount rights as against private landowners in tidelands or other lands under navigable waters. State water rights laws have grown up without specific reference to public trust principles, although state constitutional and statutory provisions often provide that the state has a "property" interest in water or that water use is a "public use" subject to state regulation and control. State water rights laws generally consist of the riparian doctrine, which provides that private landowners have property rights in waters contiguous to their lands, and the prior appropriation doctrine, which provides that water can be diverted to beneficial use. Prior to the California Supreme Court's decision in National Audubon Society v. Superior Court, 33 Cal.3d 419 (1983), no court had ever considered whether the public trust doctrine affects riparian or appropriative water rights.

In National Audubon Society, the California Supreme Court considered whether the public trust doctrine applies to the city of Los Angeles' rights to divert water from Mono Lake basin to its service area. In the 1940s, the city had obtained appropriative water rights permits authorizing diversions from Mono Lake basin. The diversions provide the city with approximately 17% of its water supply, but also cause environmental harm to Mono Lake by causing increased salinity harmful to the brine shrimp

population. The National Audubon Society brought an action to restrain the city's diversions, arguing that the diversions were invalid *per se* because they impaired public trust values in Mono Lake. The city argued that the public trust doctrine did not apply in the water rights context, and that the city has "vested" water rights that cannot be modified by subsequent state action.

The California Supreme Court held that the public trust doctrine applies in the water rights context, and that the city's water rights were not "vested" but were subject to continuing state regulation and control. The court, however, rejected National Audubon Society's argument that the city's diversions were invalid *per se* because they impaired trust values. Instead, the court held that the public trust doctrine, as applied in the water rights context, required that the state "balance" economic needs against environmental values in granting water rights, and that the state retains continuing jurisdiction to determine whether this balance is consistent with modern public needs. Indeed, the court stated that the state may authorize water diversions that impair public trust values, if, in the state's judgement, the economic need for the diversions "outweighs" the environmental interest at stake.

It is not clear whether the United States Constitution restricts state regulation of water rights under the public trust doctrine or other theories. The Takings Clause of the Constitution prohibits states from "taking" water rights for public use without payment of compensation. U.S. Const., Amendments V, XIV; see Chicago, B. & O. R. R. v. Chicago, 166 U.S. 226 (1897). On the one hand, a water right is a form of "property" within the meaning of the Takings Clause. On the other hand, state law defines property rights under the Constitution; therefore, the state may have a right to define a water right as subject to the state's continuing regulation and control. The U.S. Supreme Court has never answered these questions.

There is an unavoidable tension between the state's duty to plan water development and the state's duty to protect its resources for the public. The former assumes that the state can predict future water availability, and the latter assumes that the state can reallocate resources and thus limit future availability. Because of this tension, water regulators cannot insulate their decisions from public trust scrutiny. They can take certain steps, however, to minimize the impacts of such scrutiny.

First, regulators should thoroughly consider public trust uses in making decisions affecting such uses. Second, regulators should thoroughly evaluate

needs that are in competition with public trust uses. Third, regulators should consider alternative methods to achieve economic goals. Fourth, regulators should consider whether economic goals can be achieved by conservation of resources.

If regulators follow these steps, courts may be more likely to defer to the regulators' decisions. The proper balance between economic goals and environmental values is a traditional function of the legislative and executive branches of government, not the judicial branch. Therefore, courts will generally look to legislators and agencies to make these decisions. The courts are more likely to make such decisions only when legislators and agencies fail to act. Regulators should actively consider public trust needs and fulfill their responsibility to protect the public interest in resources.

THE NECESSITY FOR WATER PLANNING

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Dr. Tom Bahr, Secretary of the Energy, Minerals and Natural Resources Department, and Director of the New Mexico Water Resources Research Institute spoke on behalf of Governor Garrey Carruthers, who was ill and unable to speak at the conference. The following comments have been transcribed and edited.

The governor is sorry he can't be here. I'm also sorry he can't make it, and I'm sure you are as well. He was going to share with you some of his thoughts on water planning. What I am going to say here is pretty much shared by the governor. As you well know, Garrey Carruthers was the director of the Water Resources Research Institute, and has been intimately involved in these conferences for many years. So what I am about to say reflects his thoughts as they have evolved for at least the last decade.

We know that New Mexico is an arid state with a significantly growing urban population. In parts of this state, we are going to have water demands that exceed water supplies by the turn of the century. This is a localized problem, but it is common to see this imbalance crop up across the state. I think it really defines many of the problems we have with water resources in the state. We have a little more than a million acre-feet of surface water that is available for beneficial use and this is, for all practical purposes, fully appropriated. In the coming decades it is unlikely that New Mexico is going to obtain any new surface water supplies. Importation schemes are economically very difficult and politically almost impossible. I have talked to you about this before, and you have heard this from many, many people. Demand will probably be met by transferring existing water uses from one use to another. This will take place predominantly through market transfers from the agricultural sector into

municipal and industrial uses. This is already happening.

Unless you have been locked in the closet for the last eight years, you know that water supplies in the state of New Mexico are threatened by out-of-state demands. State law in New Mexico allows New Mexico ground water to be transported to another state. On the other hand, the good news is that our law can restrict the transport of out-of-state use if that transport is contrary to conservation or contrary to the public welfare of the state. Until there is resolution of these and other related issues and further definition of what the law means, the amount of water we have in the state that can be put to use, and the jurisdiction over that water, are going to remain uncertain. That uncertainty hinders any kind of comprehensive planning.

Let me add another element. When I talked with the governor yesterday, I asked him if there was anything he wanted me to stress. He said, "Yes, there is. Stress water quality." That is the other factor that needs to be incorporated into water planning. Ninety percent of the population in New Mexico is served by ground water supply systems. In the rural areas, it is about 97 percent. Since records were kept in the 1920s, at least 80 public ground water supply systems in the state have been contaminated. Now as a practical matter, once that contamination has taken place, it is difficult if not impossible economically to clean it up. Once the damage is done, you can almost forget about it. That water supply is lost just as if it were exported to the city of El Paso, or Tucson, or to Amarillo. It is contaminated and gone. A water quality problem then turns into a water supply problem. Water quality must be incorporated into the water planning process. I cannot stress that enough.

Along this line, the Environmental Improvement Division has given a lot of thought on how to

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incorporate water quality into the planning process. The Environmental Improvement Division is considering a grant program for local and regional water planning. The grants will help fill in knowledge gaps on such things as local land use, and will look at the geohydrological parameters that are going to relate to the vulnerability of some of these aquifers to contamination. There is a lot to be learned in this area, and it has to be incorporated into the water planning process. I think you could view this as a parallel to a regional water planning effort currently being administered by the Interstate Stream Commission. This new program at the Environmental Improvement Division is evolving and will need legislative approval. Keep your eyes on it. I think it is a very significant happening and something that needs to be done.

RECONCILING AGRICULTURE'S NEEDS WITH WATER QUALITY

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INTRODUCTION

For the last decade, the impact of agricultural practices on our water supplies has been the overriding concern of the Natural and Environmental Resources Division of the American Farm Bureau Federation. Almost every environmental issue we deal with is tempered by this concern. Today I will outline the scope of the problem. Agricultural practices directly and indirectly influence both water quality and water quantity. I will concentrate on water quality issues. Although both surface water and ground water are vulnerable to contamination, our more pressing concerns are with ground water contamination. I will tell you why. I will describe our present dependency on agricultural chemicals and how these chemicals get into the ground water. I will then summarize the state and federal approaches to ground water protection and pesticide regulations. Finally, I will describe some of the ways we are trying to help our farmers deal with this problem.

THE SCOPE OF THE PROBLEM

Most of us think of lakes and rivers when we think of freshwater and drinking water. But if we look at where our freshwater supplies are stored and how rapidly water is exchanged within these systems, we find that approximately 85 percent of our freshwater resources are stored in ice sheets and glaciers with a turnover rate of 8,000 years. The next largest source of freshwater comes from ground water: 14 percent with a turnover rate of 280 years. Lakes and reservoirs make up only 0.5 percent of our freshwater and their turnover rate is 7 years. Soil moisture represents less than 0.3 percent, with a rate of exchange averaging one year. Vapors in the atmosphere make up 0.05 percent

with a rapid turnover of 3 months. And finally, river water comprises a mere 0.004 percent of our freshwater, taking about 3 1/2 months to exchange old for new.

Surface Water

With surface water accounting for less than 1 percent of our available freshwater supplies, most of our data on pesticide and nitrate contamination levels comes from monitoring ground water. We do know, however, that agricultural practices can adversely affect surface water quality. Sediment in surface water costs the nation \$4 billion to \$16 billion annually (Crosson and Ostrov 1988). Crop-land erosion is responsible for about one third of this damage.

Some of the nitrogen and phosphorus applied to the soil in fertilizer and manure is carried through run-off and sediment to surface waters, where it promotes the growth of algae. Decay of the algae reduces the water's oxygen supply and thus impairs the quality of the water for recreational and other uses. This process, called eutrophication, remains a major concern with Lake Erie and Lake Ontario (Hurlburt 1988).

The United States is not alone in its concern with surface water quality. The European Commission is planning to put forward proposals covering the protection of fresh and coastal waters from pollution by effluents from livestock farming in Europe by the end of 1988 (Anon. 1988b). Both the UK and Ireland are wrestling with problems caused by silage effluent, slurry and manure storage, and dirty water and runoff from land spreading (Anon. 1988c). In addition, in the UK, fish farms will now come under government jurisdiction because of kills of the native fish population in neighboring streams (Anon. 1988a).

While data on pesticide concentrations are scarce, it is known that surface water concentrations tend to be higher than those in ground water. This is because only highly soluble pesticides leach to ground water, while less soluble chemicals can be carried to the surface water by runoff, and, in some cases, by sediment. In addition, subsurface flow can carry pesticides from ground water to surface water.

Ground Water

Although our data on ground water pollution by agricultural chemicals is hardly more substantial than that for surface water, our concern is much greater. With a turnover rate averaging 280 years, we cannot rely on nature to clean up our mistakes. In many cases, the costs of cleanup are either prohibitively expensive or technically not feasible. Ground water is the main source of drinking water in 32 of our states. Thirty four of our 100 largest cities rely on it. More than 50 percent of our population drink it. Ground water supplies 26 percent of the water for industry and 35 percent of the water for public utilities. And our farmers depend on it: 97 percent of our rural population drinks it, 55 percent of our livestock drink it, and 40 percent of our irrigation water comes from it (representing over 25 percent of the value of all crops produced) (Bruemmer 1985).

Ground water is the water stored underground, beneath the earth's surface. It is stored in the cracks and crevices of rocks and in the pores of the soil, sand and gravel that make up the earth's crust. It originates as rain or snow falling onto the surface of the ground. Some of this precipitation evaporates and some becomes runoff, replenishing rivers, lakes, streams and oceans. The rest soaks into the ground.

As the water moves down through the soil, a portion of it is retained near the surface in the unsaturated zone. Here, the spaces between soil particles hold either air or water. Some of this water is taken up by plants while the rest continues percolating downwards. It passes across the water table into the saturated zone. All of the porous spaces are filled or saturated with water. The water stored in this saturated zone is called ground water.

The percolation of water down into the saturated zone is called recharge. Recharge typically occurs in upland areas, with the ground water then moving to lowland areas where it is discharged into wetlands, streams, lakes or springs. This movement is very slow, at a rate varying from a few inches per day to a few feet per year.

Whether a particular area of ground water can be used to supply drinking water depends on its ability to store water (porosity) and its ability to transmit it (permeability). The greater the porosity and permeability, the better the area is as a likely source of water.

An underground, saturated, permeable geological formation that produces significant quantities of water is called an aquifer. Aquifers vary tremendously in size and may be anywhere from a few feet to hundreds of feet thick. They may be within a foot of the earth's surface or they may be hundreds of feet deep. The largest aquifer in the U.S. is the Ogallala Aquifer which covers a 156,000 square mile area. By studying the hydrogeological properties of our aquifers, researchers are trying to predict their vulnerability to contamination.

Contamination of Ground Water

It is helpful to remember that agriculture is only one of the many sources of ground water contamination (CAST 1985). Contamination can occur from any number of natural and man-made sources. Some of the nonagriculturally related sources include:

- chemicals leaking from industrial and municipal landfills;
- pits and ponds;
- chemical, oil and petroleum spills;
- leaking underground chemical, oil or petroleum tanks;
- defective underground injection wells;
- careless hazardous waste disposal (every American household produces more than one pound of hazardous waste per year);
- leaking septic tanks;
- disposal of sewage wastes and sludge;
- runoff of de-icing salts;
- discharge from radioactive disposals;
- natural leaching of materials into the ground water;
- natural salt water intrusion, the concentrating effect of salts in the soil, or natural interaction of chemicals in soil to produce harmful substances.

When all of our states and our seven U.S. territories were questioned this year by the U.S. General Accounting Office (GAO), 88 percent of the respondents identified leaking underground storage tanks as their most significant concern (GAO 1988). Municipal solid waste and abandoned hazardous waste dumps were cited by 70 percent of the respondents.

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Agricultural chemicals and soil amendments that do have the potential to end up in the ground water can normally be classified within one of four broad categories: fertilizers, organic residues (100 million tons of dry manure per year), pesticides, and organic amendments (including lime, gypsum, and sulfur). Only the first three categories are of great concern (CAST 1985). In the 1988 GAO report, pesticides were identified as significant contamination sources by 49 percent of our states and territories, fertilizers by 46 percent, feedlots by 42 percent, and irrigation by 2 percent (GAO 1988).

Nitrate Contamination

Nitrate contamination of ground water is widespread in the U.S. although levels rarely exceed the safety limit set by the Environmental Protection Agency (EPA). Nitrates develop from nitrogen, an essential element in most living matter. Nitrate contamination can originate from many sources. Possible contributors include animal excreta, human waste, nitrogen fertilizers, naturally occurring deposits of nitrate-containing materials, feedlots, crop residues, and decomposing animal or plant tissue. According to a recent U.S. Department of Agriculture (USDA) report, approximately 10.6 million tons of nitrogen fertilizer is used annually in the U.S. Conventional farming is almost totally dependent on chemical fertilizers, particularly those supplying nitrogen, phosphorus, and potassium. Inorganic fertilizers substantially increase yields per acre even when soil productivity has deteriorated due to soil erosion, compaction, or the removal of crop residue. An estimated 30 to 40 percent of our production results from the use of fertilizers. Some estimate that yields could drop 50 percent per acre per year without the use of commercial fertilizers (Berg 1988). We have seen a gradual accumulation of nitrates in the soils over time, with crops seldom recovering more than 70 percent of added nitrogen. Most crops recover about 50 percent of the nitrogen applied to them. The remainder has the potential to leach into the ground water.

The nitrate-nitrogen contamination from agriculture has been linked to three sources: the land application of nitrogen fertilizer (about 70 percent contribution), land application of manure (about 10 percent) and feedlots (about 20 percent) (EPA 1986a).

Much of the concern about nitrates originates from incidents of methemoglobinemia (blue baby disease) among infants around the country. The first clinical cases were reported from Iowa in 1945

(Hurlburt 1988). If not properly diagnosed, infants under six months of age can die due to lack of oxygen in their bloodstream as a result of ingesting high concentrations of nitrate-nitrogen in their drinking water. Methemoglobinemia remains the only detrimental health effect that has been directly linked to agricultural chemicals in the water supply. However, suggested health effects due to high nitrate-nitrogen levels include fetal malformations, sudden death syndrome in infants, hypertension in children, and gastric cancer in adults (Cantor et al. 1988).

The recommended EPA safe drinking water level for nitrate-nitrogen is set at 10 parts per million (ppm). According to a recent survey by the USDA, which analyzed hydrogeologic vulnerability to contamination and fertilizer use data, ground water contamination from nitrate-nitrogen appears to be concentrated in the following areas: the central Great Plains; the Palouse and Columbia Basin in Washington; portions of Montana; southwest Arizona; the intensively farmed areas of California; portions of the Corn Belt; southeast Pennsylvania; and parts of Maryland and Delaware (Nielson and Lee 1987). Within these regions, Kansas, west Texas, and southern Arizona have the highest recorded concentrations, with 25 percent or more of the sampled wells exceeding the 10 ppm limit. In some cases, the states' data bases were insufficient to decide if problems existed.

Pesticide Contamination

At present, the extent of pesticide contamination of our ground water cannot be determined. Approximately 79 percent of pesticide use in this country is related to agricultural activities. Potential pesticide contamination problems have been tied to land application (about 90 percent contribution), leaks and spills (less than 5 percent) and inadequate disposal (less than 5 percent) (CAST 1985).

A total of 661 million pounds per year of active ingredients are applied in U.S. agriculture (Berg 1988). There are approximately 1,450 active ingredients used in pesticides. At least 59 of these have a known potential to end up in ground water depending upon the soil type. Two herbicides, alachlor (on field corn and soybeans) and atrazine (on field corn) account for 22 percent of our pesticide use. To produce crops with less loss from disease and insects, agrichemicals are used extensively. U.S. farmers use an average of about 2 pounds of pesticide per acre of cropland. Corn and soybeans are the two crops with the largest amounts

of applied pesticides. These two crops account for 62 percent of the total national pesticide use (Berg 1988) but occupy only 30 percent of our cropland. Our farmers compete with 10,000 infectious diseases of plants, 2,000 species of weeds, 1,000 species of nematodes, and 10,000 species of insects. Even with pesticides, crop losses have remained high (between 32 to 37 percent) (Bottrell 1980). Returns on pesticide investments have been estimated at \$3 to \$5 for every \$1 invested in chemical crop control and gross returns on the nation's investment in chemical pest control are estimated at \$10 billion or more (Pimentel et al. 1978). It is more difficult to estimate the losses that would occur in the absence of pesticides but Borlaug (1972) warned that a complete ban of pesticides would result in a 50 percent reduction in crop yields and a four to five fold increase in food prices. At the other extreme, Pimentel et al. (1978) estimated that a ban followed by alternative control methods would reduce the current crop yield value by only 9 percent.

At present, no adverse health effects have been directly linked to the presence of pesticides in our water supplies. Suggested health effects, however, include leukemia, multiple myeloma, non-Hodgkin's lymphoma, impaired function of the reproductive, nervous, or endocrine systems, and immune system disorders (Cantor et al. 1988).

Ground water may become contaminated by pesticides at any point in the life cycle of the pesticide (EPA 1986b): its manufacture, distribution in commerce, storage, use on the land, or in industrial settings, and disposal. The sources can be grouped into two categories: point sources and nonpoint sources. Point sources include accidental spills and leaks at manufacturing facilities. They are characterized as concentrated plumes that are relatively localized and thus able to be at least partially cleaned up using current technologies. The parties who are responsible for the incident can often be identified and required to pay for the cleanup. Nonpoint sources are those sources that cannot be easily traced. They include most of our pesticide use to control insects and weeds on agricultural and forest land as well as on homes and gardens and on highway and utility rights of way.

When pesticides are applied to the land, they are carried above, over and through the ground by rainfall, runoff, irrigation, and snow melt. Pesticides dissolved in runoff water are carried to surface water or may enter ground water through a variety of potential routes. Pesticides may also leach into ground water through infiltration at either the site of application or in runoff retention areas. Con-

tamination may also occur when irrigation systems are used to apply pesticides (chemigation). These systems may siphon pesticides back into the ground water well if not equipped with proper safety devices. Other sources of contamination include small but frequent spills at mixing and loading sites on the farm field and improper disposal of small quantities of leftover pesticides and their containers.

Generally, contamination from land application extends over a wide area (a whole farm or farming region) at very low concentrations which may build up over the years of pesticide use. At present there are no techniques available for cleaning up contamination that involves a large geographical area. It is virtually impossible to identify the party or parties who are responsible since pesticide use is a common practice. For these nonpoint or diffuse sources, prevention is the key. Prevention efforts will involve both the regulation of individual pesticides as well as changes in pest control and land management practices. In most cases, where there is widespread low levels of contamination, the only effective means of providing clean water is either to treat the ground water before use or find an alternative supply.

Before 1979, relatively little systematic water monitoring was focused on ground water. Testing of pesticides for their potential to leach through the soil and contaminate ground water has also been very limited. Most pesticides on the market today were registered for use before environmental fate testing was routinely required. The general belief before 1979 was that ground water was protected from pesticide contamination by chemical degradation processes in and on the soil and by impervious layers of subsoil, rock, and clay. The discovery of DBCP, a soil insecticide, in numerous wells in California's Central Valley was the first big step in dismantling this long-held belief (EPA 1986b). DBCP-contaminated ground water was subsequently found in Arizona, Hawaii, Maryland, and South Carolina. It was traced to normal agricultural practices in these states.

The same year that all of this was happening, another pesticide, aldicarb, was found in wells on Long Island, New York. It was traced to the normal approved use of this pesticide on potato fields to control insects and nematodes. In 1980, aldicarb was found in the Central Sands region of Wisconsin, again as a result of the use of this pesticide on potato fields. Since then, aldicarb has been found in wells at levels of concern in eleven other states.

The most serious case of pesticide contamination began in 1982 with the discovery of ethylene dibromide (EDB) in two California wells and three

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wells in Georgia. By the end of the following year, EDB contamination had been discovered in sixteen different counties in California, Florida, Georgia, and Hawaii. EDB has been described by the National Cancer Institute as the most potent cancer causing substance ever found in their animal test program. EPA issued an immediate emergency suspension of all EDB use as a soil fumigant in September, 1983.

