Taking Charge of Our Water Destiny:

A Water Management Policy Guide for New Mexico in the 21st Century

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About the Cover:
The two images on the cover are of Elephant Butte Reservoir full and nearly empty. The size of the lake is very sensitive to cyclic drought. These two satellite images illustrate that. On June 22, 1987, the lake covered 36,410 acres and held about 2,061,666 acre-feet of water. On August 2,1972, it covered only 3,600 acres and held about 76,900 acre-feet. When the lake is full, it loses some 250,000 acre-feet of water annually to evaporation.

These satellite images are from the image library of the Earth Data Analysis Center (EDAC) of the University of New Mexico. The original photographs were loaned to the authors by the City of Albuquerque for this cover presentation.

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Executive Summary

We Need to Take the Following Actions

The drought years of 1996, 2000, and 2002 have made clear to many New Mexicans that our water supplies are limited. In many places we are using water faster than it can be replenished; our aquifers are being depleted, and our streams are drying up.

Our state has no plan to meet ever-increasing demands for water with our finite water supplies. Every day, more subdivisions are built on our farmland, more wells are drilled, and we pray for rain. We passively but inexorably allow the future of our state to be determined by the day-to-day operation of outdated laws, policies, and regulations relating to water.

We must change our approach to water. We must manage our water use so that New Mexico in the future is the state we want it to be and need it to be.

Chapter 1 provides a realistic a sketch of where we believe New Mexico is heading if we do not change our outdated and ineffective water management laws and regulations. It is a scary picture. Our hope is to motivate all readers to take action to avoid a scenario that none of us wants.

Chapter 2 outlines why there are no easy ways out of this mess. The remainder of this report is a blueprint of changes that we think should be made. While many of the recommendations in this document are not new, no one has acted on them. In some cases we make specific proposals; in others we identify problems and mechanisms for addressing them because more research and thought is needed.

In **Chapter 3**, we discuss the deep flaws in the present-day operation of our priority water rights system. The system, which provides that those who have the earlier or senior water right have the first right to use water over those who have later or junior water rights, is the foundation of our water rights laws. In some respects, we have a prior appropriation system in name only – not in practice. Our state has become increasingly dependent upon groundwater pumping. Over time, groundwater pumping draws water from streams and rivers toward those pumps. Because the impacts of pumping are delayed, impairment to senior surface water users cannot be readily reversed when pumping is halted. In addition, the priority system is rarely enforced because in most places there has not been a determination of who has what rights to use water (that is, adjudications of water rights have not been finalized in most of the state). We must address this hypocrisy in a sensible way that protects the rights of water users while avoiding drastic and unnecessary economic harm to the state as a whole.

Recommendations:

- Review and develop options for priority administration of surface and groundwater rights that are hydrologically connected.
- Review and develop options for priority administration of rights that are not fully adjudicated.
- Review current adjudication processes; determine if there are changes that can facilitate completion; and implement necessary changes.
- Establish a 10-year plan and timetable for completion of adjudications and commit requisite resources.

• Review options for offsetting impacts of pumping on more senior water rights in times of drought, especially when there is not a completed adjudication on the stream system.

• Review State Engineer hydrographic survey processes; determine if changes (e.g., remotely sensed mapping data, computer-automated analyses) can expedite these processes; and implement efficient changes.

Chapter 4 discusses perhaps the most overarching problem with our water management system: the lack of adequate water budgeting and planning. We must learn to live with our limited water supplies. In particular, we need laws calling for a state water plan that goes beyond our nascent regional water plans to create one cohesive whole. Ultimately, our state water plan must overlay with other plans and laws, so as to create linkages and correlations between land use and water planning.

Recommendations:

• Increase funding to accelerate computerizing paper records of water rights and other data into the State Engineer program titled WATERS.

• Continue to work with regional water planners to ensure that all regional plans are completed within three years and that regions continue to address how they will meet demand with available water supplies.

• Conduct polls to ask what people want New Mexico to look like in 50 to100 years and what tradeoffs are acceptable to achieve it.

• Enact legislation that mandates creation of a state water plan addressing the following needs:

- accurate information that comes from measuring, metering, and monitoring water supply;
- water budgets at the local, regional, and state level;
- a connection between water budgets and water use;
- management of the state's water resources;
- a vision for the future;
- drought planning;
- public involvement;
- adequate funding; and
- a connection between water and land use planning.

• Link land use and water planning at the local and regional levels.

Chapter 5 addresses our lack of groundwater management and recommends that we be pro-active in managing this important resource. In particular, we must exert greater management controls in those areas where groundwater aquifers are greatly stressed and where they are closely linked to surface water systems.