At least 17 pesticides have been found in the ground water in 23 states as the result of routine agricultural use. At last count, a total of 73 pesticides had been detected in the ground water of 34 states. The largest number of pesticides have been detected in California, New York, and Iowa but this is probably a function of closer monitoring in those states. Concentrations of pesticides are usually low, ranging in most cases from 0.1 to 1.0 milligrams per liter.

In a 1987 U.S. Department of Agriculture report on ground water contamination from agricultural chemicals, the authors looked at 38 pesticides and their potential to pollute the ground water (Nielsen and Lee 1987). They estimated that approximately 12 percent of our counties have a high contamination potential due to high rates of pesticide use and soil conditions favorable to leaching. Another 25 percent were judged to have moderate potential. These figures, however, represent only potential risks, not actual findings of pesticide contamination in the ground water. A survey of U.S. wells is currently being undertaken by the U.S. Environmental Protection Agency. It is scheduled for completion in 1990 and should provide much-needed information about the pervasiveness of pesticides in ground water at the national level.

SOLUTIONS

Federal Legislation

The protection of our nation's ground water is looked at by many as the major environmental challenge. Over the last 25 years, numerous laws have been enacted to protect our environment (EPA 1986b): the Clean Air Act amendments of 1963, 1965, and 1970; the National Environmental Policy Act of 1969; the Clean Water Act of 1972; the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) amendments of 1972; the Safe Drinking Water Act of 1974; the Resources Conservation Recovery Act (RCRA) of 1976; the Toxic Substances Control Act (TSCA) of 1976; and the Compre-

hensive Environmental Response, Compensation and Liability Act (Superfund) of 1980. In addition to these, the Environmental Protection Agency (EPA) was established by Congress in 1969.

Despite all of this activity, no comprehensive federal statute deals specifically with ground water protection in a coordinated and consistent manner. At last count, there were sixteen federal laws which provided some regulatory authority to various departments for some type of ground water protection activity.

Federal policy makers have three basic options in their attempts to deal with the ground water protection issue. They can:

- make regulatory changes based on current statutory authority;
- amend specific environmental statutes to address ground water issues; and
- enact comprehensive ground water legislation.

Option one, regulatory changes based on current authority, was utilized in 1985 when EPA approved implementation of its Ground Water Protection Strategy (GPS). It is designed to (a) strengthen state ground water programs (through grants and technical assistance); (b) look for current inadequacies in its protection strategies (through surveys to determine the extent of contamination); and (c) create a policy framework for guiding EPA programs (by adopting guidelines for consistency within programs).

The second option used by Congress has been to amend current laws with specific references to ground water. The 1984 amendments to the Resource Conservation Recovery Act (RCRA) directed the EPA to develop a regulatory program to address the problem of leaking underground storage tanks. Congress also attempted to amend the Clean Water Act of 1972 in 1985 to establish grants for funding state ground water protection programs and activities. The bill was vetoed for budgetary reasons. Superfund, which provides a resource pool of money to clean up hazardous waste sites, was reauthorized in 1986. In 1984, EPA added six agriculturally contaminated ground water sites to the National Priority List. It is also expected that ground water protection language will eventually be added to FIFRA. Possibilities include specific provisions about the protection of ground water from pesticide contamination and a farmer exemption from pesticide ground water contamination liability unless negligence is proven.

Option three for Congress is comprehensive ground water legislation. Such a statute will likely be patterned after other federal environmental

statutes and encourage the development of state ground water protection programs in return for grants and technical assistance from the federal government. State programs would have to meet certain EPA established guidelines. Some of the questions Congress will have to wrestle with include:

- What should we protect: all ground water, drinking water, potential drinking water, or all three?
- What standard of protection should be used: a standard based on health, health and technology, unreasonable risk, or simply zero contamination (non-degradation)?
- What should be the scope of concern and should it be prevention or response-oriented?
- If prevention prevails, should we consider the benefits of agricultural chemicals and balance those with the risks? Should chemicals found to be leachers be restricted for use nationwide, regionally, or in site-specific cases?
- What should the response be if the health standard is exceeded? What response is appropriate if the contamination is detected but at levels that currently do not pose a risk?
- Who should be liable for response, including cleanup, alternative water supplies, damages, etc.?
- What is the appropriate federal and state role?

There is a fourth option for Congress as well: addressing environmental concerns in farm policies. The conservation title of the Food Security Act of 1985 (the 1985 Farm Bill) served notice to the agricultural community that farm policy has shifted to a concept based on the common good. Many are now suggesting that the 1990 Farm Bill will make an even more direct link between environmentalists and other common interests (Richardson 1988; AFBF 1990 Farm Program Study, 1988). Among the probabilities:

- Nitrogen management will be addressed as a matter of special priority across a broad policy front.
- Provisions within the commodity and crop insurance programs will be augmented to offer incentives for rotations and adoptions of integrated pest management (IPM).
- The roles of state and federal government agencies will be reassessed. Specifically, the roles of states in setting water quality goals and defining practices farmers must adopt to reach those goals will be re-examined. New federal funding may also be forthcoming, possibly through non-point-source pollution-control goals.

Legislative approaches to nitrogen management were recently offered before the House Subcommittee on Department Operations, Research, and Foreign Agriculture (Richardson 1988). They include the following:

- Place a high enough tax on nitrogen fertilizers so that overall use is reduced; taxes collected would be used to conduct research.
- Require certification of farmers and fertilizer applicators so they will apply fertilizers economically to minimize risks.
- Prescription fertilization: require universities to give prescriptions for a range of management plans.

Nitrogen management will not be an easy problem to address. The nitrate Safe Drinking Water Standard is currently set at 10 ppm nitrate-nitrogen. Studies have shown that crops such as corn grow best with soil nitrate-nitrogen levels that are two to four times above this standard (Colburn 1986).

State Legislation

In the absence of a comprehensive Federal Statute on Ground Water Protection, many states have moved toward implementation of ground water protection legislation to protect aquifers within their states. Currently, ground water legislation has been enacted in Wisconsin, California, Arizona, Iowa, Mississippi, Illinois, Connecticut, and Nebraska. Further legislation concerning aquifer protection zones is being considered in Connecticut. Legislation was attempted in South Dakota, Tennessee, and Massachusetts. The National Agricultural Chemical Association expects twelve more states to try next year (A. T. Hart, personal communication).

So far, two of our states, Iowa and Minnesota, have passed laws establishing certification programs for soil test labs. They hope to standardize soil analysis and reporting methods and provide cost effective fertilizer recommendations for farmers, based on land grant university research.

According to the General Accounting Office, 52 percent of our states have set numeric standards for ground water contaminants, 76 percent have narrative standards (some states have both types of standards), and 32 percent of our states have no set standards (GAO 1988). The report concludes that the existence or absence of standards is not related to the types of ground water problems within a state or the extent to which a state relies on ground water for its drinking water. Their best explanation for the lack of correlation is that "the development of

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standards is based on the political orientation of a state." As far as active programs dealing with agricultural contamination, 10.5 percent of our states report no activity, 14 percent report little activity, 38.5 percent report some activity, 26 percent report moderate activity, 9 percent report great activity, and one state reports very great activity (GAO 1988).

The disposal of pesticide containers is beginning to be regulated. Maine requires a deposit on restricted use metal pesticide containers. Iowa and Minnesota have some language in various bills regarding this issue. New York is moving toward deposit and return. And Connecticut is trying out a \$300,000 cost-share pesticide disposal program in three counties. The trend is toward waste reduction laws and plastic containers.

We are also seeing the appearance of Proposition 65 clones. California's Prop. 65 (the Clean Water Act) requires the publication of an annual list of cancer-causing chemicals and reproductive toxicants and prohibits the discharge of any chemical on the list. It was a ballot initiative, not legislation, and was voted upon by all of the citizens of California. Half of our states have ballot initiatives. Once passed, the initiative goes into law and only the people can change it. Hawaii is looking at similar legislation only it also includes immunotoxicants as well. Tennessee, Missouri, Illinois, New York, and Massachusetts are all considering shorter versions which eliminate the "no discharge" provision but which include "right-to-know."

Farmer Initiatives

A wide variety of agricultural management practices can minimize the threat of ground water contamination. Some are broadly applicable to most sites and farming situations; other practices are appropriate only in specific circumstances; and still others hold promise but are as yet untested.

Nitrogen Management

Best management decisions for nitrogen (N) vary widely, even on an individual farm, because site-specific cropland and environmental and economic factors result in numerous management options. For example, a farmer must weigh the possibility of a greater risk of nitrogen loss if fertilizer is applied in the fall against the possibility that higher prices, poorer weather, and soil conditions may limit N fertilizer options in the spring. Some options (from Jackson et al. 1987):

1. Fertilizer Management

- a. proper rates to minimize excess nitrates at the end of the season (requires knowledge of yield potential, yield goal, soil organic matter, past history, cropping practices, tillage, and economics).
- b. timing of application: fall versus spring application.
- c. split applications: labor, energy, and equipment intensive but permits adjustments of rates based on early season weather and tissue/soil tests.
- d. fertilizer through irrigation water: avoid with shallow rooted plants and on crops grown on ridges.
- e. placement: banding near the seed during planting, placement in ridges for crops planted using "till-plant" ridge tillage, may reduce leaching potential.
- f. nitrification inhibitors: effectiveness depends on weather, environment, soil, and management. Savings often do not justify the expense of inhibitors.
- g. slow-release forms of N: currently not economical due to high cost and problems matching release rates to crop needs.
- h. foliar application: reduces amount of N used but may increase the number of applications needed.
- i. better overall management: improved calibration of equipment, more even distribution of fertilizer, and continual adjustment of application rates in response to in-field conditions.

2. Soil and Tissue Testing

- a. N indices of the soil: currently lack consistency in our determinations of percent of N released.
- b. testing for residual nitrate at the start of growing season: sampling so far is difficult and results are variable. In theory, nitrate in profile at planting is same as fertilizer N.
- c. tissue testing: usually too late for current crop but can serve as a general diagnostic guide to modify fertilizer rate recommendations.

3. Crop Waste and Residue Management

- a. manures: better land application management is needed since manure is often regarded as a waste rather than a nutrient resource. Nutrient concentrations tend to be variable.
- b. alfalfa, other legumes: research indicates that nitrogen credit is important. Plowing down an excellent stand of alfalfa would

- supply enough N for a corn crop the next year and for a partial crop the subsequent year.
- c. cropping sequence: legumes in rotation.
 - d. conservation tillage: a high amount of crop residue (specifically, carbonaceous residue) on the soil surface affects the N cycle by increasing immobilization. Soil injection of N can be used.
 - e. municipal sewage sludge: although a good source of slowly available N, loss of nitrate by leaching may occur when N is released from waste during time when crop needs are low. State regulations govern loading rate based on N and heavy metals content.
 - f. winter cover crops: theoretically can capture excess N after harvest but fall season must be long enough to allow crop to grow.
 - g. interseeding with legumes: a possibility but legumes tend to start late and grow poorly in shaded rows. Weed control is difficult.
 - h. deep rooted crops to retrieve N: alfalfa is a good example.
 - i. alternative agriculture: involves increased use of rotations and organic wastes. So far, the environmental benefits do not offset the economic disadvantages of the system (Crosson and Ostrov 1988).
4. **Limitations on Fertilizer Use**
Although a possibility through state legislation, the N mass balance cannot be predicted with sufficient accuracy to justify limitations set by rules.
 5. **Improved Recommendations**
The technology exists to improve N fertilizer recommendations using computer-assisted modeling and in-field fine tuning of application rates.

Pesticide Management

Best Management Practices involving pesticides revolve around the use of non-chemical practices such as crop rotation, resistant varieties, cultural practices, and biological control, and a more judicious use of chemical control measures by monitoring fields more closely. By far the most important approach is the adoption of an integrated pest management philosophy (Sorensen 1988).

Integrated Pest Management (IPM) looks at pest control from a broader perspective than just attempts at eradicating the pests that threaten the crop. It is the informed selection and use of pest control actions that will result in a good crop and an

undamaged environment. In developing IPM programs, scientists introduced two key concepts into the farming community. First, they developed the idea of economic thresholds. Since plants evolved along with pests, they can tolerate a certain amount of damage. Pest populations only need to be controlled when the cost of that control is justified. That can be predetermined by knowing the kind of damage the pest does, how resilient the plants are, and how much the crop is worth. Thus, the farmers were now given some sort of threshold number that could trigger preventative measures: for example, 15 loopers per sweep net sample or 3 mites per leaf. And second, to make sure decisions were made in a timely manner and with up-to-date information, intensive monitoring of pest populations was encouraged. Suitable and rapid monitoring techniques were developed.

Slowly, the word "integrated" began to dominate the thinking in IPM. Researchers found that something as seemingly innocent as irrigating the crop or adding more fertilizer might make the plants look more inviting to certain insects (bad) while creating a fuller canopy, crowding out competing weeds (good). The focus of IPM kept expanding to keep pace with the knowledge base: from the goal of managing the pest to managing the crop and ultimately to managing the agroecosystem. And, along the way, the computer became an indispensable tool to help the researchers collect data, store it, process it, and refine predictions. Nowadays, computer programs can continually readjust economic thresholds to reflect the market price of the commodity. And farmers can get advice not only on when pests should be controlled and which techniques to utilize, but also on how many acres and which crops to plant.

Currently, IPM programs enable our farmers to incorporate all of the pest control techniques that are in our arsenal into an integrated program, choosing those techniques that are the least damaging to the environment. Unfortunately, IPM programs are not always available because they are site-specific and require an intensive research effort to develop. IPM is also hampered by misconceptions. It is not pest control without pesticides at one end of the spectrum nor is it pest control simply using better timing of pesticide applications on the other end. Permanent pest suppression can sometimes result through the successful establishment of predators and parasites, environmental modifications, changes in cultural practices, or in the development of resistant crop varieties. In all cases, chemical

Reconciling Agriculture's Needs With Water Quality

pesticides are used only when necessary and appropriate.

Best management techniques for pesticide use (CTIC 1988) include:

1. Use pesticides effectively by utilizing an integrated pesticide management (IPM) approach to pesticide use.
 - a. Know key pests and the crop's economic threshold.
 - b. Monitor fields so developing pest problems can be pinpointed.
 - c. Before applying pesticides, make sure that infestation levels warrant chemical treatment. Pesticides should be applied only if they will increase profits, not just yields.
 - d. Time applications carefully. Consider the life cycle of the pest and current weather conditions to maximize control.
 - e. Consider crop rotation to eliminate persistent and recurring insects and weeds.
 - f. Use pest resistant varieties of crops.
 - g. Equip harvesters with weed seed killers to reduce inadvertent spread of weed seeds.
2. Use non-leaching pesticides when possible.
 - a. Know pesticide characteristics that increase their leaching potential: high water solubility, low soil adsorption capability, and long persistence in the soil.
 - b. Be familiar with EPA's list of pesticides which are leachers or potential leachers.
 - c. Choose the pesticide with the lowest leaching potential when more than one chemical will do the job.
3. Know the on-site characteristics of each field and what properties promote pesticide leaching.
 - a. Sandy soils are more likely to leach than soils high in clay or organic matter.
 - b. Leaching is more rapid and deeper in coarse or light textured soils than in fine or heavy soils.
 - c. Pesticides can be transported at higher volumes through porous soils. Macropores (worm tunnels) and shrinkage cracks may promote rapid leaching. Conversely, they may allow water to quickly bypass pesticides trapped in the organic layer.
 - d. Areas with high rainfall or irrigation rates have large amounts of water passing through the soil and are more susceptible to leaching.
 - e. Areas with shallow water tables and a permeable unsaturated zone above the ground water are highly susceptible to leaching.
4. Do not apply pesticides when environmental conditions are unfavorable.
 - a. Avoid application when heavy rainfall is predicted.
 - b. Do not irrigate in large quantities after application.
5. Use application technology to reduce leaching potential.
 - a. Reduce the quantity of pesticides by optimizing spray drop size. Drops that are too large tend to run off plant surfaces. Drops that are too small are highly susceptible to drift.
 - b. Reduce the quantity of applied pesticide by enhancing the "cling" of foliar applied chemicals to the plant surface. Adjuvants such as stickers and electrostatic sprayers that apply a charge to spray droplets can be utilized.
 - c. Use anti-backsiphoning devices with chemigation to avoid direct well contamination.
6. Prevent pesticide accidents and spills.
 - a. Establish buffer zones to protect points of possible direct ground water recharge (well, sinkholes, irrigation ditches) from pesticide contamination.
 - b. Do not mix, handle, apply, or dispose of pesticides in the immediate vicinity of a well or a Karst sinkhole.
 - c. Channel pesticide contaminated runoff away from sinkholes or plant buffer strips around them.
 - d. Use proper pesticide storage facilities. They should have concrete floors, be well ventilated, posted clearly with signs, and locked.
 - e. Calculate chemical needs as closely as possible.
 - f. Dispose of pesticide containers safely.
 - g. Use refillable bulk containers and closed system chemical transfer systems.

Farm Bureau's Approach to Ground Water Problems

The American Farm Bureau Federation has been actively involved in ground water issues for almost a decade. We have comprehensive policies on ground water quality and quantity, agricultural chemical usage, integrated pest management, and future agricultural research needs. These policies are drafted by our active farmer and rancher members during our policy development process. This process takes roughly eight months and is repeated

on an annual basis to keep our policies relevant to current events.

On ground water quality problems, Farm Bureau has taken the lead among farm organizations with its Groundwater and Environmental Quality Self-Help Checklist for Farmsteads and Farm Fields. The "Checklist" is a fifteen page booklet of questions about pollution problems that can occur around farms. A year in development, the checklist was particularly designed to be used in group meetings where twenty minutes are set aside for everyone to fill in their answers to the questions. The checklist analyzes on-farm water supplies and directs the farmer's attention to potential problems. It provides suggestions on best management techniques, proper storage and handling of agricultural chemicals, safe disposal and application of chemicals, and advice on water testing. It also provides a form that can be filled out on an annual basis to keep track of water quality on the farm.

The Checklist is currently being used by 34 of our state Farm Bureaus and 9 more plan to use it soon. Montana, North Dakota, and Rhode Island have mailed a copy to every farmer member. Delaware and Ohio plan to do the same. Other state Farm Bureaus are using the Checklist in cooperation with their state health departments, Soil Conservation Service or Cooperative Extension Service. The USDA is considering mailing out Checklists to every Cooperative Extension agent, Farmers Home Administration (FmHA) office, Agricultural Stabilization and Conservation Service (ASCS) office, and Soil Conservation Service office in the U.S. Our ultimate goal is to get a checklist into the hands of every farmer in the country.

With regard to integrated pest management (IPM), we are encouraging the widespread use of IPM among our members. We are also aggressively promoting use of IPM through member education and legislative initiatives. So far, six states have passed some form of IPM legislation. Rhode Island taxes agricultural chemicals to collect funds for IPM research. California can permit use of restricted pesticides with approved IPM programs. Wisconsin can prescribe IPM tactics to protect vulnerable aquifers. Vermont has expanded the efforts of its Cooperative Extension Service in IPM. Iowa has set up demonstration farms and field studies which utilize IPM techniques. Connecticut has set aside funds for IPM research. Two more states are trying to pass legislation to encourage the use of IPM: Massachusetts and New York.

On the federal level, we are hopeful that the promotion of IPM programs will be incorporated

into the new version of FIFRA, the 1990 Farm Bill, into any federal pesticide or ground water legislation, into agricultural research bills and perhaps as separate legislation.

Farm Bureau is also supporting the use of biotechnology to help solve environmental concerns. Although not a magic bullet, some of these new technologies can potentially help researchers develop disease resistant plants, plants with nitrogen-fixing capabilities, herbicide-resistant plants (focusing on environmentally safe herbicides), plants with weed-suppressing capabilities, insect resistant plants, animal vaccines for insect-borne diseases, and enhanced microbial control agents to control insect pests, weeds, and plant pathogens. All of these possibilities will decrease our dependency on agricultural chemicals. In addition, the new technologies can engineer microbes to degrade some of our more environmentally persistent chemicals.

CONCLUSION

Our country is dependent on ground water and we are rapidly developing an understanding of the importance of protecting it. What this means to agriculture is that ground water quality issues will dictate the ways our farmers can farm in the future. Right now we are in a transition period. We are trying to modify our chemically intensive agriculture while minimizing the economic impact on our farmers. With the right combination of research and education, we may be able to pull it off (AFBF Farm Income Study 1987). If not, our farmers, and ultimately, our consumers and the environment will suffer.

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PROJECTIONS FOR THE FUTURE

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INTRODUCTION

In this paper, current uses of water in New Mexico, as well as potential future demands, will be presented. The basis of these projections was a study conducted for the Second New Mexico Town Hall on Water held at Angel Fire, New Mexico in mid-May, 1988. These long-range projections will be conjectural in nature and constitute possible water futures for New Mexico. Demand estimates and existing supply figures will be combined to predict future water scarcity.

Water depletion is the foundation for any discussion of water use. The term depletion, means water withdrawn and no longer available for use because it has been evaporated, transpired, incorporated into products or crops, consumed by man or livestock, or otherwise removed.

For this presentation, the state of New Mexico was divided into nine river basins (figure 1). The

water use figures on depletion were taken from a 1986 report by the State Engineer Office (SEO) (Wilson 1986). The data presented here combines Wilson's thirteen water use categories into five: agriculture, municipal, industrial, minerals and power, and evaporation.

CURRENT STATE WATER DEPLETIONS

Water depletions in New Mexico from 1970 to 1985 reflected the state's economic health during that period. From 1970 through 1980, there was an increase in water depletions. However, from 1980 to 1985, there was a significant decrease (400,000 acre-feet) in statewide depletions (table 1). The late 1970s and early 1980s represented the era of

Table 1. Water Depletion in New Mexico by Category, 1970-1985.

| <u>Water Use Category</u> | <u>1970*</u> | <u>1975**</u> | <u>1980*</u> | <u>1985**</u> |
|---------------------------------------|--|--------------------------|--------------|---------------|
| | - - - - -thousands of acre-feet- - - - - | | | |
| Agriculture | 1,760.5 | 1,820.1 | 1,910.4 | 1,482.7 |
| Municipal | 84.9 | 107.5 | 129.9 | 137.9 |
| Industrial | 12.9 | 12.1 | 12.0 | 12.0 |
| Minerals and Power | 61.3 | 767.0 | 105.6 | 87.9 |
| Evaporation | <u>295.8</u> | <u>270.2</u> | <u>416.0</u> | <u>451.3</u> |
| Total | 2,215.4 | 2,286.9 | 2,573.9 | 2,171.8 |
| *Source: Bureau of Reclamation (1976) | | #Source: Sorensen (1982) | | |
| **Source: Sorensen (1977) | | ##Source: Wilson (1986) | | |

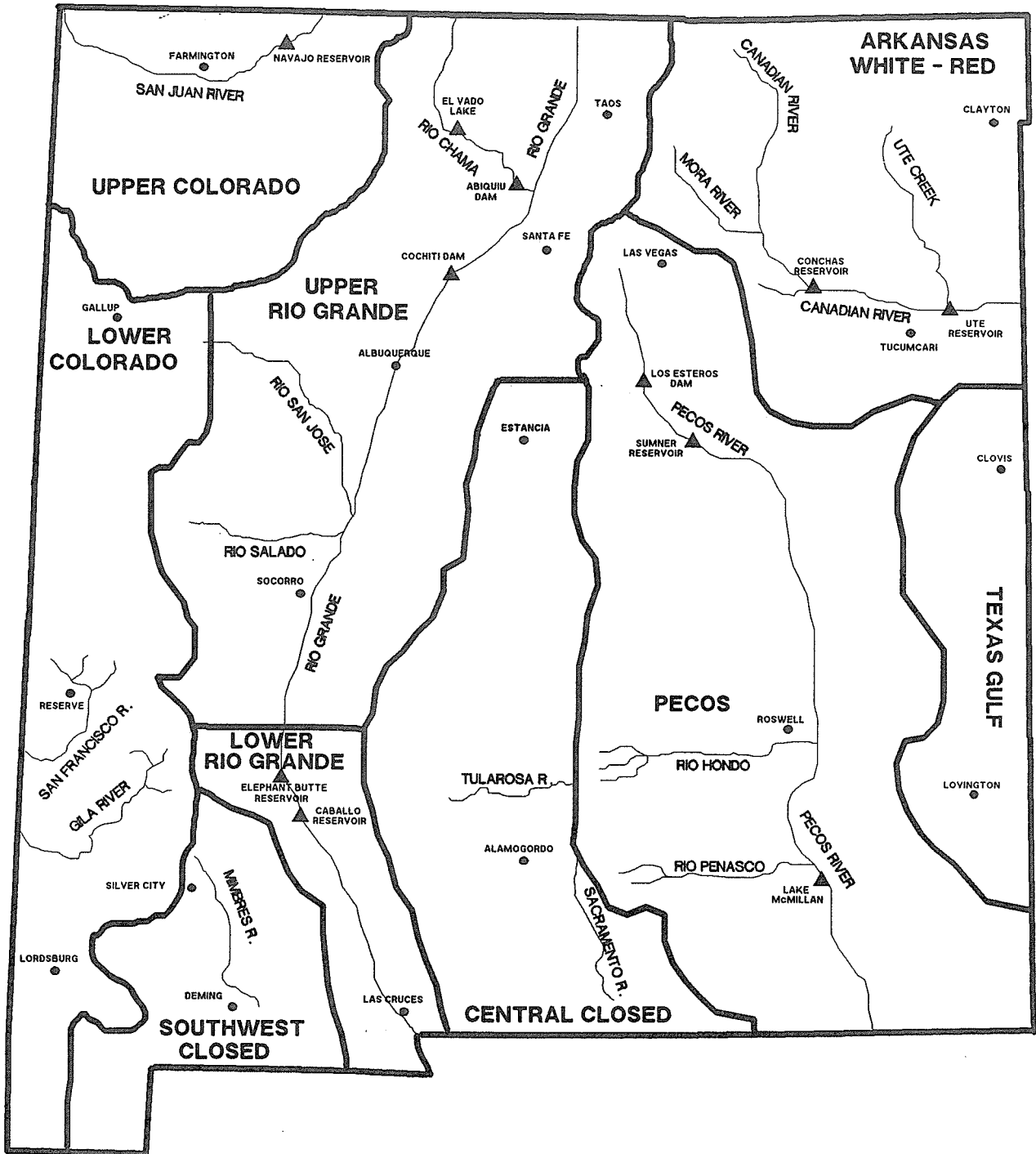


Figure 1. New Mexico's River Basins

Projections for the Future

greatest economic activity in the history of New Mexico. As indicated by depletions, the agricultural, and minerals and power sectors were at the height of economic activity. Since the early to mid-1980s, these sectors have been in an economic slump and water depletions are down (figure 2). The 1985 statewide depletions by the five water use categories are presented in figure 3. Of total depletions, agriculture accounted for 68%; evaporation, 21%; municipal, 6%; minerals and power, 4%; and industry, less than 1%.

CURRENT DEPLETIONS BY RIVER BASINS

Figure 4 presents depletions by river basin.

Upper Colorado River Basin

Nearly 99 percent of the 1985 depletions for the Upper Colorado River Basin were from surface water sources (Wilson 1986). Small quantities of ground water were used for rural, domestic, livestock, minerals, and recreation purposes. Of total depletions in this basin,

- Agriculture accounted for 72%
- Evaporation accounted for 13%
- Minerals and power accounted for 13%
- Municipal accounted for 2%
- Industry accounted for less than 1%

With the recent development of the Navajo Indian Irrigation Project (NIIP) in San Juan County, this basin has become one of the important irrigated agriculture regions in the state. During 1976, water was delivered to the first 9,200 acres on the project. Since then, water has been delivered to an additional 37,400 acres and eventually, 110,000 acres will be irrigated. The principal crops grown in this basin were alfalfa, corn, pasture, wheat, dry beans, and potatoes.

Lower Colorado River Basin

The Lower Colorado River Basin has the lowest depletions of all the basins in New Mexico. Much of the lower portion of the basin (Gila and San Francisco river basins) is under a federal adjudication decree. In these basins, surface and conjunctive ground water use is monitored closely by the SEO. There are no major reservoirs in this basin. Of total depletions in this basin,

- Agriculture accounted for 52%
- Minerals and power accounted for 28%
- Evaporation accounted for 12%
- Municipal accounted for 7%

- Industry accounted for less than 1%

Nearly all of the irrigated croplands were located in the southern portion of the basin (Catron and Hidalgo counties). Ground water was the most important source for irrigation and nearly all of the ground water depletions were in Hidalgo County. The principal crops were low-value crops such as cotton, grain sorghum, and corn.

Southwest Closed Basin

About 80 percent of the 1985 depletions in the Southwest Closed Basin were from ground water sources. All of the surface water depletions were for agricultural purposes. Of the total depletions in this basin,

- Agriculture accounted for 82%
- Minerals and power accounted for 13%
- Municipal accounted for 4%
- Evaporation accounted for less than 1%
- Industry accounted for less than 1%

Some 10,000 acres of native pasture in the Mimbres Basin in Luna County were irrigated with surface water from the Mimbres River. The Southwest Closed Basin encompassed about 3.3 percent of the state population in 1985, but only 2.8 percent of the state's municipal depletions.

Upper Rio Grande Basin

The Upper Rio Grande Basin had the fifth highest depletions of all the basins in New Mexico. Of total depletions, estimated at about 297,000 acre-feet in 1985,

- Agriculture accounted for 51%
- Municipal accounted for 26%
- Evaporation accounted for 18%
- Minerals and power accounted for 3%
- Industry accounted for 2%

The irrigated cropland was located primarily along the Rio Grande, the Rio Chama, the Jemez, the Rio Puerco, and the Rio San Jose. Surface water was the primary source of water for irrigation accounting for about 85 percent of the irrigation depletions. The lack of supplemental ground water presented a major problem during periods of low flows in the rivers. The cropping plan reflected this problem primarily producing low-value crops such as pasture, alfalfa, native pastures, corn, and small grains. However, some high-value crops were being produced in Rio Arriba, Bernalillo, and Valencia counties.

This basin had the largest municipal depletions of all the basins because of the Albuquerque metropolitan area. This basin accounted for about 56

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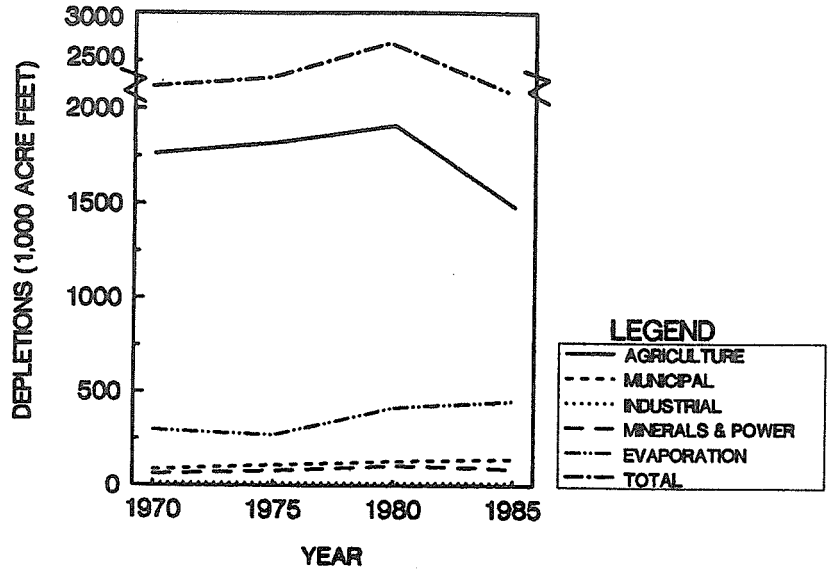


Figure 2. Water Depletion in New Mexico by Category, 1970 - 1985

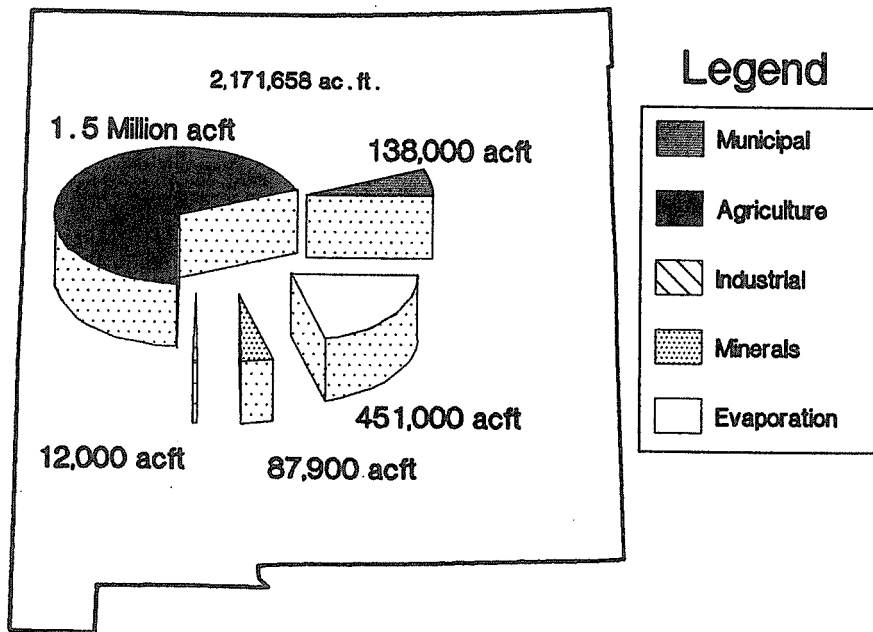
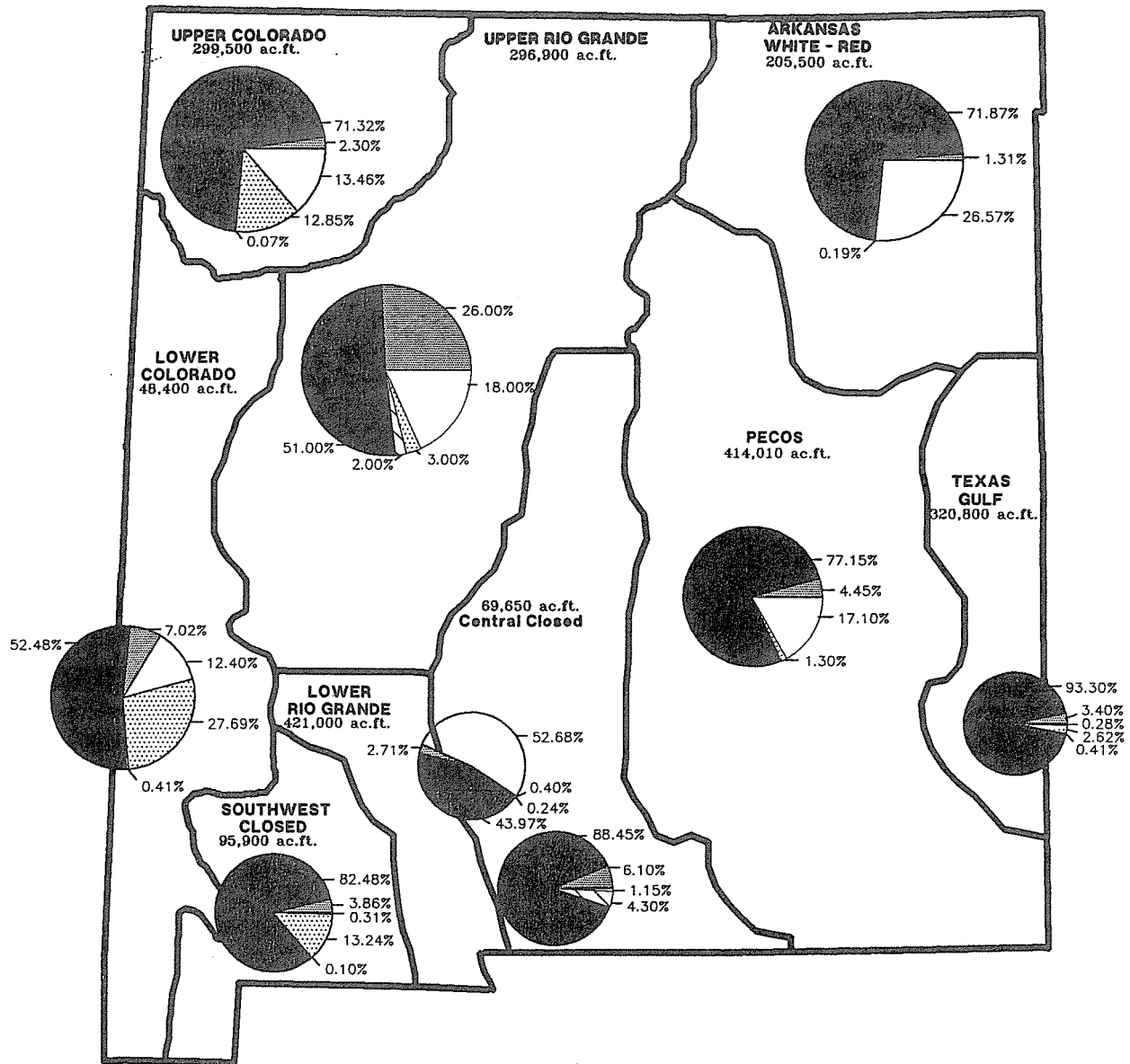


Figure 3. Summary of Water Depletions in New Mexico, 1985

Projections for the Future



Legend

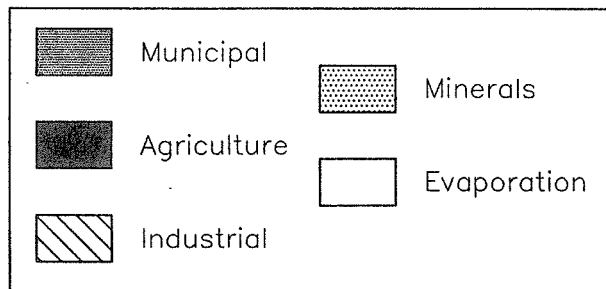


Figure 4. Water Depletions in New Mexico by River Basins, 1985

percent of the total municipal depletions in the state. The population of the basin accounted for about 49 percent of the total state population, and, therefore, the annual municipal depletion of 35,500 gallons per person was well above the state average of 31,000 gallons per person.

Lower Rio Grande Basin

About 88 percent of the depletions for 1985 in the Lower Rio Grande Basin were from surface water sources. Agriculture and municipal were large users of ground water. Small quantities of ground water were used for industrial, minerals, and recreational purposes. Of total depletions,

- Evaporation accounted for 53%
- Agriculture accounted for 44%
- Municipal accounted for 3%
- Minerals and power accounted for less than 1%
- Industry accounted for less than 1%

Because of its southernmost location and the presence of Elephant Butte and Caballo reservoirs, this basin ranked first in terms of evaporation among the state's nine river basins in New Mexico.

This was an important agricultural region in New Mexico producing about 70 percent of the high-value crops in New Mexico. The important irrigated crops in the basin in 1985, which account for about 44 percent of total depletions, were alfalfa, pecans, cotton, chile, lettuce, onions, and wheat.

Central Closed Basin

The Central Closed Basin had the second lowest depletions of all the basins in New Mexico. Of total depletions,

- Agriculture accounted for 88%
- Municipal accounted for 6%
- Industry accounted for 4%
- Evaporation accounted for 1%
- Minerals and power accounted for 0%

The Central Closed Basin includes several small rivers and major streams that feed the ground water basin. The major economic activity was primarily centered in southern Santa Fe County and northern Torrance County around the towns of Moriarty and Estancia in the northern part of the basin, and in Otero County and southeastern Doña Ana County around the cities of Alamogordo, Las Cruces, and El Paso, Texas, in the southern part of the basin.

Pecos River Basin

The Pecos River Basin had the second highest depletions in the state, surpassed only by the Lower Rio Grande Basin. Of total depletions in this basin,

- Agriculture accounted for 77%
- Evaporation accounted for 17%
- Municipal accounted for 4%
- Minerals and power accounted for 1%
- Industry accounted for less than 1%

The Pecos River Basin had the largest agricultural depletions of all the basins. The majority of the irrigated cropland was located primarily along the Pecos River in Chaves and Eddy counties; and the Rio Hondo and Rio Penasco in Lincoln, Chaves, Otero, and Eddy counties.

Arkansas-Red-White Basin

About 56 percent of the depletions in the Arkansas-Red-White (ARW) Basin for 1985 were from surface water sources. Small quantities of ground water were used for municipal and recreational purposes. Of total depletions,

- Agriculture accounted for 72%
- Evaporation accounted for 27%
- Municipal accounted for 1%
- Minerals and power accounted for less than 1%
- Industry accounted for less than 1%

The ARW basin was an important agricultural region in New Mexico with irrigated crops in 1985 of corn, grain sorghum, and wheat.

Texas Gulf Basin

More than 99 percent of the depletions in the Texas Gulf Basin for 1985 were from ground water sources. There are no rivers or major streams in the Texas Gulf Basin. Agriculture, municipal, and minerals were the top three water users in the basin. Small quantities of ground water were used for industrial and recreational purposes. Of total depletions,

- Agriculture accounted for 93%
- Municipal accounted for 3%
- Minerals and power accounted for 3%
- Industry accounted for less than 1%
- Evaporation accounted for less than 1%

Projections for the Future

POPULATION PROJECTIONS

To determine alternative future water depletions, three population projections were developed: 1) conservative growth, 2) potential growth, and 3) optimistic growth. The population projections for each are presented in figure 5 and table 2.

A detailed analysis of the three alternative population projections (conservative, potential, and optimistic) was completed and presented in a Water Resources Research Institute report by Creel, et al. (1988). There were little differences in depletions among the three population projections because there was little difference among population projections. The major differences were among scenarios. Consequently, in the interest of simplicity and readability, only future depletions for the middle "potential" population projections will be presented in this paper. Two scenarios will be presented for the population projections. The first scenario (A) will hold agricultural depletions constant at the 1985 level over time. The second scenario (B) will permit agricultural depletions to increase at the same rate

as the other economic sectors. The second scenario could be representative of the conditions and projections of a high-growth economy that prevailed during the late 1970s and early 1980s. During this period, water depletions were much higher than in 1985. The agricultural, and minerals and power sectors were growing at a fast rate. If these sectors were to recover to growth levels experienced earlier, then Scenario B projections might be more valid.