Recommendations:

• Create a groundwater management system with appropriate safeguards to protect areas where groundwater supplies are threatened.

• Increase measuring, metering, and reporting of water diversions and consumption.

• Amend domestic well regulations and statutes to reduce the amount of pumping allowed and remove the statutory requirement that all domestic well applications must be approved in order to prevent new domestic wells from impairing existing water rights or negatively impacting interstate stream compact deliveries.

Chapter 6 challenges the paradigm that has long sustained growth in this state – that the way to find the water for new growth is by taking it from farming in our rural areas which use so much of the state's water. Is this really what the people of our state want? If not, what can we do about it?

Recommendations:

• Include provisions in the state water plan requiring that regional water plan policies regarding water transfers out of a region be adhered to unless a compelling public interest is demonstrated in allowing such transfers.

• Consider enacting other area-of-origin protection legislation.

• Explore the complex options for allowing farmers to lease water rather than sell water rights and benefit financially from allowing temporary use of their water rights or otherwise benefit from conservation in water use. Some of these options may best considered under the broad heading of water banking (see Chapter 8).

Chapter 7 discusses what can and should be done to promote agricultural, riparian, and urban water conservation as well as reducing evaporation of water from open reservoir storage. Conservation is a concept bandied about freely, but conservation has little value until concrete measures actually reduce water consumption. Particularly in the agricultural arena, however, it turns out to be very difficult – but not impossible – to integrate water conservation into our "use it or lose it" water rights system. Conservation is one of the best ways to ensure an adequate water supply for New Mexico, but we need to invest in water conservation in much the same way we once invested in water projects.

Recommendations:

• Establish a system leading to complete measurement of water supply and water use to provide the information needed to make good decisions about what conservation measures work and should be implemented.

• Examine and resolve dilemmas posed by agricultural water conservation.

• Enforce provisions in the water code that provide that the State Engineer not approve applications if they are contrary to conservation of water in the state.

• Increase funding to the State Engineer Water Use and Conservation Bureau to design and implement research on the best avenues for conservation, provide conservation information to the public, develop model conservation ordinances, and develop and help implement the conservation component of the state water plan.

• Where appropriate, enact state water conservation legislation promoting agricultural, urban, and riparian water conservation and provide increased funding as appropriate.

Chapter 8 is a "grab bag" of topics, including suggested means of increasing water supply, other water management measures, and environmental issues. These are matters we believe are important and deserve discussion, but that do not fall on the short list of the early actions that must be taken to begin addressing the flaws in our water management system. Our recommendations for each topic are as follows:

Water Banking:

• Work to clarify and agree on the purpose of a water bank and objectives for a water banking system before drafting legislation.

Reorganizing State Agencies Dealing with Water

• Delay reorganization of state agencies until after a thorough examination of water laws – concerning both quality and quantity – has occurred.

Drinking Water

• Increase funding for small community water systems and establish a permanent revenue fund to support the continual needs of small water systems for maintenance and upgrades.

• Increase training, planning, and engineering support.

• Increase cooperation among the various agencies that regulate and support community water systems.

• Examine the inequities in the amount allowed per person among mutual domestic water systems.

Changes in Reservoir Operations

• Analyze all alternatives to current full storage at Elephant Butte, including options that would require amendment of the Rio Grande Compact, amendment to the Rio Grande Project authorization, and other federal and state legislation.

Underground Storage

• Amend underground water storage statutes to allow other governmental entities such as the state to obtain permits for underground storage.

Imposing Water Charges

• Study the need for user or transfer fees to fund water management and/or promote water conservation.

Water Quality

• Protect water quality in order to protect our water quantity.

Endangered Species

• Comply with the Endangered Species Act through a variety of short-term and long-term measures, including planning, conservation, and groundwater management and involve all stakeholders in helping to devise solutions.

Watershed Protection

• Before proceeding with attempts to increase water yields from watersheds, conduct a detailed study of potential water gains (including their timing and duration) and costs, and develop a long-term watershed management plan that ensures compliance with all applicable federal and state laws.

• Manage watersheds to protect water supplies from catastrophic fires and maintain a healthy watershed

Desalination

• Support research efforts on desalination and promote New Mexico's national laboratories' taking the lead in research to reduce the costs and environmental effects of desalination.

The **Conclusion** includes summaries of our recommendations reorganized into categories that include changes to water management policies, legislative action, funding needs, and a plea to individual citizens to become involved in determining our water destiny.

We hope that you will carry away some understanding that we New Mexicans don't have to just let things happen in our state — we can plan for our future.