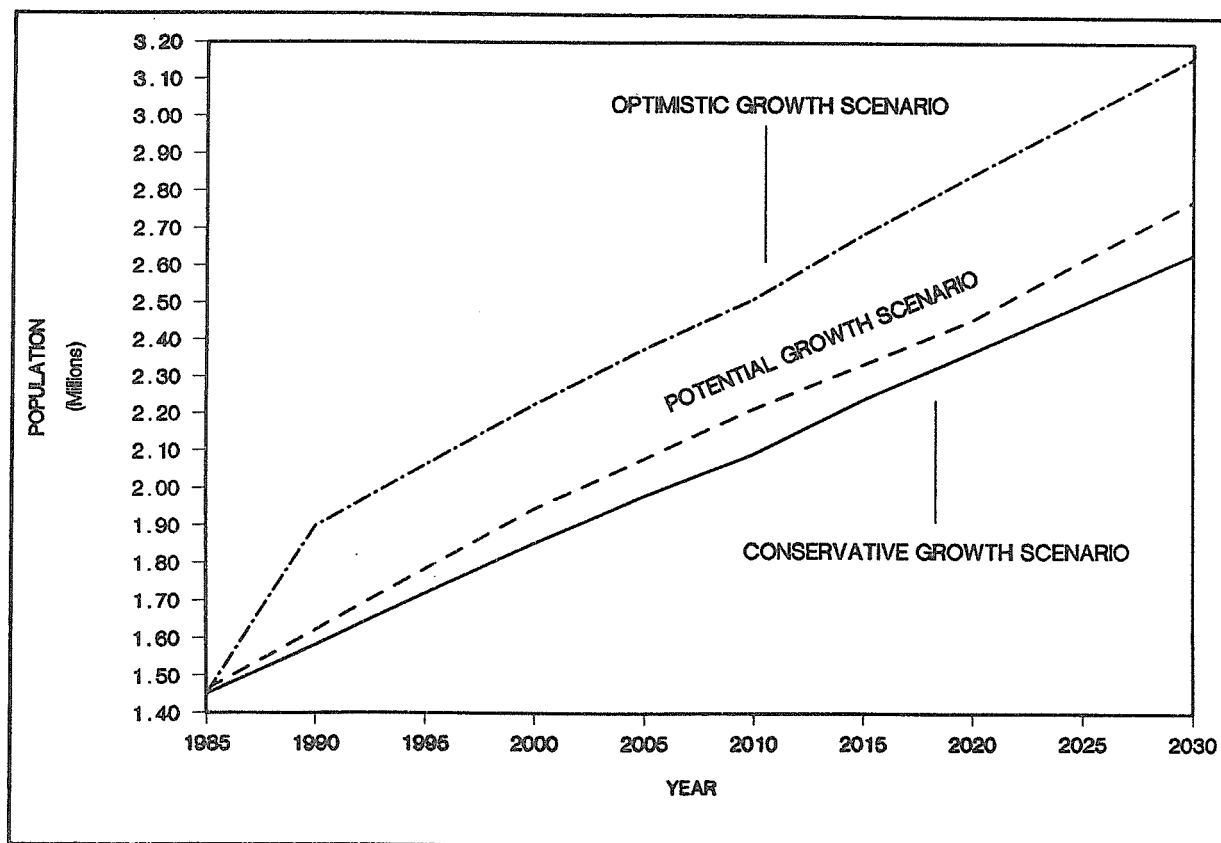


Figure 5. New Mexico Population Projections by Growth Scenarios

Table 2. New Mexico Population Projections by Growth Scenario, 1985-2030.

| Basin | 1985 | 2000 | 2010 | 2020 | 2030 |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| <u>Conservative*</u> | | | | | |
| Upper Colorado | 62,028 | 100,295 | 121,501 | 148,337 | 173,053 |
| Lower Colorado | 64,870 | 89,987 | 108,363 | 123,828 | 140,469 |
| Southwest Closed | 47,980 | 56,807 | 63,035 | 68,748 | 74,672 |
| Upper Rio Grande | 706,052 | 881,119 | 972,162 | 1,093,211 | 1,203,207 |
| Lower Rio Grande | 126,803 | 189,283 | 219,478 | 263,490 | 302,085 |
| Central Closed | 59,824 | 77,191 | 87,503 | 99,512 | 110,846 |
| Pecos | 225,667 | 282,101 | 326,407 | 364,536 | 405,250 |
| Arkansas-Red-White | 42,907 | 46,608 | 49,558 | 52,499 | 55,430 |
| Texas Gulf | <u>115,170</u> | <u>130,709</u> | <u>145,093</u> | <u>156,417</u> | <u>168,781</u> |
| Total | 1,451,300 | 1,854,100 | 2,093,100 | 3,470,579 | 2,633,793 |
| <u>Potential**</u> | | | | | |
| Upper Colorado | 59,005 | 91,985 | 115,181 | 139,505 | 161,399 |
| Lower Colorado | 65,201 | 86,378 | 102,234 | 120,423 | 134,082 |
| Southwest Closed | 49,359 | 62,361 | 70,265 | 78,312 | 86,882 |
| Upper Rio Grande | 721,175 | 940,529 | 1,043,331 | 1,118,540 | 1,266,756 |
| Lower Rio Grande | 124,091 | 193,882 | 236,564 | 271,712 | 318,464 |
| Central Closed | 57,978 | 71,789 | 79,668 | 87,384 | 96,548 |
| Pecos | 230,534 | 315,309 | 367,139 | 420,753 | 476,212 |
| Arkansas-Red-White | 42,760 | 50,452 | 54,840 | 59,285 | 64,319 |
| Texas Gulf | <u>112,202</u> | <u>131,967</u> | <u>145,307</u> | <u>160,342</u> | <u>173,208</u> |
| Total | 1,462,303 | 1,944,652 | 2,214,529 | 2,456,256 | 2,777,870 |
| <u>Optimistic#</u> | | | | | |
| Upper Colorado | 62,028 | 120,354 | 145,801 | 178,004 | 207,663 |
| Lower Colorado | 64,870 | 107,985 | 130,035 | 148,593 | 168,562 |
| Southwest Closed | 47,980 | 68,168 | 75,643 | 82,498 | 89,607 |
| Upper Rio Grande | 706,052 | 1,057,343 | 1,166,595 | 1,311,854 | 1,443,848 |
| Lower Rio Grande | 126,803 | 227,140 | 263,374 | 316,854 | 1,443,848 |
| Central Closed | 59,824 | 92,629 | 105,003 | 119,414 | 133,015 |
| Pecos | 225,667 | 338,521 | 391,688 | 437,444 | 486,300 |
| Arkansas-Red-White | 42,907 | 55,929 | 59,470 | 62,000 | 66,517 |
| Texas Gulf | <u>115,170</u> | <u>156,851</u> | <u>174,112</u> | <u>187,701</u> | <u>202,538</u> |
| Total | 1,451,300 | 2,224,920 | 2,511,720 | 2,844,694 | 3,160,551 |

*Source: Bureau of Business and Economic Research, 1987.
**Source: Peach, J.T. and J.D. Williams, 1987.
#Source: adapted from Bureau of Business and Economic Research, 1987.

PROJECTED DEPLETIONS

Water depletions will be estimated for each of the three population projections based on 1985 depletions. Depletions per person will remain at the 1985 levels for the municipal, industrial, minerals and power, recreation, and fish and wildlife sectors. The per capita depletion coefficients will be used in conjunction with the population projection

to estimate future water depletions by water use category. Reservoir evaporation will be held to the average of the past 20 years. The mid-1980s were very wet years and most of the reservoirs were at or near capacity which produced a very high evaporation estimate for 1985. Therefore, in typical years, evaporation would be grossly overestimated.

Projections for the Future

State-Scenario A

The state's water depletions will not exceed supply by 2030 (table 3). At the rate that depletions are increasing, the state has enough total water supplies to last for an additional 40 to 50 years. However, this large surplus is somewhat misleading because much of this surplus will be located in basins with low economic potential and population projections, such as the Lower Colorado, Southwest Closed, Central Closed, and the ARW basins.

The state depletions were estimated at 2.2 million acre-feet in 1985. Under this scenario, they were estimated to increase to 2.3 million acre-feet in 2030 (table 3). The total supply of water for depletions was estimated to be 3.2 million acre-feet

in 1985 and is expected to decrease slowly to 3.1 million in 2030 due to ground water mining in the Texas Gulf Basin (table 3). Of total depletions in 2030,

- Agriculture accounted for 64%
- Evaporation accounted for 16%
- Municipal accounted for 11%
- Minerals and power accounted for 8%
- Industry accounted for less than 1%

State-Scenario B

If depletions had been permitted to grow at about the same rate as occurred in the late 1970s, statewide depletions would exceed supply between 2010 and 2020. The statewide water depletions, in

Table 3. Water Depletions by Water Use Category and Water Supply, New Mexico, Potential Growth Scenario, 1985-2030.

| <u>Water Use Category</u> | Depletions | | | | |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|
| | <u>1985</u> | <u>2000</u> | <u>2010</u> | <u>2020</u> | <u>2030</u> |
| ----- -thousands of acre-feet- ----- | | | | | |
| Scenario A | | | | | |
| Agricultural | 1,483.8 | 1,483.8 | 1,483.8 | 1,483.8 | 1,483.8 |
| Municipal | 138.6 | 183.6 | 208.4 | 229.9 | 260.1 |
| Industrial | 12.4 | 16.0 | 17.9 | 19.6 | 22.0 |
| Minerals | 88.5 | 124.3 | 148.5 | 173.6 | 197.3 |
| Evaporation | <u>448.5</u> | <u>350.3</u> | <u>355.2</u> | <u>359.7</u> | <u>365.4</u> |
| Total Depletions | 2,171.7 | 2,158.0 | 2,213.7 | 2,266.6 | 2,328.5 |
| Supply | 3,249.0 | 3,235.0 | 3,174.0 | 3,149.0 | 3,124.0 |
| ----- | | | | | |
| Scenario B | | | | | |
| Agricultural | 1,483.8 | 1,985.7 | 2,301.5 | 2,615.0 | 2,947.2 |
| Municipal | 138.6 | 183.6 | 208.4 | 229.9 | 260.1 |
| Industrial | 12.4 | 16.0 | 17.9 | 19.6 | 22.0 |
| Minerals | 88.5 | 124.3 | 148.5 | 173.6 | 197.3 |
| Evaporation | <u>448.5</u> | <u>350.3</u> | <u>355.2</u> | <u>359.7</u> | <u>365.4</u> |
| Total Depletions | 2,171.7 | 2,659.9 | 3,031.5 | 3,397.9 | 3,791.9 |
| Supply | 3,249.0 | 3,235.0 | 3,174.0 | 3,149.0 | 3,791.9 |

2030, were estimated at 3.8 million acre-feet (table 3). Of total depletions,

- Agriculture accounted for 78%
- Evaporation accounted for 10%
- Municipal accounted for 6%
- Minerals and power accounted for 5%
- Industry accounted for less than 1%

RIVER BASINS

Upper Colorado River Basin-Scenario A

Based on the projected depletions it appears that in the Upper Colorado River Basin, supply will exceed depletions, in 2030, by 303,000 acre-feet (table 4). Depletions, in 2030, will account for 55 percent of the available supply. This surplus should continue beyond the year 2200. The total supply of water available for depletions in the basin was estimated to be 674,000 acre-feet over the period of this analysis. The depletions in the Upper Colorado River Basin were estimated at about 300,000 acre-feet in 1985 and are expected to increase to 371,000 acre-feet in 2030 (figure 6). The population projection under this scenario is expected to be about 11,600 persons less than under the conservative population projection. The Bureau of Business and Economic Research (BBER) recently revised the population projection upward for northwestern New Mexico because of the potential for a faster than expected recovery in the minerals and energy sector of the economy.

Upper Colorado River Basin-Scenario B

Depletions under this scenario will exceed supplies before 2030 (table 4). Total depletions in 2020 were estimated to be 645,100 acre-feet and are expected to increase to 741,600 acre-feet in 2030 (figure 7). This may be the more likely scenario if the Navajo Indian Irrigation Project (NIIP) is fully developed during the 45-year period of this analysis. Approximately 50,000 acres of irrigated cropland has been developed on NIIP, with approximately 60,000 acres yet to be developed.

Lower Colorado River Basin-Scenario A

Depletions will not exceed water supplies in 2030 (table 4). A surplus of 303,000 acre-feet will continue through the year 2200. Depletions, in 2030, account for about 42 percent of the available water supply. The total supply of water available for

depletions in the basin was estimated to be 157,000 acre-feet over the period of this analysis. The depletions in the Lower Colorado River Basin were estimated at about 48,400 acre-feet in 1985 (figure 6) and are expected to increase to 66,400 acre-feet in 2030.

Lower Colorado River Basin-Scenario B

Depletions under this scenario will not exceed supplies in 2030 (table 4). Total depletions, in 2030, were estimated to be 93,200 acre-feet (figure 7). Under this scenario, the break-even point between depletions and supplies is near the year 2100.

Southwest Closed Basin-Scenario A

Depletions will not exceed supplies in 2030, by 78,400 acre-feet (table 4). Depletions, in 2030, account for about 58 percent of the available supply. This surplus should continue through 2200. The total supply of water available for depletions in the basin was estimated to be 187,000 acre-feet over the period of this analysis (figure 6). The depletions in the Southwest Closed Basin were estimated at about 95,900 acre-feet in 1985 and are expected to increase to 108,600 acre-feet in 2030.

Southwest Closed Basin-Scenario B

Depletions under this scenario will not exceed supplies in 2030 (table 4). Total depletions, in 2030, were estimated to be 168,700 acre-feet (figure 7). Under this scenario, the break-even point between depletions and supplies is expected to be between 2040 and 2050.

Upper Rio Grande Basin-Scenario A

Depletions will not exceed supplies in 2030 by 25,800 acre-feet (table 4). However, the basin's depletions will exceed supplies very shortly after 2040. The total supply of water available for depletions in the basin was estimated to be 395,000 acre-feet over the period of this analysis (figure 8). The depletions in the Upper Rio Grande Basin were estimated at about 296,800 acre-feet in 1985 and are expected to increase to 369,200 acre-feet in 2030.

Upper Rio Grande Basin-Scenario B

Depletions under this scenario will exceed supplies in 2030 by about 88,200 feet (table 4). Total depletions in 2010 were estimated to be

Table 4. Water Depletions by Water Use Category by Basin and Water Supply, Potential Population Projection, 1985 and 2030

| Water Use Category | Upper Colorado River | | Lower Colorado River | | Southwest Closed | |
|--|----------------------|--------------|--------------------------|--------------|------------------|--------------|
| | 1985 | 2030 | 1985 | 2030 | 1985 | 2030 |
| --(depletions in thousands of acre-feet)-- | | | | | | |
| Scenario A | | | | | | |
| Agricultural | 213.6 | 213.6 | 25.4 | 25.4 | 79.1 | 79.1 |
| Municipal | 6.9 | 18.9 | 3.4 | 6.9 | 3.7 | 6.5 |
| Industrial | 0.2 | 0.6 | 0.2 | 0.5 | 0.1 | 0.2 |
| Minerals | 38.5 | 105.4 | 13.4 | 27.6 | 12.7 | 22.4 |
| Evaporation | 40.3 | 32.5 | 6.0 | 6.0 | 0.3 | 0.5 |
| Total Depletions | 299.6 | 371.0 | 48.4 | 66.4 | 95.9 | 108.6 |
| Supply | 674.0 | 674.0 | 157.0 | 157.0 | 187.0 | 187.0 |
| ----- | | | | | | |
| Scenario B | | | | | | |
| Agricultural | 213.6 | 584.2 | 25.4 | 52.2 | 79.1 | 139.2 |
| Municipal | 6.9 | 18.9 | 3.4 | 6.9 | 3.7 | 6.5 |
| Industrial | 0.2 | 0.6 | 0.2 | 0.5 | 0.1 | 0.2 |
| Minerals | 38.5 | 105.4 | 13.4 | 27.6 | 12.7 | 22.4 |
| Evaporation | 40.3 | 32.5 | 6.0 | 6.0 | 0.3 | 0.5 |
| Total Depletions | 299.6 | 741.6 | 48.4 | 93.2 | 95.9 | 168.7 |
| Supply | 674.0 | 674.0 | 157.0 | 157.0 | 187.0 | 187.0 |
| ----- | | | | | | |
| | Upper Rio Grande | | Lower Rio Grande | | Central Closed | |
| | 1985 | 2030 | 1985 | 2030 | 1985 | 2030 |
| --(depletions in thousands of acre-feet)-- | | | | | | |
| Scenario A | | | | | | |
| Agricultural | 151.8 | 151.8 | 185.1 | 185.1 | 61.6 | 61.6 |
| Municipal | 77.0 | 135.3 | 11.4 | 29.4 | 4.5 | 7.3 |
| Industrial | 5.6 | 9.9 | 1.0 | 2.5 | 3.0 | 4.7 |
| Minerals | 8.5 | 14.9 | 1.7 | 4.4 | 0.0 | 0.0 |
| Evaporation | 54.0 | 57.3 | 221.8 | 154.7 | 0.5 | 0.8 |
| Total Depletions | 296.8 | 369.2 | 421.0 | 376.1 | 69.6 | 74.4 |
| Supply | 395.0 | 395.0 | 420.0 | 420.0 | 185.0 | 185.0 |
| ----- | | | | | | |
| Scenario B | | | | | | |
| Agricultural | 151.8 | 265.8 | 185.1 | 475.1 | 61.6 | 124.4 |
| Municipal | 77.0 | 135.3 | 11.4 | 29.4 | 4.5 | 7.3 |
| Industrial | 5.6 | 9.9 | 1.0 | 2.5 | 3.0 | 4.7 |
| Minerals | 8.5 | 14.9 | 1.7 | 4.4 | 0.0 | 0.0 |
| Evaporation | 54.0 | 57.3 | 221.8 | 154.7 | 0.5 | 0.8 |
| Total Depletions | 296.8 | 483.2 | 421.0 | 666.1 | 69.6 | 137.2 |
| Supply | 395.0 | 395.0 | 420.0 | 420.0 | 185.0 | 185.0 |
| ----- | | | | | | |
| | Pecos River | | Arkansas-Red-White River | | Texas Gulf | |
| | 1985 | 2030 | 1985 | 2030 | 1985 | 2030 |
| --(depletions in thousands of acre-feet)-- | | | | | | |
| Scenario A | | | | | | |
| Agricultural | 320.1 | 320.1 | 147.7 | 147.7 | 299.3 | 299.3 |
| Municipal | 18.0 | 34.8 | 2.7 | 4.1 | 10.9 | 16.8 |
| Industrial | 0.8 | 1.6 | 0.0 | 0.0 | 1.3 | 2.0 |
| Minerals | 4.8 | 9.1 | 0.4 | 0.6 | 8.4 | 13.0 |
| Evaporation | 70.2 | 65.5 | 54.6 | 46.7 | 0.9 | 1.4 |
| Total Depletions | 414.0 | 431.1 | 205.5 | 199.2 | 320.8 | 332.5 |
| Supply | 435.0 | 435.0 | 424.0 | 424.0 | 342.0 | 152.0 |
| ----- | | | | | | |
| Scenario B | | | | | | |
| Agricultural | 320.1 | 622.0 | 147.7 | 222.2 | 299.3 | 462.0 |
| Municipal | 18.0 | 34.8 | 2.7 | 4.1 | 10.9 | 16.8 |
| Industrial | 0.8 | 1.6 | 0.0 | 0.0 | 1.3 | 2.0 |
| Minerals | 4.8 | 9.1 | 0.4 | 0.6 | 8.4 | 13.0 |
| Evaporation | 70.2 | 65.5 | 54.6 | 46.7 | 0.9 | 1.4 |
| Total Depletions | 414.0 | 733.0 | 205.5 | 273.7 | 320.8 | 495.2 |
| Supply | 435.0 | 435.0 | 424.0 | 424.0 | 342.0 | 152.0 |

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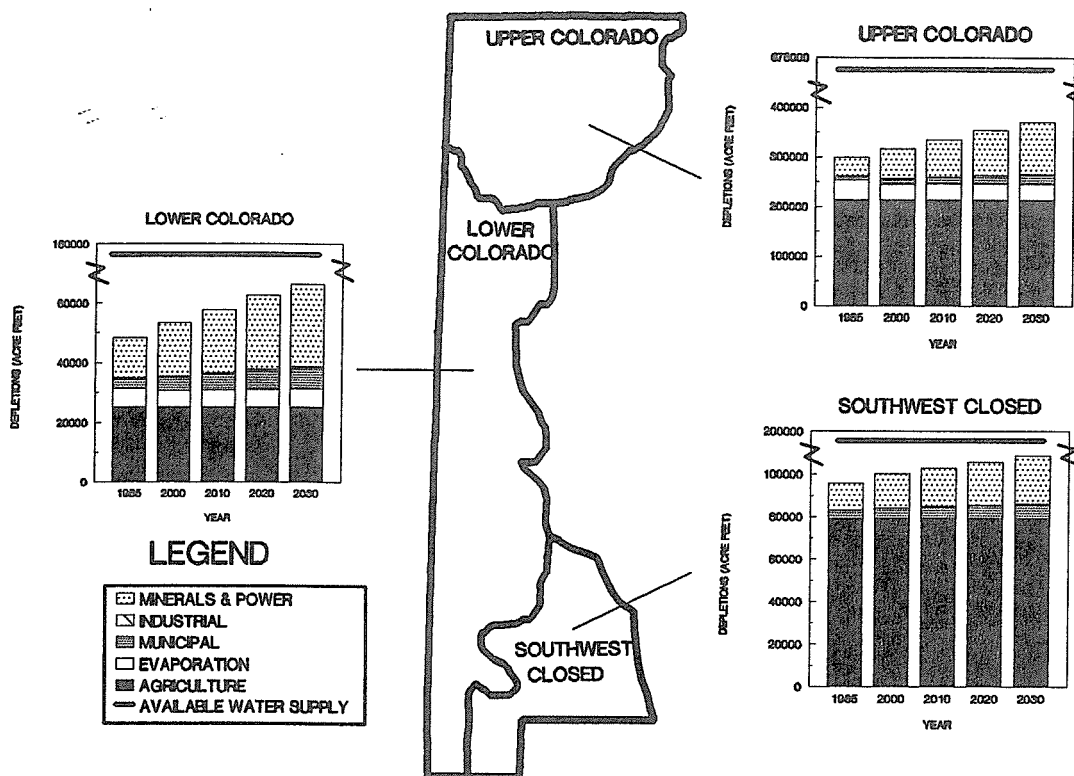


Figure 6. Water Depletion Projections for Upper Colorado, Lower Colorado and Southwest Closed Basins, Potential Growth Projection, Scenario A

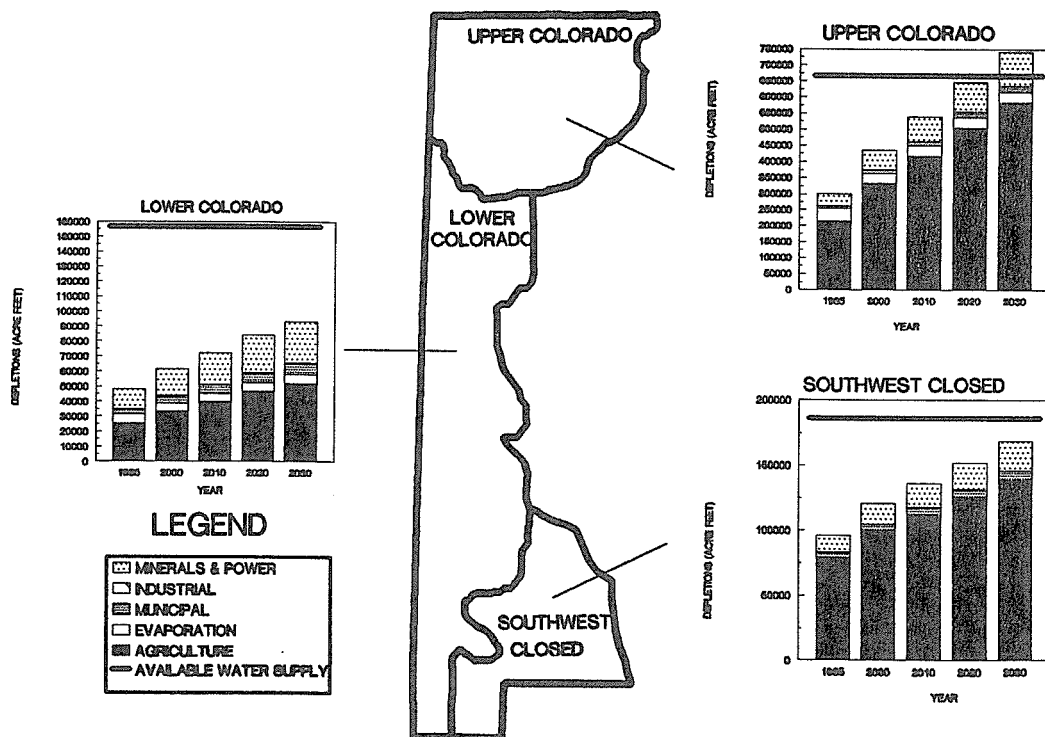


Figure 7. Water Depletion Projections for Upper Colorado, Lower Colorado and Southwest Closed Basins, Potential Growth Projection, Scenario B

Projections for the Future

404,600 acre-feet, 431,900 acre-feet in 2020, and increase to 483,200 acre-feet in 2030 (figure 9).

Lower Rio Grande Basin-Scenario A

Depletions will not exceed supply in 2030, by 3,900 acre-feet (table 4). However, the basin's depletions will exceed supplies very shortly after 2100. The total supply of water available for depletions in the basin was estimated to be 420,000 acre-feet over the period of this analysis (figure 8). The depletions in the Lower Rio Grande Basin were estimated at about 421,000 acre-feet in 1985 and are expected to decrease to 376,100 acre-feet in 2030. The decrease in depletions is due to the 67,100 acre-feet reduction in evaporation.

Lower Rio Grande Basin-Scenario B

Depletions under this scenario will exceed supplies in 2030 by about 246,100 acre-feet (table 4). Total depletions, in 2030, were estimated to be 666,100 acre-feet (figure 9), which is 246,100 acre-feet above available supplies. Under this scenario, the break-even point between depletions and supplies is about 1995.

Central Closed Basin-Scenario A

Depletions, in 2030, will not exceed supplies by 110,600 acre-feet (table 4). Depletions, in 2030, account for only about one-third of the available supply (figure 8). This surplus should continue through the year 2200. The depletions in the Central Closed Basin were estimated at about 69,600 acre-feet in 1985 and are expected to increase to 74,400 acre-feet in 2030.

Central Closed Basin-Scenario B

Depletions under this scenario will not exceed supplies in 2030 (table 4). Total depletions, in 2030, were estimated to be 137,200 acre-feet (figure 9). Under this scenario, the break-even point between depletions and supplies is more than 50 years beyond 2030.

Pecos River Basin-Scenario A

Depletions, in 2030, will not exceed supplies by 3,900 acre-feet (table 4). However, the basin's depletions will exceed supplies by 2040. The total supply of water available for depletions in the basin

was estimated to be 435,000 acre-feet over the period of this analysis (figure 10). The depletions in the Pecos River Basin were estimated at about 414,000 acre-feet in 1985 and are expected to increase to 431,100 acre-feet in 2030.

Pecos River Basin-Scenario B

Depletions under this scenario will exceed supplies in 2030 by about 298,000 acre-feet (table 4). Total depletions, in 2030, were estimated to be 733,000 acre-feet (figure 11), which is 298,000 acre-feet above supplies. Under this scenario, the break-even point between depletions and supplies is between 1990 and 1995.

Arkansas-Red-White River Basin-Scenario A

Depletions, in 2030, will not exceed supplies by 224,800 acre-feet. The total supply of water available for depletions in the basin was estimated to be 424,000 acre-feet over the period of this analysis (figure 10). Depletions account for about 47 percent of the available supply. This surplus should continue beyond the year 2200. The depletions in the ARW Basin were estimated at about 205,500 acre-feet in 1985 and are expected to decrease to 199,200 acre-feet in 2030.

Arkansas-Red-White River Basin-Scenario B

Depletions under this scenario will not exceed supplies in 2030 (table 4). Total depletions, in 2030, were estimated to be 273,700 acre-feet (figure 11). Under this scenario, the break-even point between depletions and supplies is estimated to be beyond the year 2100.

Texas Gulf Basin-Scenario A

The Texas Gulf Basin depletions will exceed supplies prior to the turn of this century. The total supply of water available for depletions in the basin was estimated to be 342,000 acre-feet in 1985, 328,000 in 2000, 217,000 in 2020 and 152,000 in 2030 (figure 10). The depletions in the Texas Gulf Basin were estimated at about 320,800 acre-feet in 1985 and are expected to increase to 332,500 acre-feet in 2030.

Texas Gulf Basin-Scenario B

Depletions under this scenario will exceed supplies well before the turn of the century. Total

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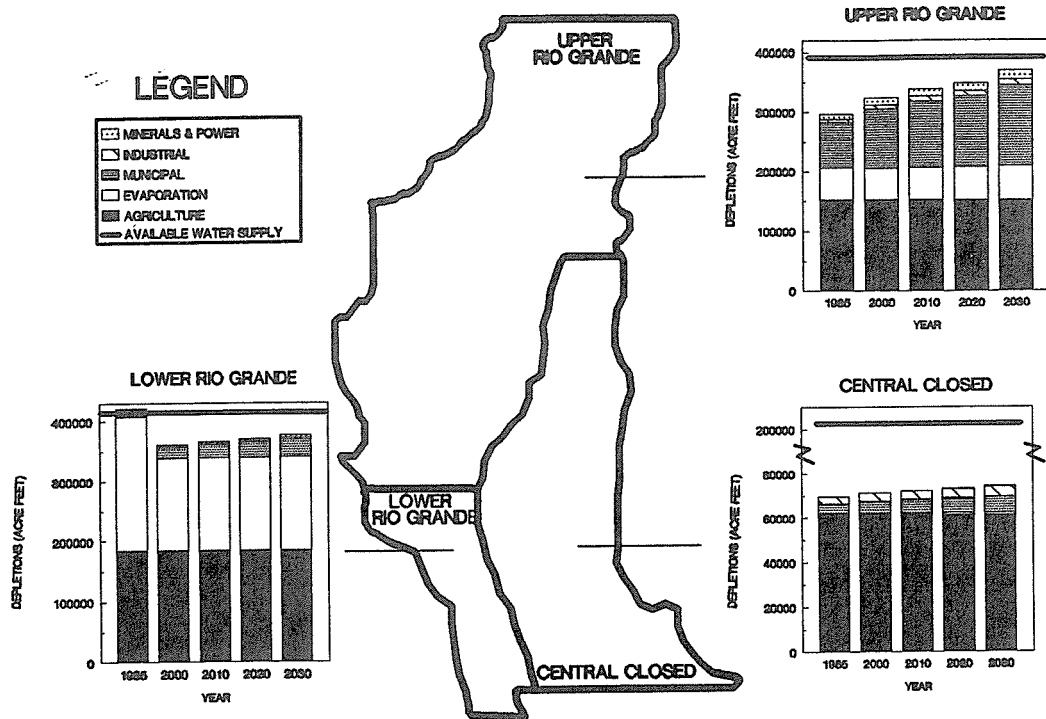


Figure 8. Water Depletion Projections for Lower Rio Grande, Upper Rio Grande, and Central Closed Basins, Potential Growth Projection, Scenario A

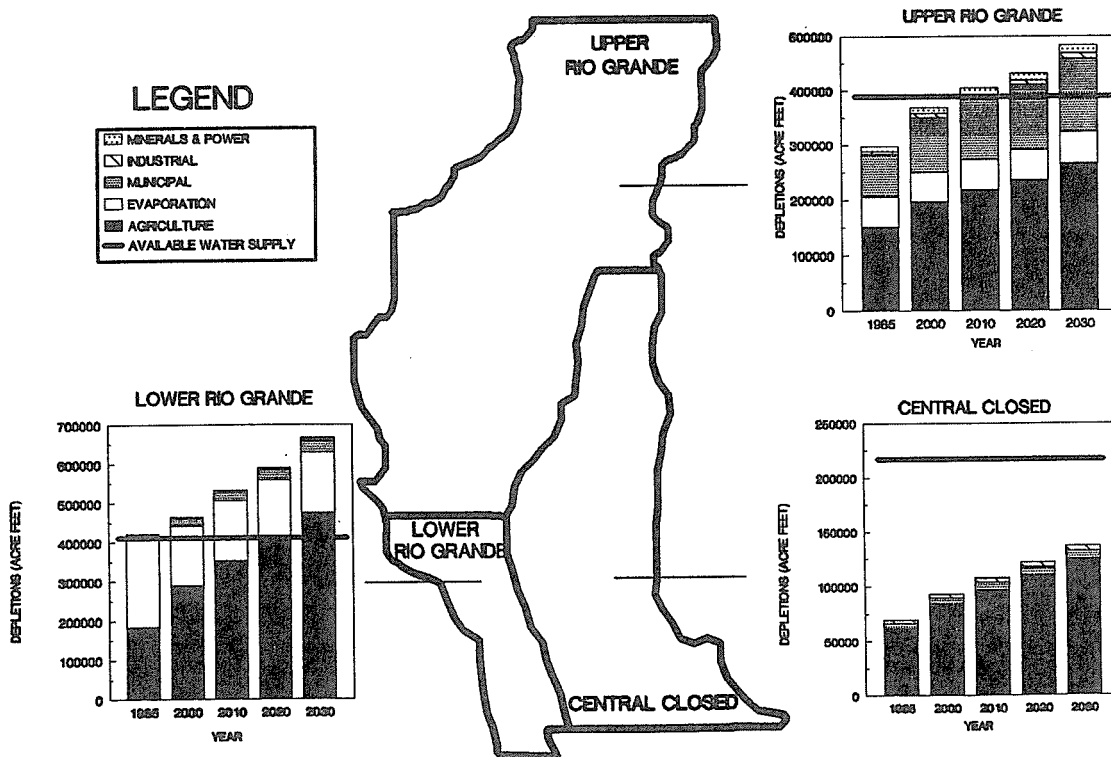


Figure 9. Water Depletion Projections for Lower Rio Grande, Upper Rio Grande, and Central Closed Basins, Potential Growth Projection, Scenario B

Projections for the Future

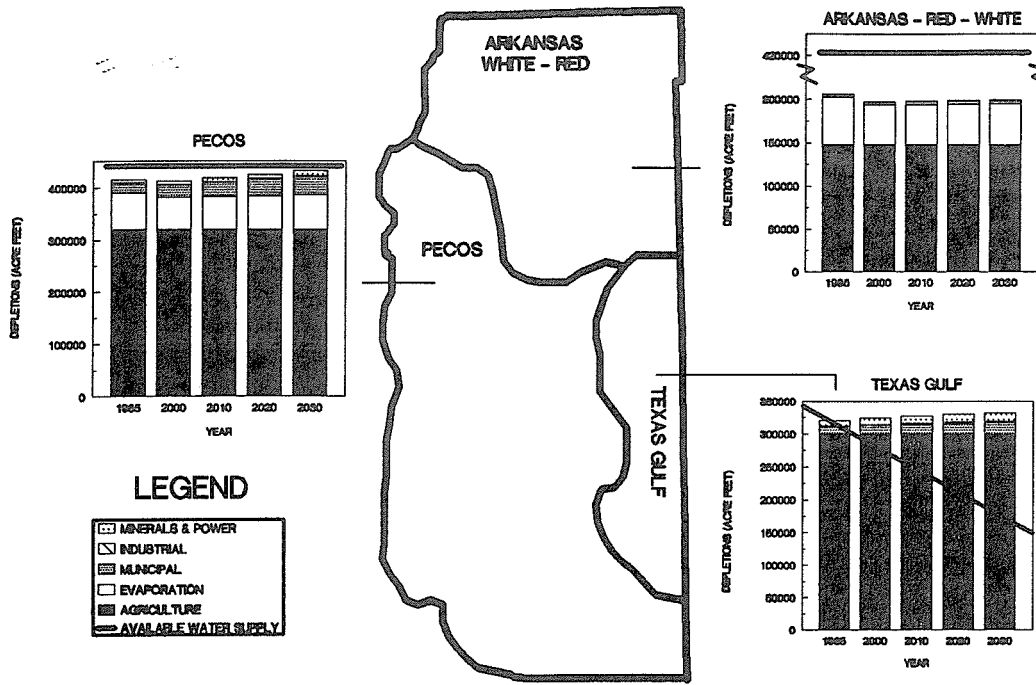


Figure 10. Water Depletion Projections for Pecos, Texas Gulf, and Arkansas-Red-White Basins, Potential Growth Projection, Scenario A

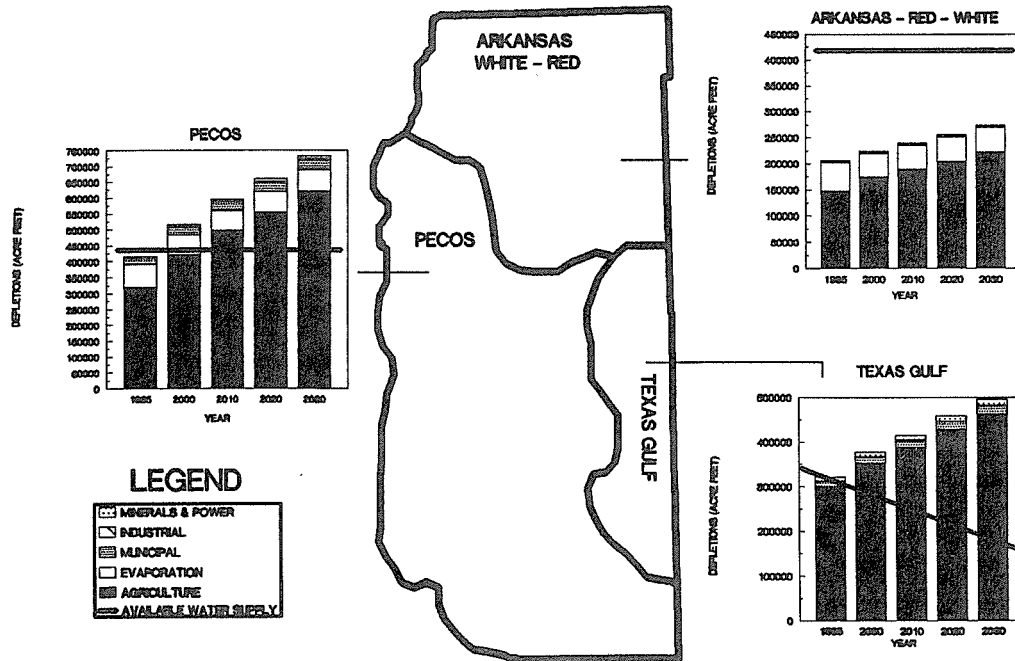


Figure 11. Water Depletion Projections for Pecos, Texas Gulf, and Arkansas-Red-White Basins, Potential Growth Projection, Scenario B

depletions, in the year 2000, were estimated to be 377,300 acre-feet, which is about 49,300 acre-feet above supplies (figure 11). Total depletions in 2030 will increase to nearly 500,000 acre-feet.

CONSERVATION

It is reasonable to expect that a 10 percent reduction in depletions could be brought about either through improved irrigation technology or increased consumer education. To determine the effects of such conservation efforts for each scenario, an estimate of the impact of a 10 percent reduction in depletions was used for each of the population projections and for each of the depletion categories except reservoir evaporation.

In general, the conservation factor had little effect on the depletion percentages of the water use categories. Agricultural depletions continued to rank first, followed by evaporation, municipal, minerals and power, and industrial.

Under Scenario A, where agricultural depletions are held constant, a 10 percent conservation had a corresponding effect on the supply. It was only when agricultural depletions were permitted to increase over time that conservation savings were more evident. In several basins including the Upper and Lower Rio Grande, conservation extended the supply by 10 years. However, 10 years was the maximum recorded for any basin.

IMPLICATIONS

Scenario A

New Mexico's water use outlook as projected to 2030 is promising if agricultural depletions do not increase and if water quality is not substantially decreased. If agricultural depletions remain constant over this period, all of the population projections predict that New Mexico's water depletions will not exceed the supply before 2030 (figure 12).

State depletions were estimated at 2.2 million acre-feet in 1985. Under the potential population projection, total depletions were estimated to increase to 2.3 million acre-feet in 2030. Under the conservative population projection, total depletions were estimated to be about the same as for the potential population projection at 2.3 million acre-feet in 2030. Under the optimistic population

projection, total depletions were estimated to increase to 2.4 million acre-feet in 2030, which is well below the water supply of 3.1 million in 2030.

An overall state water surplus can be misleading, since it is equally important as to where these surpluses occur in the state. For example, expected surpluses of water are located in the Upper Colorado, the Lower Colorado, the Southwest Closed, the Central Closed, and the Arkansas-Red-White basins. Most of these basins typically have low population growth expectations.

Figure 13 presents the expected time when water depletions will exceed supply by river basin and population projection for Scenario A. Under the potential population projection, only the Texas Gulf Basin is expected to have a deficit by the year 2030 (table 5). The Pecos and Upper Rio Grande basins are expected to have deficits by the year 2040 under the potential population projection. The rest of the basins will have sufficient supplies to carry them beyond the year 2060.

Under the conservative population projection, only the Texas Gulf Basin is expected to have a deficit by 2020 and the Upper Rio Grande by 2050 (figure 13). Under the optimistic population projection, depletions are expected to exceed supplies by 2030 in the Upper Rio Grande Basin, which is 10 years earlier than under the potential population projection and 20 years earlier than under the conservative population projection (table 5).