Introduction

This paper is about water – New Mexico's water. It outlines the high costs to be paid if we fail to take action to protect this resource. Our aim is to create awareness that something must be done – and done soon, and that we actually *can* do what's needed to bring New Mexico's water management into our modern world. This paper is about priorities and solutions. We hope it provides a road map to improve management of the state's water.

"Latest Population Figures Show Top Growth in West"

- *New York Times*, January 28, 2001

In 1910, three years after New Mexico's territorial water code was enacted, the population was 372,301[1]; in 2000, the population was 1,819,046,[2] an increase of almost 500 percent. The 2000 census pegged the growth for the last ten years at 20 percent, making New Mexico the 12th fastest growing state in the nation.[3] Population growth and new industries have changed New Mexico, but with the exception of statutes enacted in the 1930's to address the beginning of groundwater exploitation, few changes have been made to our water laws since 1907. The few changes that have been made in water administration have been short-term, narrowly focused, and procedural rather than long-term, comprehensive, and visionary.

Meanwhile, surface waters have become over-appropriated, and water users have become increasingly dependent on non-renewable groundwater supplies. Few people realize how overextended our water resources have become. We are slowly losing many of the things we value about living in New Mexico.

Unfortunately, policy changes often do not occur until we see serious damage from those we've been using. That time has come. New Mexico can't afford to delay. If we do not take charge of our water destiny soon, few will be happy with the consequences. Fortunately, awareness of the critical importance in addressing impending water shortages is growing among our citizens and elected officials, and that growth needs nurturing.

We focus here on the changes we believe are most important. Many of the proposals in this document are not new, but few have been acted on. In some cases, we know changes are needed, but we don't pretend to know exactly what they should be. The state clearly needs to begin systematic discussions in such areas – discussions that can lead to judicious proposals.

Finally, many changes will require money. Until recently, administration of our water affairs has been like a house that no one has maintained and everyone is afraid to examine, fearful to learn how much repairs will cost. But we must not allow this house to fall down. Therefore, we must face the fact that we need to spend money to fix it. The longer we delay, the more expensive it becomes.

Water is a precious resource. We cannot afford to fail.

1
Water Visions to Avoid

If No Action is Taken, the Future is Scary

People are comfortable now. We're getting along all right, aren't we? Well, look at it this way. Changes are occurring whether we want them or not. Our growing urban areas are sucking up more and more water; farmland is being covered by housing tracts; and we've begun to feel the impacts of drought. Let's look at a scenario we *don't* want to live through.

HOW BAD COULD IT GET?

Droughts can be really scary. Let's imagine that it's sometime in the future, perhaps the *near* future. New Mexico has been suffering through drought for several years in a row. It's summer, but the bed of the Rio Grande stretches bone dry into the distance. There isn't enough water to meet farmers' needs in the valley. Major parts of the Rio Grande valley are already brown. Upstream reservoirs are now at minimum-pool levels, and nothing is left for "emergency" releases for fish, farmers, or municipalities.

New Mexico is also failing to meet its legal obligation to deliver water to New Mexicans below Elephant Butte Dam and to the State of Texas, pursuant to the Rio Grande Compact. Texas has filed suit against New Mexico to force this state to meet its obligations and to pay damages. Their damage claims are for many tens of millions of dollars, and that's just for one year.

A few endangered Rio Grande silvery minnows are confined to a couple of short stretches of the river that actually have some water, although most of the remaining silvery minnows are in tanks, waiting for the river to return. A federal judge is considering whether to order that all San Juan-Chama Project water[4] and native Rio Grande water be left in the river to avoid extinction of the silvery minnow.

The State Engineer, in desperation, has threatened a "priority call" to shut off junior water right holders in order to reduce flow losses from the Rio Grande. But the junior right holders mostly pump groundwater, and groundwater is what supplies the cities of Albuquerque and Rio Rancho, among others. Shutting off their drinking water would be a political impossibility. Besides, blocking their groundwater production would not immediately restore stream flows that have been diminished by decades of pumping. Hardly anyone believes it will come to that. Most believe, surely quite correctly, that with many uncompleted adjudications and inadequate advance administrative planning, a priority call is not possible. The State Engineer asks cities to pump water from some of their wells directly into the river where locations permit. Because of the cost and the legal implications for their water rights, most cities refuse.

Watering lawns, or any landscape for that matter, is now illegal under declarations of emergency by the governor, most city councils and county commissions. High-tech companies considering relocating to Albuquerque are crossing New Mexico off their short lists. Many local leaders and citizens are outraged, asking why this crisis could not have been avoided.