Scenario B

If New Mexico's depletions increase over time along the trends of the late 1970s, then water use will exceed the supply by 2030 under all of the population projections (figure 12). The total supply of water for depletions was estimated to be 3.2 million acre-feet in 1985 and then slowly decreases to 3.1 million, in 2030, because of ground water mining in the Texas Gulf Basin. The state's water depletions will exceed supply by 2030 under all of the scenarios: conservative by 2020, potential by 2020, and optimistic by 2010 (figure 14). Under the potential population projection, the Texas Gulf, Lower Rio Grande, and Pecos River basins are expected to have water deficits prior to the year 2000 (table 6). The Upper Colorado and the Upper Rio Grande are expected to have a water deficit between the years 2000 and 2030. The Southwest Closed Basin is expected to have a deficit by the year 2045. The rest of the basins (Lower Colorado,

Projections for the Future

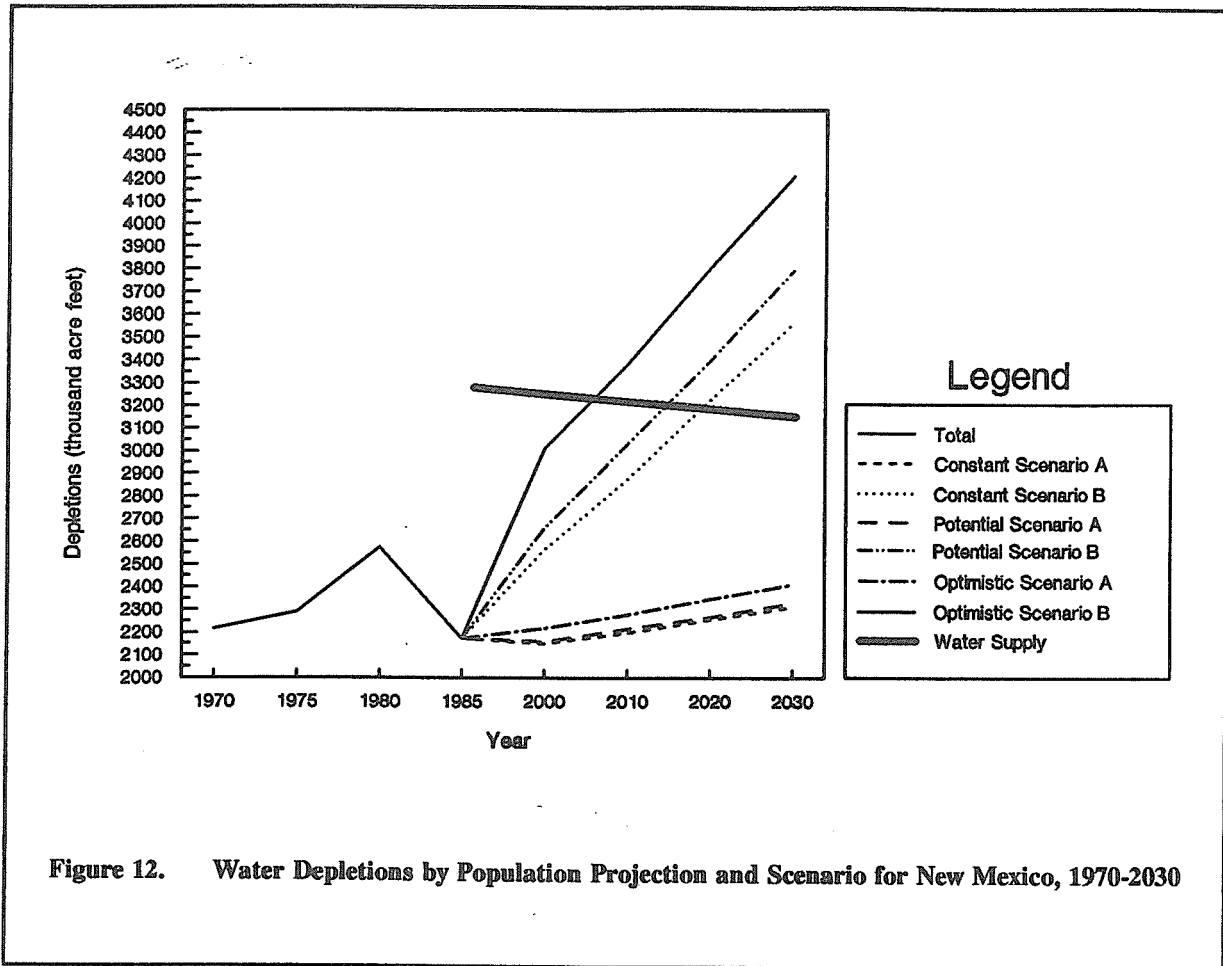


Figure 12. Water Depletions by Population Projection and Scenario for New Mexico, 1970-2030

Central Closed and ARW) will have sufficient supplies to carry them beyond the year 2060.

However, some basins will have surpluses into the 22nd century and beyond. For example, these surpluses of water are located in the Upper Colorado, the Lower Colorado, the Southwest Closed, the Central Closed, and the ARW basins. Most of these basins typically have low economic potential and thus, low population growth expectations.

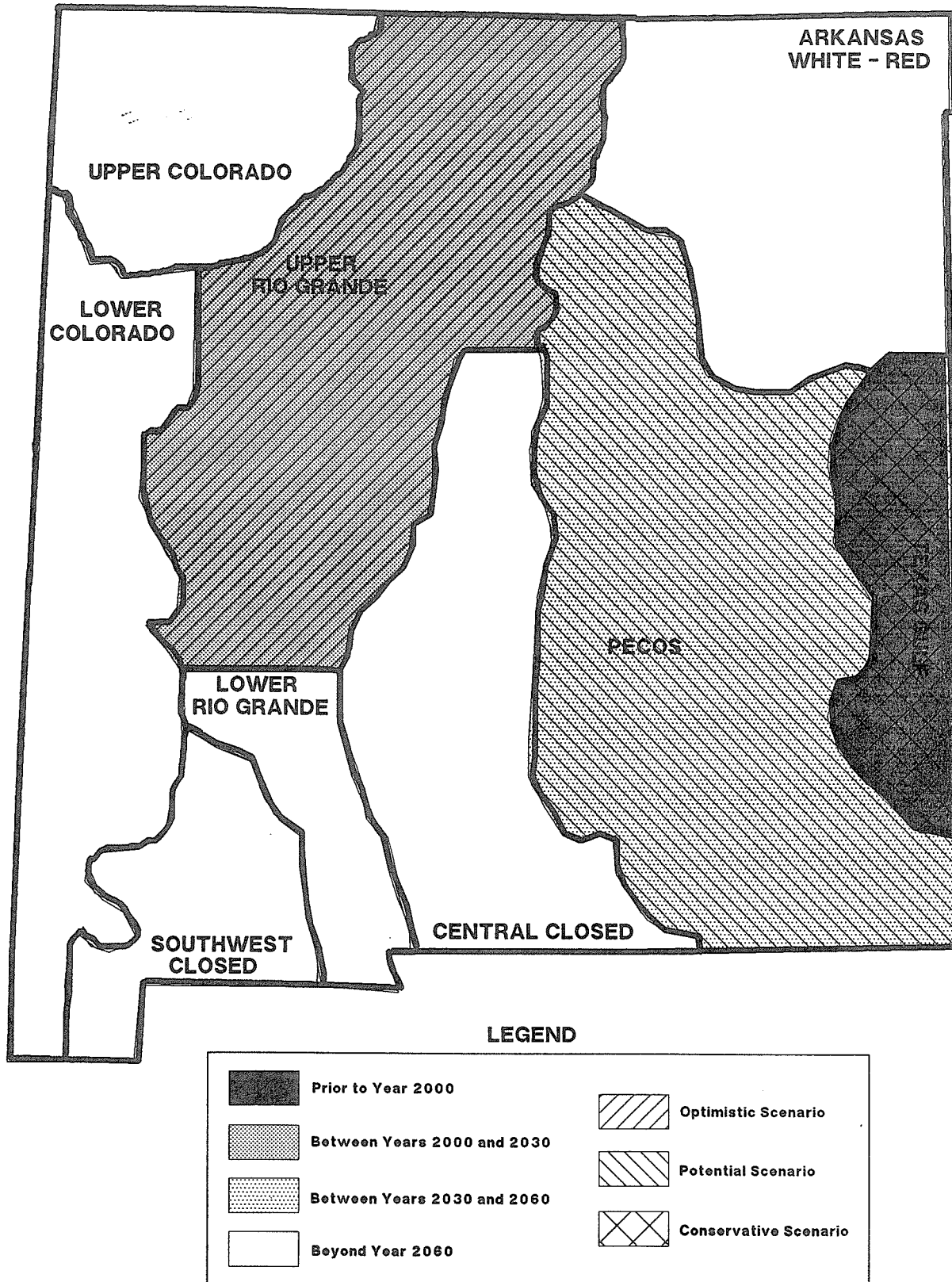


Figure 13. Year Water Depletions Exceed Water Supply by Population Projection and River Basin, Scenario A

Projections for the Future

Table 5. Year Water Depletions Exceed Water Supply by River Basin and Population Projection, Scenario A.

| River Basin | Population Projection | | |
|--------------------|-----------------------|--------------|------------|
| | Potential | Conservative | Optimistic |
| Upper Colorado | 2060+ | 2060+ | 2060+ |
| Lower Colorado | 2060+ | 2060+ | 2060+ |
| Southwest Closed | 2060+ | 2060+ | 2060+ |
| Upper Rio Grande | 2040 | 2050 | 2030 |
| Lower Rio Grande | 2060+ | 2060+ | 2060+ |
| Central Closed | 2060+ | 2060+ | 2060+ |
| Pecos | 2040 | 2060+ | 2040 |
| Arkansas-Red-White | 2060+ | 2060+ | 2060+ |
| Texas Gulf | 1990 | 1990 | 1990 |

Table 6. Year Water Depletions Exceed Water Supply by River Basin and Population Projection, Scenario B.

| River Basin | Population Projection | | |
|--------------------|-----------------------|--------------|------------|
| | Potential | Conservative | Optimistic |
| Upper Colorado | 2025 | 2025 | 2025 |
| Lower Colorado | 2060+ | 2060+ | 2060 |
| Southwest Closed | 2045 | 2060 | 2040 |
| Upper Rio Grande | 2010 | 2010 | 2000 |
| Lower Rio Grande | 1995 | 1995 | 1990 |
| Central Closed | 2060+ | 2060+ | 2060+ |
| Pecos | 1990 | 1995 | 1990 |
| Arkansas-Red-White | 2060+ | 2060+ | 2060+ |
| Texas Gulf | 1990 | 1990 | 1990 |

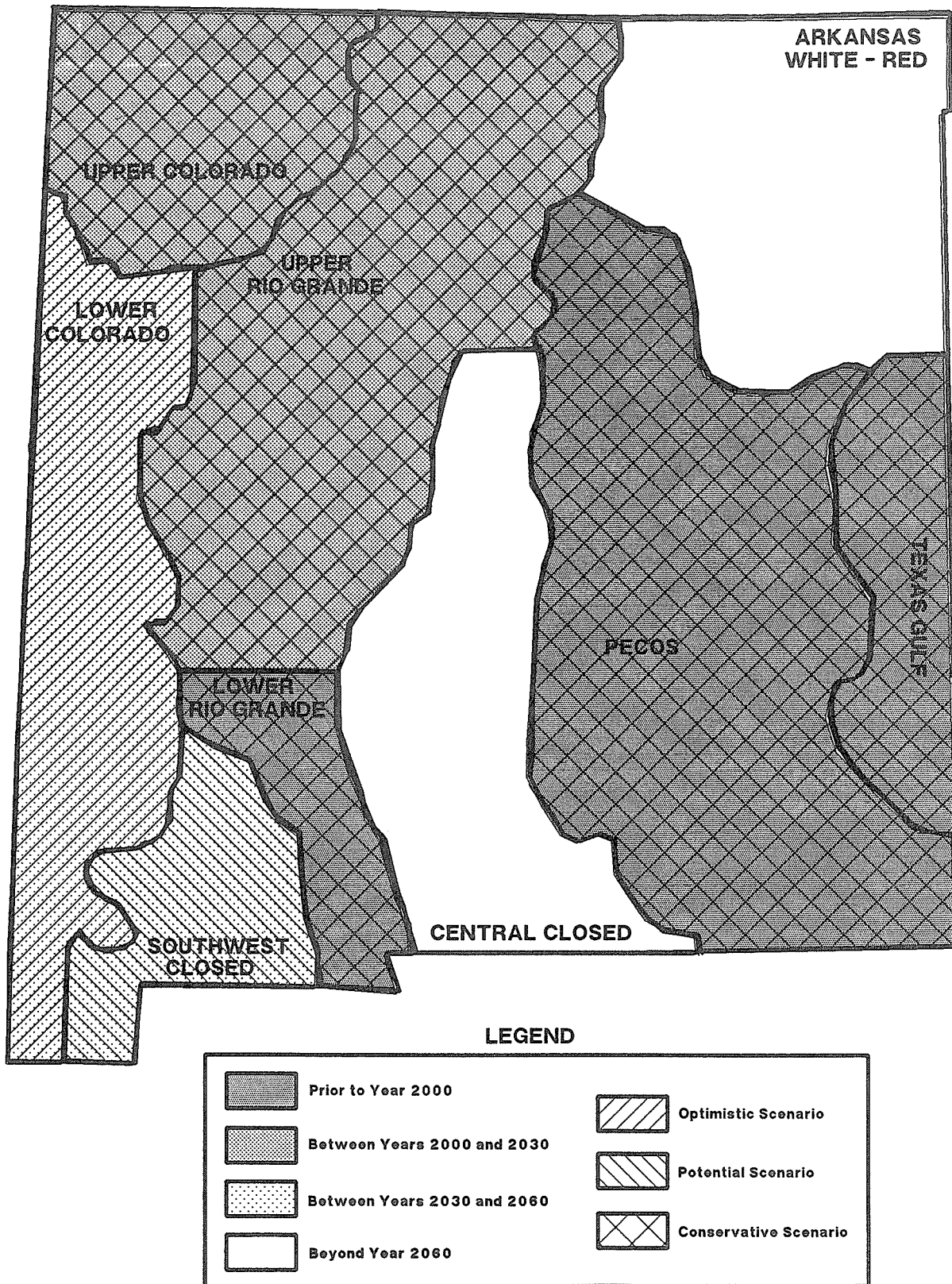


Figure 14. Year Water Depletions Exceed Water Supply by Population Projection and River Basin, Scenario B

Projections for the Future

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SPECIAL INTERESTS IN WATER PLANNING: A PANEL DISCUSSION

The Panel Discussion of the water conference provided a forum for questions and answers based upon written questions submitted by conference participants. Questions were to be considered starting points to a general discussion and would allow for audience interchange. The videotape of the discussion is available on loan from the New Mexico Water Resources Research Institute. The following has been transcribed and edited.

Panel Moderator:

Tom Bahr, Secretary, Energy, Minerals and Natural Resources Department and Director, Water Resources Research Institute

Panel Participants:

Herbert Becker, Assistant U.S. Attorney, Office of U.S. Attorney, Albuquerque

Tom Davis, Manager, Carlsbad Irrigation District

Vickie Gabin, Special Assistant Attorney General, New Mexico State Engineer Office

Maxine Goad, Water Resources Specialist, New Mexico Environmental Improvement Division

Wilfred Gutierrez, Commissioner, Chicos Ditch Commission, Acequia de Garcias

Cleve Matthews, Land Operations Manager, Sandia Peak Tram Company

James Mitchell, Director, Citizens' Equal Rights Alliance

Phillip Wallin, Director, River Network, Portland Oregon

DR. BAHR: We have a very well-rounded group of panelists here today. I know that some of the panelists have some prepared remarks while others do not. Let me start with some questions and there will be an adequate opportunity for panelists to

present prepared remarks if they would like. Questions will not be directed to any one individual; anyone can respond. Here's the first question.

Question 1:

There is a great need for a quick determination of whether or not and what type of water rights are attached to a parcel of property. This information is necessary for persons wanting to borrow money and who must indicate to the lender whether the property has "water rights." Appraisers also need this information to provide an accurate appraisal to the financial institution. Municipalities must advise would-be subdividers whether a parcel of property has water rights that are transferable to the municipality, or whether the subdivider would have to purchase transferable water rights.

That's a two-problem question relating to quick turnaround time and getting meaningful information about water rights.

MR. BECKER: As part of the process here, I need to give the normal disclaimer. I'm Herb Becker with the U.S. Attorney's Office. The comments you are going to get from me are not necessarily those of the U.S. Attorney's Office or the Department of Justice, for whom I work. I will take the first stab at answering this question because I think some things are missing from it. There exists a great need for a quick determination of water rights. Mr. Steve Reynolds, state engineer, would agree with me, I think, that we are not going to have quick determination of water rights as long as the major water rights player is missing from this conference. And that player, of course, is the various Indian tribes in the state who, in a few years, are going to be the possessors of the largest block of water rights in the state. They have to be involved in any future planning. From a water quality standpoint, tribes must be involved because under the Clean Water Act, they are equivalent to a state for administrative purposes. Tribes have the same broad power to control water resources on the reservations as the state does outside of the Indian reservations.

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The question talks about "quick." We've just finished litigating a portion of the Hondo case and part of the Pecos case on behalf of the Mescalero tribe. That case initially was filed in 1956. So if 32 years is any indication of quickness, you're not going to have a quick resolution of any water rights if you go to court. There have to be other mechanisms developed outside the courts that allow for quick determination of water rights.

We have not seen the state forthcoming in any cooperative manner, willing to recognize that Indians are human beings, that they have a need for water now and in the future. The Attorney General's Office constantly litigates with the state and I think it's been very acrimonious litigation at times. That results in hardening of positions by everyone; and as a result, we do not have quick or orderly determination of water rights.

MR. MITCHELL: If the Aamodt case is any indication, I have to agree with Mr. Becker 100 percent, which means we need to do something differently than to get the federal government involved in our water rights. I would like to pick up on John Folk-Williamses' ideas about working from the bottom up in our planning process. It's too bad that we allowed the federal Justice Department to step in and dictate how we should settle our water rights problems.

If we had made up our minds 25 years ago in the case of the Aamodt water lawsuit, we would probably have a decision by now. What I would like to see us do is quit beating around the bushes and really talk about fairness and justice for all citizens in this state, not just our Indian citizens. If we had been allowed to meet and develop a planning process with our Indian people on the basis of sharing water equally with fairness to all, we wouldn't be having litigation costing the taxpayers of the state of New Mexico enormously and years of trying to negotiate settlements.

MR. GUTIERREZ: I'm going to tell you about my title as "Doctor of the Acequias." Last night about four people asked me, "How come we don't have any speakers on this program to address the issues of the northern part of the state, after all, the title of this conference is planning from the bottom up." This morning I questioned why. I said that I had told those people last night that essentially all the speakers here have a long list of degrees. I told Tom Bahr that I feel that I have a degree from the Hard Knocks University of Velarde. That's why he gave me the title of Doctor.

To address the question, for years I've been hearing all these amounts of water that we have in the state in the different areas, and yet I have not seen a real comprehensive report on this water. I remember when I was in high school, back in the 1950s, hearing that there was a tremendous amount of water in an area called the Ogallala aquifer, and it would never be exhausted. There was no way that this aquifer was going to be exhausted. A few years ago, we started seeing different theories on this aquifer, that it was being mined and it was becoming too expensive for the farmers. As you well know, at least, I hope most of you know, how expensive it is for a farming enterprise, and how the small farmer has to spend a tremendous amount of money farming.

What does this do to the people who have invested their lives, their earnings and the future of their kids, and then all of a sudden, we don't have any water? Or, as the El Paso case comes into mind, where other states are going to be wanting our water, it'll be transferred out. I think it's unfair, and I agree with this gentleman here. I've lived with Indians, gone to school with Indians, I have very good Indian friends, but I think we have to equalize this some way. I was instrumental in convincing the senator to give us approximately \$465,000 for the Aamodt case. I should be ashamed to admit that I had any say-so because as soon as the attorneys saw the money, it became nothing but a ripoff. I think we have to develop a different system to find out who has what.

MS. GABIN: Herb Becker has been a very active litigant on behalf of the Indian tribes and pueblos. I don't want to respond to everything he said, except to say the process takes too long. I think we can talk about streamlining the process of litigating water rights. But I don't think anybody can point at the state and say that we, as a policy matter, won't negotiate, and we cause deliberate delay. We certainly are interested in getting water rights settled. I know it's been discussed that maybe we ought to have some kind of statutory provision like they have in Montana, where, roughly speaking, you sit down around the table to negotiate before you even think about court. That's something I'd personally like to see, and as with Herb, I speak for myself, and not necessarily for the State Engineer Office.

But all these gentlemen are right. The process takes much too long, it's much too cumbersome. Lawyers don't need to be involved in the great majority of water rights determinations. However,

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lawyers are trained to litigate to the extent that Indian water rights are defined under federal law, and they have a right to do that. But I think it's getting to the point where it's all an adversarial process and it shouldn't be an adversarial process, in most cases. I think that when we talk about consensus, part of that consensus is the first step toward change in the perception of water rights adjudication.

I want to address what I think the sense of the question is. The question states that there is a great need for a quick determination of whether or not, and what type of water rights are attached to a parcel of property. I know that Herb came with a prepared statement on Indian rights, and some of these people here have an interest in that area. But this question asks how a person can find out what kind of water rights are attached to a piece of property. Why isn't there a quick way to find out? That is in the sphere of our office, the State Engineer Office. The reason why until now there has not been a quick determination of whether or not and what kinds of water rights are attached to a property is that the job is a very cumbersome and labor-intensive one. The State Engineer Office, for the last several years, has been in the process of putting all this information in a data base on a computer. Very soon we should have a way to call up that kind of information and get a state-of-the-art current readout on the nature of the water right for any property that has adjudicated water rights or permitted water rights in the state.

MR. BECKER: If I may, I'll respond to that briefly. I think there are several things that are very wrong with Vickie's statement. First is the fact that there are approximately 13 adjudications going on in this state involving almost all the systems, involving or brought by the state of New Mexico, except one.

The state of New Mexico made a conscious decision not to sit down with the tribes and dragged them into court along with the federal government. We know from the U.S. Supreme Court that even though the rights belong to the tribes, the tribes do not have to be involved in cases that adjudicate their rights. That obligation falls solely and squarely on the United States itself.

In a number of adjudications, the tribes have sought to and have intervened as a party. However, if they were not a party, it would not make any difference because their rights would still be determined in the process. That's the response to Mr. Mitchell. When the United States is involved, we represent some constitutional authority, the interest

of the United States, for the Indian tribes. We do not support one group or another as certain groups around the country would like us to do.

Secondly, with respect to the question, the people want to know that types of water rights are attached to particular pieces of property. There are no solid water rights attached to any property until you have a plan of adjudication under New Mexico state law. Therefore, until everybody's been given an opportunity to object, you don't have a water right. You have in one sense this, an agreement with the state to recognize, with a non-Indian water user, what their rights are.

When you make a request with the State Engineer Office, the state initially attempts, and I think, correctly, to determine what rights an individual has. The state tells that person, "Here is what we think your right is." If that person is satisfied with it, he signs off on it and goes home. If he's not, he comes and knocks on our door and tells us what he wants.

Therein lies the problem. In reviewing judgments or agreements between the state and non-Indian parties, the United States is seeing that the law is being followed fairly. Where it's not, we have an overriding obligation to see that the law is followed fairly. We will come in and file objections with the court, saying these grievances are wrong because there's no evidence to support it. That frustrates the entire process of determining in quick fashion a person's water rights. Under the bifurcated system the state follows, it takes years and years unnecessarily to arrive at that conclusion. Until the final judgment, people are not going to know what water rights attach to a parcel of property.

MR. DAVIS: Let me address this question in light of the Carlsbad Irrigation District. The position of the Carlsbad Irrigation District, and it's supported by the Bureau of Reclamation, is that we have definitely established water rights within the county and the Irrigation District, and these water rights are attached by acre basis to certain acreage within the district boundaries. This means people can obtain a very accurate determination of location of Carlsbad Irrigation District water rights.

We are contacted on a daily basis by financial institutions, appraisers, realtors, and title companies as to different tracts of ownership. They need to know what amount of irrigation district water rights are attached to those ownerships. We respond accordingly. I feel that there is a very quick response time and accurate information available to

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these entities by contacting Carlsbad Irrigation District.

MR. GUTIERREZ: I think I have a problem with the word "attached." To me, "attached" means that the water rights come with the land. If the water comes with the land, the water rights cannot be sold separately. But this is not true in the state of New Mexico. Water rights can be sold separately. This is one of the things that I don't like about our water law at the present time because it puts a burden on us if water rights are sold in an irrigation system. It adds to the cost of that delivery for the farmers in the state because the fewer the water users in a system, the more their respective share of the cost.

MS. GABIN: I don't know how many of you know how the water statutes in New Mexico work. The statutory process authorizes the Attorney General to bring a lawsuit to determine the water rights on a stream system and, granted, that has turned out not to be the most efficient thing to do. Although, the state of New Mexico brings that lawsuit, it doesn't have any stake in the suit itself. The state brings the action, sits back, not really a stakeholder, and watches the parties supposedly litigate these matters out. It's a statutory process that's been around for years and years and we are just now coming to see the consequences of what this kind of protracted litigation can bring. I'm not really satisfied that it's working well. I think it's up to a lot of people to start thinking about alternatives and talking to their legislators.

As far as the statutes go, the State Engineer is charged to follow the statutes. We bring these suits as a plaintiff and we adjudicate defendants' water rights out of the stream system. That's why the poor, hapless souls who are defendants seem to be in an inferior position in the lawsuit. They're defending themselves from the lawsuit where the state is the big guy with the big stick. I agree, it's an antiquated mechanism and not a very efficient one.

In some of the lawsuits, for efficiency's sake, we allow the United States to become a co-plaintiff, so you've got two big sticks on one side against non-federal, defendant water users. The defendants see this as an unfair situation. But it's to accomplish a very simple matter, to determine what claims people have to water which they've been beneficially using. Over the years, it's evolved into lawsuits with lawyers, and lots of time and money is spent. Here are the people, look around you, who are going to form

the next consensus, the next coalition of people who are going to adjudicate water rights.

DR. BAHR: Does anyone in the audience have a comment on this question?

AUDIENCE: I'm Gilbert Garcia, from Belen. I hope I'm better at managing water resources in Belen than I am at communicating. That was my question. I didn't have any question about federal courts or adjudication, or Indians. My question was a very simple one: several times a week a would-be subdivider shows up and says, "I might buy that parcel of property and I'd like to subdivide. Do you happen to know what kind of water rights are attached to it?" All I can do is shrug my shoulders. They are asking for guidance, and I can't really direct them. I tell them to call the State Engineer Office but they are not looking for adjudication or for a two-year wait. They want to know whether a parcel of property has community or separate water rights, no water rights, or none of the above.

Then secondly, from the standpoint of someone who's been charged with appraising property for banks for the purpose of making loans, and owner says, "Well, it has water rights". In the infamous words of Steve Reynolds, there's a difference between rights to water and water rights, and we all understand that. But water rights to John Q. Public doesn't mean the same thing that it does to people who take time to learn something about water rights.

We need to know what type of water rights and whether or not there are any water rights available for a particular parcel of property. We need a quick way to do it, and Vickie, I congratulate you, you hit the nail right on the head. If that data base is going to be available to municipalities, that's the answer right there. It'll be extremely important if the information can be obtained by plugging in metes and bounds.

AUDIENCE (STEVE REYNOLDS, STATE ENGINEER): I want to ad lib to Vickie's answer to the mayor pro tem's question. Certainly, we are trying to get a data base for water rights. It takes time and money. What you asked is available now, but it may take several days instead of several minutes.

We have a system where we'll certify what our files reflect with respect to a certain parcel regarding water rights. As I recall, we charge you about ten dollars, maybe five, for each five files we have to review. However, in giving that information, we don't warrant that parcel has a water right. We tell

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you what the file says. If the purchaser is a little nervous, he might want to hire a lawyer to look after what that file means, and he might want to hire an economist to see whether it's a good buy.

MR. MITCHELL: I just want to comment on Steve Reynold's statement. They'd probably already have a data base if they hadn't had to try to keep the U.S. Justice Department in line all these years.

MR. GUTIERREZ: May I ask a question of Mr. Reynolds? How does this apply to the Pecos case where there is some question as to whether or not New Mexico will compensate the state of Texas with money or water? If we must compensate with water, what good did it do people to know what water rights they had twenty or thirty years ago?

MR. REYNOLDS: On the Pecos, we're engaged in a basin-wide, from the headwaters to the state line, hydrographic survey and adjudication. Our answer cannot be final until the case is adjudicated. That's the problem with adjudication. We can't enforce priorities until we have all rights adjudicated in the same decree. We have several adjudications that we've done on the Pecos. But if, in fact, we have to pay off with water, the only way we can do it is through enforced priorities. To enforce priorities, the watermaster has to know the priority of each of the rights involved.

I might add to that, and to what Vickie said, concerning Herb's comment about the state not negotiating with the Indians. As a matter of fact, we must make the hydrographic survey, and sometimes we can't get on Indian lands to do that. But we do make the hydrographic survey, and about 90 percent of the time, individual water rights are settled on the basis of that hydrographic survey. Our people sit and talk with the owners and in some cases, the water right claimant says, "Well, this is wrong. This should be over here. Actually, I've got five acres instead of two." Our people go back into the field and check, and if the claimant is right, we reach agreement, sign off on the judgment, and that's the end with respect to that water user and the state. But everybody else, you see, has a chance to challenge what we have agreed to, as Mr. Becker has said.

Indians' water rights do not depend on state law, they depend on federal law. Therefore, you can't look at our files and tell what the Indian water rights might be. The theory of Indian rights is much different than those under state law.

AUDIENCE (DENNIS RAWSON, ROSWELL): Even though the water rights have been adjudicated and filed in the office of the State Engineer, you cannot rely on that information. The reason being that a farmer often sells his land and water rights and provides a warranty deed to the buyer. He files the deed with the County Clerk, and that's it. Unless he files a change of ownership with the State Engineer, the State Engineer's files have no way of reflecting that change. So it's a practical matter that whoever is advising in the sale should make sure the change of ownership is filed with the State Engineer or they're in trouble.

DR. BAHR: In other words, let the buyer beware. Let's move on and shift gears to water quality.

Question 2:

How should local planning procedures be structured to protect ground water quality and to prevent siting of polluting activities in sensitive recharge areas?

MS. GOAD: As you probably all know, potentially polluting industries are controlled under various state and federal laws. However, rules on siting, land use and special protection for vulnerable areas here in New Mexico is done on the local level. Counties and municipalities have the authority to control such matters; some counties and municipalities have exercised their authority and others have not.

I think the question is sort of narrow, it asks how the planning process can be structured. I want to broaden that a little bit and look at the things that ought to be looked at, not just vulnerable aquifers. A key fact is that prevention of ground water pollution is much more cost effective and technically feasible than cleanup after pollution has taken place. Planning should always stress prevention of problems and not count on later remediation.

Another thing I think is terribly important is that there be good communication among the various facets of the local government that's trying to lay out plans. We heard yesterday that the Portales planner didn't realize that the city sewage treatment plant was already at capacity. We have heard lately about planners in certain cities putting in a new city well while some other part of city government intends to put an industrial park adjacent to the new well. It is a local decision where landfills are put. Landfills have been put in extremely unsuitable places, either over vulnerable aquifers or near city wells. I think communication inside the local government,

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particularly in planning is terribly important. Obviously in many of these cases, one hand did not know what the other one was doing.

When officials sit down to make plans to protect their vulnerable aquifers, they first need information on where the aquifers are located. This is one of the things that Mr. Richard Perkins of the Environmental Improvement Division has been working on. Resources must be provided to local governments so they can determine where the vulnerable aquifers are, where the vulnerable areas around their city wellheads are, and then decide what to restrict in the vulnerable areas. Do they want to restrict facilities such as service stations, landfills, hazardous waste facilities or septic tanks?

MR. MATTHEWS: I represent two small patches of that quilt that John Folk-Williams spoke of yesterday, that of being a developer and also that of being an operator of a private water utility company. With respect to the utility company, we're not only concerned with quantity, but also with quality because of our responsibilities to our customers. As a developer, we also look for goals.

As far as how the government should be structured, there already exists a framework that was established by the New Mexico Subdivision Act. Most of the counties in New Mexico have or are working on a subdivision ordinance which includes zoning. By using these two ordinances, counties can limit or restrict the uses on known tracts of land that may have a vulnerable aquifer or have already had some type of contamination. Also, by the use of these ordinances, they can zone properly based on future uses and know what wastes could be generated from these types of zoning once they are developed.

I'm most familiar with Bernalillo County where they have arrived at a consensus-building procedure with the private and public sectors. Recently the county passed a liquid waste ordinance on septic tanks. The ordinance is more restrictive in the acreage required for use of septic tanks and is based on several factors such as water table, slope, and percolation rate of the soil. By passing this ordinance, the county has instituted some control regarding water quality. They also recently established a technical advisory committee jointly with the city of Albuquerque and Bernalillo County to come up with a plan for water quality for both the municipality and the county. A year ago, the county established a water standards ordinance for private utilities in Bernalillo County. The standards stipulate what utilities have to do to protect well water

and ground water, and how those systems are to be constructed.

The framework is there, I think. If forums such as this conference are an awakening process for state and local governments, it should be clear that planning needs to come from the bottom up. There's no question about it, that's the only way it's going to work. That's where the impact is. I think the days of the developer coming in and raping the land and walking away are gone. There's an obligation now and the local governments are more attuned to that obligation. Local governments can require the developer to consider water quality in their planning process. In Bernalillo County now, to go through the development process, it takes almost a year before you can turn that first shovel of dirt. County commissioners are going to have to bite the bullet and enforce the authorizing statutory responsibility act.

MR. MITCHELL: The planning process will be completely stymied until the American public, citizens of this state, decide to consider deeper issues involving federal authority. That doesn't mean that I'm against the Indian people. We have to understand that there are other people out here, as well as Indians. Somehow we have to establish a dialogue that will allow us to plan. I suppose most people don't realize that the tribes have the authority, although many of them have not done so, to zone within their reservations and areas, and stymie any regional planning for pollution and environmental controls, or whatever. Somehow or another, we've got to solve this from a political standpoint. We've got to have some equity and allow the county and the state governments to operate without interference from the federal government and the tribe themselves.

MR. BECKER: I'd like to follow up on Cleve Matthews's point. Section 506 of the 1987 Clean Water Act requires that Indian tribes be treated as states. That's the federal law. I assume, at least since the Civil War, people know that the federal law is supreme. The Clean Water Act permits the Environmental Protection Agency to issue regulations. In Bernalillo County, and other municipalities along the Rio Grande where pueblos are located, Indians have the statutory authority from the water act to issue their own standards. The Indians get together with the state to determine if they can arrive at consistent standards for sewage plants and other water quality problems that may be based on a common stream.

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Tribes are empowered by this act to have their own regulations and rightfully so. The state, of course, has their own authority. The thing that has to be kept in mind is that the tribes were here long before the Europeans came. They have their own independent authority, which has been reaffirmed repeatedly by United States Congress and United States Supreme Court. What you see now is more and more federal legislation in recognition of that authority. Included within all acts are provisions for Indian tribes to exercise that authority. There are also provisions for regulations to be issued so that the tribes and states can work out their differences in a friendly manner so agreements are in the best interest of the tribe and the state.

In Bernalillo County, as Cleve Matthews mentioned, the planning process is the first step. Because the county has Isleta Pueblo to the south and Sandia Pueblo to the north, the county has legitimate concerns about water quality. The Indians have to be brought into the process. By the Water Quality Act, the mechanism is in place for this search for equality. Indian tribes really should have been part of this conference.

DR. BAHR: The next question is a fairly simple question, and it deals with acequias. It's a question, really, from the acequias to the State Engineer.

Question 3:

Why does the State Engineer Office require acequia bylaws to meet current state statutes in order to receive financial assistance? These requirements often force the acequia to change their bylaws and traditional operation of the ditch. Wouldn't a signed affidavit by the acequia indicating their existence as a community ditch suffice?

MR. REYNOLDS: This is a current issue. The legislature authorized the State Engineer to make grants and the Interstate Stream Commission to make loans to community ditches. That authorization is legal only if the community ditch is a political subdivision as per a statute enacted in 1965. That statute was enacted to make the ditches eligible for grants and loans from state funds.

If the State Engineer has that responsibility, he needs to be sure the community ditch is a political subdivision. If the community ditches' bylaws do not conform to the state statute, then we can only presume that they are not a political subdivision. The State Engineer then becomes liable for unlaw-

ful grants and loans. This is a very important concern when we invest the \$53 million Corps of Engineers funds for the ditch rehabilitation program.

For that reason, we have recently been just a little more meticulous about ensuring that the ditch commission really believes it is a political subdivision by adopting bylaws in conformance with the statute. It's possible to read many statutes differently. I must, of course, rely on the interpretation of the statutes given to me by my attorney.

DR. BAHR:

Question 4:

Adam Smith, in The Wealth of Nations, said, in effect, that "hardly anything is more useful than water, but it will buy scarce anything; however, a diamond is useful for very little, but will buy a great many things." Has society, or is it now seeing the reversal of this idea? If not, when will water be as valuable as a diamond?

MR. WALLIN: I think it was former Governor Lamm of Colorado who said something like, "In the West we talk about water as being precious and in fact we treat it as if it were useless, as if it had no value, as if it were a free good like air." What we're realizing is we can't afford to treat water as if it were unlimited, and we are seeing that water resources planning has got to be a matter of using water more than once, maintaining its quality so that we can use it more than once, and of allocating water according to its highest use in the public interest.

I have been hanging my hat in Oregon lately, and there's a neat statute that was passed in 1987 by the Oregon legislature that I think is kind of a model. We'll let them make all the mistakes and iron out all the bugs, and then we'll look at it as a model. The statute enables a farmer to adopt conservation measures, whether it's for a delivery system or irrigation system, and to document that those measures actually conserve water. The farmer then has a severable right to that conserved water, which, of course, is difficult to measure, as Steve Reynolds would tell us quite readily. The farmer is allowed to market 75 percent of that conserved water to another user, as long as 25 percent of that conserved water is dedicated to instream flow on behalf of the public.

What that means is, number one, there's an incentive to conserve, to treat water as a diamond. It actually has a value because it can be severed and marketed. Number two, it frees up water for other

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uses; water that might otherwise result in some of the waterlogging problems that agriculture has had in the Middle Rio Grande District, for example. Water is freed for municipal and industrial uses or for instream recreational wildlife uses. This is kind of a reworking of traditional water laws to give water a value, to give people an incentive to conserve, and to make sure that water gets allocated by the system to the highest-value uses. That's one example we ought to look at.

MR. MITCHELL: I'm a *pro-se* water defendant. I'm doing all of this on my own. Nobody's paying my salary to be here. Water, to me, is valuable. That's why I'm in this. It's worth more than diamonds to me.

MR. GUTIERREZ: Steve Reynolds and I have been on the opposite sides of the fence on many issues. In the worst, I consider him as a good friend. I consider him the "godfather of water in New Mexico." Of course, he knows that sometimes we refuse his deals. I have made the comment to him, "not with diamonds, or with a gold mine." I still hold true to that. If I had a gold mine someplace in New Mexico and I didn't have the water to drink so that I could work the gold mine, that gold mine would be worthless. I'd rather have a glass of water on my table than a diamond ring.

MR. REYNOLDS: In New Mexico, beneficial use is the basis, the measure and the limit of the right to use water. If there is a wasteful practice, we need to terminate it. That practice certainly should have no right to continue. Now, if you follow that Oregon statute far enough, you can get in a lot of trouble. We have gone this far in that direction. We've allowed an irrigator who wants to change his cropping pattern to extend his acreage with a reduced duty of water per acre, which goes a short ways in accordance with the change proposed.

MR. WALLIN: I think it's fair to predict that a statute prohibiting wastage of water in agriculture is not going to be enforced. We'd have to put everything else on a back burner, including all adjudications. We'd have to do nothing but enforce the non-wastage statute. I don't think that's going to happen.

Seems to me that in lieu of that, it would make some sense to let the market encourage more cost-efficient uses of water in agriculture. What Oregon's trying to do is just that, to create a market incentive for people to conserve water on the theory that the only thing that's going to enable a farmer to invest

in water conservation is his ability to recover that cost through the marketing of water.

Secondly, it seems to me that one of the biggest water concerns we're going to face down the road is the transfer of water from agriculture to municipal use. As Albuquerque outstrips the San Juan Chama project, which it will do someday, it is going to be in the market to buy water rights from agriculture. The laws are going to facilitate that one way or another. It's just going to happen. That being the case, it seems to me that we need to establish a system whereby Albuquerque can in fact buy agricultural water rights without disrupting agricultural communities, without retiring farmland and turning green fields into sagebrush. We need to learn from Phoenix. We need to start preparing for the future now. Albuquerque is already in the market and it's going to be more so as time goes on. Albuquerque needs to be able to buy conserved water. It needs to be in a cooperative effort with farmers so that it's not putting farmers out of farming. Albuquerque also doesn't want to be owning fallow lands all over New Mexico.

The system with which Oregon is experimenting is a way to do that; it's a way for agriculture and Albuquerque to be in a cooperative posture. Albuquerque essentially needs to be investing in water conservation in northern farmland or in the Middle Rio Grande Conservancy District as a means of freeing up water for municipal use.

DR. BAHR: I appreciate what Phil says and I'll be very interested to see how Oregon comes along with that particular statute. In New Mexico, I think we need to look at the type of irrigation that's going on in terms of conserved water. In the High Plains, you're using ground water, you're not using surface water. When you conserve water, you basically pump less. I've heard it said over and over again, and I believe it. The most powerful incentive to water conservation is the cost of that water. As you increase the pumping depth, your energy costs are going to go up. Most of the people in the High Plains who I've talked with say, "We're going to run out of money before we run out of water." It's a powerful economic incentive, at least in the ground water pumping areas, which is different from surface water diversion. Surface water goes downhill by gravity, and, as Steve Reynolds says, goes uphill to money.

MR. BECKER: The Supreme Court did everybody a favor in the Sporhase decision when they basically determined that water mining was an agreed-upon

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commerce. In the long term, that is going to dry up the wasteful water practices. You're not going to see wasteful practices eliminated through any other mechanism, I think, other than it being more economical for people to save water.

AUDIENCE (unidentified): One other thing needs to be considered within your premise that the cost is going to cause the farmers to conserve water. We're going to have to stop propping the farmer up with government subsidies paid for by the taxpayer.

AUDIENCE: I'm David Foote from Arch-Hurley Conservancy District. I think the last four questions have illustrated one thing. The main thing we need is education. Everybody needs to be educated more. We mention one question and we get 15 different opinions about the answer. They're all good answers, but none of them actually address the question. In Santa Fe, water usage was very low and the cost high. If we can drive the cost of water up, we can do a lot of things.

DR. BAHR: Here's an interesting question that deals with regional water plans.

Question 5:

Will individual regional water plans be coordinated under an overall plan (e.g., by basin or major aquifer)? Or will areas which produce plans first be able to have an advantage over those without plans? It seems like a piecemeal approach.

MR. WALLIN: Tom Bahr, I'm going to impose on you. I came here with a statement, and this is as good a place as any. This question seems to be the most closely related to my statement.

I was delighted to learn of the action taken last week by the New Mexico congressional delegation in designating the Rio Chama Wild and Scenic River. This action affirms our pride in the magnificent landscape of New Mexico, and our determination to preserve it for our children. To put that in perspective, I might add that Congress in the same week designated 41 new Wild and Scenic Rivers in the state of Oregon.

It's good to see water resources planning become a priority in New Mexico. Two years ago, the United States Senate conducted a hearing here in Santa Fe on the bill to protect the Rio Chama. At that hearing it became clear that there had been no comprehensive planning for water resources in the Rio Grande basin.

Now that "water planning" is being proposed, we need to ask: "Planning by whom? and Planning for what?" In the case of New Mexico today, planning appears to be motivated by the ground water claims of the city of El Paso. Planning is intended to support our claim that we need every drop of unappropriated water for our own consumptive use.

But planning for water resources needs to be more than an inventory of demands for consumptive use. It needs to consider the broad public interest: what patterns of water use and stream flow will be most conducive to the long-term quality of life and livelihood for New Mexicans?

It has become very clear that recreation and tourism are vital to the public interest in New Mexico, and the water in our streams and our lakes and reservoirs is vital to recreation and tourism. Tourism is New Mexico's biggest growth industry. Our unspoiled mountains and streams, and the fishing, boating and hiking they provide, give us a natural advantage over other states.

As New Mexico becomes more urban, and tourism continues to grow, there will be more demand for river-related recreation. This means there will be a growing demand for flowing water in our streams in the late summer and early fall. It's going to require careful planning and management to provide water for recreation in the right quantities, at the right times, but it can be done.

The Rio Chama, below El Vado Dam, is a perfect example of a stream that should be managed consistently for wildlife and recreation as well as for consumptive uses. There is an outstanding opportunity for water managers to schedule water deliveries from Heron and El Vado Dams to provide flows for weekend river boating throughout the late summer. That opportunity has still not been taken because, I maintain, the state and federal agencies that manage the Rio Chama and Rio Grande do not consider river recreation an important use of water.

Another outstanding example: The Rio Grande Wild and Scenic River, between the Colorado border and the village of Pilar, has developed into one of the foremost boating rivers in the western United States, with segments that are wilderness, segments that have easy access, and segments that are wild whitewater. The Rio Grande Wild and Scenic River has become a playground for Albuquerque, Santa Fe, and many of the tourists who visit New Mexico. A small but steady commercial rafting business has developed on the upper Rio Grande, generating \$1.5 million in gross revenues in 1987.

In 1988, the water disappeared from the Rio Grande, and so did the boating. In June, at the

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same moment that flows above Alamosa exceeded 3,000 cubic feet per second (cfs), the flow across the Colorado, New Mexico state line was less than 200 cfs. In one sense, that was the result of a spill at Elephant Butte Dam and the cancellation of Colorado's debt to New Mexico on the Rio Grande. In another sense, it was the result of the prevailing attitude among water managers, that it is foolish and wasteful to allow water to escape across a state line, except under legal compulsion.

If recreation and tourism were important to water managers in New Mexico, serious attention would be paid to summer flows in the Rio Grande Wild and Scenic River. Managers would use some creativity. For example, could the Closed Basin Project of the Bureau of Reclamation supplement low flows in July? Or if ground water is going to be pumped from beneath the Baca Grande in the Closed basin, could it be exported to municipalities in the middle and lower Rio Grande Basin, so as to make up for depletion of Rio Grande flows by farming in the San Luis Valley?

These are questions, not answers. There is a need for planning and management to provide reliable flows for recreation and wildlife. Before that planning can occur, however, the agencies that manage water in New Mexico will have to decide that recreation and wildlife are valuable uses of water. And someone will have to provide leadership.

The governor and the legislature need to help by reforming our water laws to encourage instream flows for recreation and wildlife. New Mexico is now the only western state that fails to recognize the validity of water rights held for instream flow. That needs to be changed. Beyond that, the legislature might consider the example of Oregon, which has created a way for farmers to make money by conserving water and leaving it in the stream. Under a 1987 statute, if a farmer adopts conservation measures that free up a certain amount of irrigation water, the farmer can sell or lease 75 percent of that conserved water to another user, so long as 25 percent is dedicated to the public as instream flow. This creates a financial incentive for a farmer to conserve water. It frees up water for other uses and for instream flow, without removing agricultural land from production. Applying that model to New Mexico, farmers in the Rio Grande basin could conserve water by lining acequias and sell that conserved water to Albuquerque, without taking any fields out of production. To put it another way, Albuquerque could obtain water rights

for the future by financing water conservation measures for farmers.

This is the kind of creativity that could weave together the interests of farmers, cities, recreation and wildlife. It will require enlightened political leadership to reform our water laws to encourage conservation and provide the flows that are needed for recreation and wildlife.

I would argue that a first essential element of water resource planning is to recognize river segments that are outstanding for their natural and recreational values. These are streams whose highest and best use is to remain as they are, to provide life corridors for wildlife and to enrich the lives and spirits of those who float, fish, hike and hunt along them.

Last week, the Rio Chama between El Vado and Abiquiu Reservoir was designated as a National Wild and Scenic River. Planners now know that it is "off limits" for dams, diversions, or other development. They can take that fact as a "given" in their planning, much as Abiquiu Dam and El Vado Dam are "givens." Those dams and the Wild and Scenic River are permanent parts of the landscape that we can all rely upon, and our planners can plan around them.

In the Pacific Northwest, there is a planning body called the Northwest Power Planning Council, with representatives from four states. This year, after a round of public hearings, the Council identified 44,000 miles of streams in the Pacific Northwest as "Protected Areas" that are "off limits" for hydropower development. The objective of this program is to guide hydropower planners and developers away from streams that have high value for fish and wildlife.

It seems to me some kind of assessment and recognition of our finest, most scenic and natural rivers is an essential first step for water resource planning. We need to take a comprehensive look at New Mexico's streams and identify those which have outstanding value in their free-flowing state. These would include certain segments of the Gila, the San Francisco, the Canadian, the Pecos, the Jemez, Costilla Creek, the Mora, the Embudo and others. Some should receive protection as federal Wild and Scenic Rivers, to protect them from development by federal agencies. Others should be included in a state scenic rivers system, to give notice to state and local agencies that these are streams with special value for all New Mexicans.

For water resources planning to work, it has to be more than a weapon against El Paso. It has to be more than a list of projects for storing and

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diverting more water for more consumptive use, which is the traditional approach. It needs to begin with recognition of streams that are precious to our people in their present state, that should not be dammed, channelized or dewatered. And it needs to propose creative changes in our outmoded system of water laws and management to make better use of the water supplies we already have.

DR. BAHR: Phil, thank you. Unfortunately, I'm a moderator and not a panelist. I would like to have followed up on a few of those comments. Let me simply make one comment here. The Rio Grande, in the region that's wild and scenic, is indeed a very precious resource. I think there is an expectation, however, that in view of the fact that it's wild and scenic, that there has to be a natural flow. What you really have is a very regulated system enforced by federal law in the Rio Grande Compact. I know that the Rio Grande Compact Commissioner, Jerry Danielson, from Colorado, is not here. Perhaps Steve Reynolds could give us an idea or address an idea of where Mr. Danielson might come from in terms of allowing additional water to come into New Mexico if he doesn't have to.

MR. REYNOLDS: He would simply say that Colorado cannot, under the law, allow water to be bypassed in a drought year. New Mexico cannot force Colorado to release water. That would take an amendment to the Rio Grande Compact which could be very dangerous. You might start out to do one thing but you never know how it's going to come out. I don't think anybody really wants to renegotiate the Rio Grande Compact.

MR. GUTIERREZ: I want to make a comment at this time concerning the statistic that farmers use 85 percent of the water in New Mexico. I believe that we should provide for all citizens of New Mexico but one thing has not come up during this conference. I'm referring to food production in the United States. As we look around the country, every state is losing valuable agricultural land to industrial, commercial, and housing developments. We also have not addressed the issue of the ozone layer; many scientists are worried about it and think it will change climate patterns in some of the areas where our food is grown. We saw the drought in the Midwest this summer and we've talked about the expense of mining water.

Yet here in this area of New Mexico, where we have gravity flow, where we could keep the cost of

food down, we have no comprehensive study of how to keep agricultural lands in production. We should keep the greenbelt areas for food production that we might need later, especially small farms in the northern part of the state. I'm concerned about the poor people, not those who can afford to pay a dollar an apple for Washington apples while they can get them from me for 15 cents. I'm talking about the poor people who are having trouble right now putting food on their table. What will it be like 20 or 30 years from now if we do not plan on keeping these agricultural lands as they are? I think farmers have become the whipping boy. If we looked at where a lot of that agricultural water goes, it goes back to you people as consumers of the food products you buy. It's not the farmer who is wasting water. It's coming back to you the consumer.

MR. MITCHELL: One of the things I have a grave concern about is the fact that we keep allocating more and more water. I don't propose to understand it, but we are obligated under federal law to live by the Rio Grande Compact. Speaking of farming, we're trying to make commercial farmers out of the Indian tribes. What's going to happen to the farmers who are currently using water given expanded Indian water rights? I'd like somebody to fill me in.

The Indians have proposed to build a commercial farm involving the most wasteful method of distribution of water that I know of; a sprinkling system. The system involves twelve thousand acres and roughly 48,000 acre-feet of water. If we're fully appropriated, doesn't expanded Indian water rights mean that to fulfill the obligations of the Rio Grande Compact, current New Mexico farmers will lose their rights?

DR. BAHR: Steve Reynolds told me one time that water is a very complex issue, and for every complex water problem there's a simple answer and it's wrong.

MR. REYNOLDS: If you are fully appropriated and your water committed, and the courts allow the Indians to develop additional water, somebody has to give up water. But you mustn't get the idea that Indian water rights are unavailable in the marketplace. This is a big concern in the Animas-La Plata project. The Indians' right to sell water for use off the reservation was the big issue. The Jicarillas are negotiating with the Interior and Justice Departments for a large part of New Mexico's share of the San Juan River flow with the right to lease or sell it

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for use off the reservation. If in fact the courts adjudicate to the Indians, amounts of water like Herb Becker claims for them, it sure better be available for sale, or the rest of us won't have anything to irrigate with or drink.

MR. BECKER: I think it's interesting that the Indian tribes are singled out here as some kind of culprit. I think that history shows that the culprit sits over in the State Engineer Office in Western states, by and large.

The reason for that is rather simple. In 1908, the U.S. Supreme Court told all the states, in the Winters case, that Indians are people and entitled to water. Despite that holding, states, willy-nilly, without regard to their obligation to Indians, without regard to the non-Indian people who were settling in areas where Indians lived, continued to issue permits for appropriations of water, allowed transfers, dams to be built, and allowed economic development. Not once did the state tell those people, "We put you on notice that tribes have the valid rights to water. Sometime they may put a call on that right. If you, knowing that, want to continue with your development, so be it." The states have never done that.

Now the states jump in horror when the United States, after dragging its feet for 80 years, is being brought into court. The tribes, since they've always been here, want their fair share. That is not going to deprive the non-Indian of legal Indian water. You have to have regional claims in regional systems to accommodate that. You cannot stop at artificial state boundaries, because waters don't stop at artificial state boundaries, they continue on.

You know what the systems are. You saw the Pecos system this morning drafted by Bob Lansford. You have to plan within the Pecos system in its entirety, not just in New Mexico. In a system like the Pecos, you have to take into consideration the valid needs of the tribes, states, and other water users. You cannot single out a user and say, "You're too late; you're not going to get any water." That's clearly not fair. Until the states give up some of their parochialism and realize that it's to the advantage of everybody in the system, regardless of size, to get together and have appropriate planning and discuss what Phil Wallin's talking about, you're going to continue having problems.

MR. REYNOLDS: Mr. Becker, there's nothing that I've said to allow you to infer that I see the Indians as culprits.

MR. BECKER: I was not referring to you, Mr. Reynolds, I was referring to comments made.

MR. REYNOLDS: Oh, certainly. I think Indians should have a right. Given what our economy has been like lately, I can understand why the Indians would rather sell the water than try to irrigate with it. So, as I said, I don't fault the Indians or the Justice Department for trying to get for the Indians every drop to which they're entitled.

MR. GUTIERREZ: The attorneys look at everything differently than I do, but I don't see how they can say that if the courts award water in the amount the Indians are asking, there would be any left for the non-Indians. It's just like the Pojoaque case. If the Indians get all the water they were asking for, there won't be any water left in that stream unless it's sold or transported out.

AUDIENCE: I'm Phelps White, from Roswell, a member of the Interstate Stream Commission, and I'd like to get back to the original question. Are we going to end up with a regional water plan? Are we going to have a conglomeration of a bunch of plans that are not going to help anybody? Are we going to have a statewide plan? I think we ought to deal with this question. I think it's pertinent to this conference.

When the Commission started talking about regional water planning, I had some very serious reservations about it because I could see a conglomeration of plans that was not going to do anyone any good. In fact, I was almost ready to make a motion that we give the money back to the legislature and really not get into this.

The more I've gotten into it, the more I really believe that the great benefit is not going to be so much in developing a solid forward plan in the next few years, but in the tremendous increase in public awareness of regional planning, water laws, and with what resources we have to work. I think the big benefit of regional water planning, and eventually statewide water planning, is going to be public awareness. Communities and all the parties that deal with water will be aware of what we have, what we can do with it and how we'll use it. To me, that's the big advantage.

AUDIENCE (MR. UTTON, CHAIRMAN OF INTERSTATE STREAM COMMISSION): I would just add to and agree with what Mr. White has said. Certainly you can look at the approach that New Mexico has taken, and in some ways it looks like a

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patchwork approach. I think that's a reasonable conclusion. However, in politics and public affairs, as someone said, the shortest distance from point A to point B is not a straight line. We've learned from past legislation that it is much better to have bottom up, community-oriented participation by all of the state voters, all of the actors, rather than perhaps a tidier approach from the top, which is centralized and directed by the state. Mussolini, I suppose, was able to make railroads run on time. The top down approach is easier, tidier. A state centralized approach might be more uniform and cohesive. But I think there's a value, personally, in going from the bottom up and having community participation and having the communities, themselves, have to wrestle with dealing with each other. They then determine what their water needs are going to be. It's a difference in philosophy.

MR. REYNOLDS: Be sure it's understood that the completion of a regional plan is neither a necessary nor sufficient condition to get a water right. That's a separate consideration.

MR. DAVIS: First, I must make a comment in reference to Mr. Wallin's prepared statement of river recreationists. I fully realize that in some areas there probably is some economic benefit associated with that type of recreational use. To my knowledge, there's neither the demand nor the economic benefits thereof of river recreationists in the lower Pecos region in the state of New Mexico. However, there is quite a large amount of economic benefit that can be derived from reservoir-type recreation in that area of the state.

Second, let me take a shot at this question. Yesterday, we heard Tony Mayne who's been involved in regional water planning. Basically, the financing that's received from the Interstate Streams Commission allows the plan to be developed, and then stops right there. It's nice to have a lot of regional plans and these plans need to be looked at closely for overlap. It's nice to have the plans, but unless they are implemented and eventually even have water rights attached to them, it's merely a nice gesture on behalf of the legislature to provide money for these plans. I don't know that there's any real value in the plans if they're not carried out fully.

DR. BAHR: Let me wrap this up by having each of the panelists very quickly address this general question: We've seen the beginning of some significant planning efforts. Water planning today, as

someone said earlier, is almost a household word; ten years ago, it wasn't. Plans are beginning to develop; there already exist regional water supply plans and I think we're going to see water quality planning soon. Where is this all going to lead? Are we going to have the evolution of a comprehensive plan and a consensus-building process spin off this?

MR. BECKER: To have what you've just suggested, we need to have some innovative thinking by various state and federal legislative bodies. We also need to have the authority in regional bodies to determine water rights. The impacts of the regional system are too great for any one state or any one group to control how the water's going to be allocated. Appropriate utilization of water in the future is necessary. Unless states are willing to give up the ability to determine for themselves in a vacuum, the extent of water rights and how they are going to be used, we're not going to have a satisfactory solution. We'll just have some plans, like so many other plans, on the shelf, to be looked at now and then.

MR. DAVIS: I think these plans must be done by qualified experts. We can't just allow any group to have a lot of money to do a plan. Even if the plans are quality, valid plans, plans are no good as plans. There's got to be some type of follow-up, to organize these plans into workable units statewide. There has to be some type of implementation that could possibly attach water rights to these plans if necessary or develop whatever follow-up is necessary to make these plans functional.

MS. GABIN: Yesterday, somebody asked how the public is going to get information in a useful, understandable manner. The inference from the question was somehow the state is going to pass out information to all its citizens to dutifully read. I can't disagree with that approach more.

The catalyst is for people to start demanding information from the bottom up; to assimilate that information and become educated planners. The process starts in communities and works up to the regional level. Eventually you get statewide coordination. We're looking at the bottom up approach. We've got to start from the citizens demand for knowledge. The state's not going to do it for you. If everybody going back to his home tells his community about the available means of acquiring information, and how to put that information to use, water planning will begin from the grass-roots level.

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MS. GOAD: I have been very happy during this conference to hear so many people acknowledge that water quality planning is an essential part of the overall water planning picture. In New Mexico, I think that some substantial planning at the state level is certainly appropriate. What the water quality control commission has done in designating and enforcing minimum standards in ground water is certainly an important and effective element of statewide planning.

There are other things that are best done locally. Zoning, determining where the vulnerable areas are and giving them extra protection, putting your landfills in the right place, and protecting wellheads are things that really need to be done locally. The thinking about this sort of thing has to have state leadership, a strong public backing and a good consensus. The Environmental Improvement Division (EID) has been making a great effort to provide information needed to accomplish that. Ms. Anna Deardorff of the EID spearheads the effort to get information out to the public in New Mexico about ground water problems, vulnerable aquifers and protecting wells.

MR. GUTIERREZ: On a small scale, I like to plan because I don't like to drink contaminated water, and I don't like to contaminate the water of my friends or my neighbors. But on the larger scale, statewide, I think it's not as simple. I think we're putting the horse in front of the cart. To me, to have a plan that really makes sense we must make sure all the adjudications are settled. Then we can decide who has control of what water. We can then come up with a plan that makes sense. Right now I can't build a \$2 million house. I don't have the money. But I can plan it. I'm going to have to make sure that I have water before I build that house. I think this is the problem with water planning; we don't know yet who has what. We've got to find out. Only then can we plan what we are going to do with it: sell it or drink it.

DR. BAHR: Let me just add one thing to what Mr. Gutierrez has said. Even if you did have the \$2 million, you better have clear title to that land you're going to build a house on.

MR. MATTHEWS: I think we're on the right track with the planning process, and I'd like to reinforce the statements that were made about public awareness. Instead of just awareness, there has to be an educational program. Also, there has to be the involvement of the private sector with the general

public in the preparation of those plans. Then that involvement should continue through the implementation of the plans.

MR. MITCHELL: I have to agree completely with Mr. Gutierrez. For years I was a bureaucrat and we used to prepare range management plans for ranchers. I saw those plans for years and years sit up on the top shelf. The plans sat on the top shelf simply because we didn't get the rancher involved enough in developing the plan. I think that the success or failure of any regional plans that we prepare will depend upon whether we continue to allow the federal government to assert itself. The federal government needs to back off and let the ordinary people of the state, who have to deal with the water, decide how the water should be used. All interest groups, including the tribes, environmentalists, ranchers, farmers and everybody must have a greater say into what water is going to be used, or we're doomed to failure. Until we force the federal government to back off and let the states manage its resources, I think we'll continue to have regional plans which are nothing more than a set of rules that sit on the shelf.

MR. WALLIN: I think the process is fatally flawed. I think the process isn't going to go anywhere. I think we're going to wind up with a bunch of patches and no quilt. I feel the state does need to take the first responsibility now. It's up to the state to provide the leadership, to provide the format, to provide the data base, and to specify what aspects need to be dealt with. It's up to the state to develop a process that holds true statewide. Public participation must be a part of this to make sure the process doesn't get captured by local dominant-interest groups. Everyone indeed should have an opportunity to participate. Basically, I think our problem is the same that I was ranting and raving about two years ago: there's no state agency in the state of New Mexico that has the clear lead as the authority on water issues. It's bifurcated between the State Engineer and the Department of Energy, Minerals, and Natural Resources. So what does the legislature do? Do they give grants to these local folks, agencies, and ad hoc groups, and whoever is willing to go out and do a plan for water resources? I don't see that approach coming together into a comprehensive, reliable, high-quality, statewide water plan.

DR. BAHR: For a while, there, until we started this panel discussion, I thought we had absolute

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unanimity and consensus. I thought we could say, "Hey, we don't need a water conference next year. Everything's been solved." I think we're going to have another water conference next year.

Thank you.

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