It's not just the Rio Grande that faces hard times. The whole of the Land of Enchantment is withering. No group is more anxious and anguished than the ranchers. The grass is gone. The range is blowing away. Their breeding stock is either gone or going. And few know whether, or how, they can hang on to their land. Las Vegas has been scrambling for water for years. Each time they thought they'd found a solution to water shortage, bad news devastated them. This time it's the drought, but it has always been something. The San Juan system is dramatically shorting the Navajo Indian Irrigation Project, and

the Navajos are incensed. The Canadian and Gila rivers are down to trickles or less. Their water users are frightened and out of options.

The Pecos River meanders through New Mexico's second most important irrigated valley. To Pecos farmers, it is *the* most important irrigated valley. Here too, farm fields are dry, brown, and barren; town lawns are dead. The reservoirs are essentially empty. The threatened Pecos bluntnose shiner is on the brink of extinction as most of the 200 miles of river where it lives is now dry. New Mexico can't make its required Pecos River delivery to Texas and is about to be held in contempt by the U.S. Supreme Court.[5]

It is a time of desperation for water users everywhere. Here and there a tedious activist is muttering that nearly all of this was coming for New Mexicans whether a drought showed up or not. The drought just got it here a bit sooner.

HOW REAL IS THIS SCENARIO?

Now, let's analyze the above hypothetical. Do these scenes sound unlikely? Are fears of a drought overdrawn? Or – maybe we are already well into the drought, but it won't really be that bad? To the contrary, hardly anyone would argue that we needn't worry about a looming drought. Droughts are part of life in the Southwest.

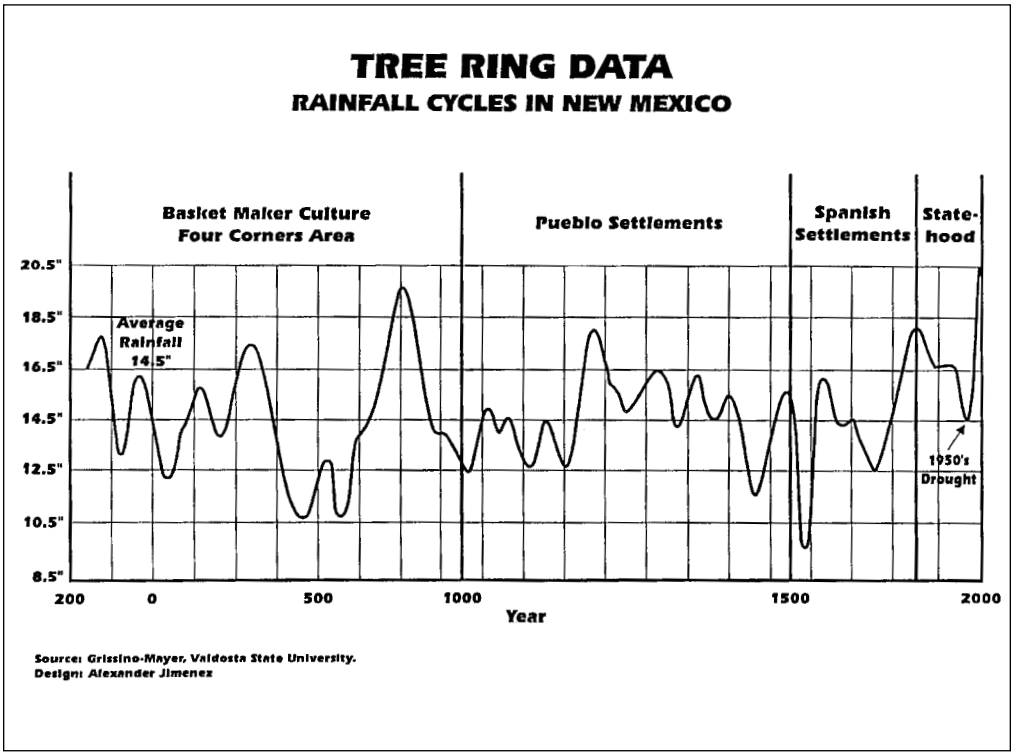

FIGURE 1 – Tree Ring Data: Rainfall Cycles in New Mexico
Henri Grissino-Mayer

Tree-ring data collected from El Malpais National Monument southwest of Grants show a 2,100-year history of repetitive drought cycles.[6] This graph starkly and inescapably depicts the cyclic nature of our weather patterns. The graph also confirms that the two decades since 1980 have been dramatically wetter than average for the region. The infamous 1950's drought, the one that many New Mexicans remember well, was severe, but as this graph shows

other droughts in the Southwest have been much worse. Actually, precipitation for that 1950's drought was close to the long-term average.

Must we leave water in the river? The short answer is, yes – for two reasons. First, we agreed long ago that we would always leave some water for people living downstream; second, fish need water. Fortunately – or unfortunately, depending on one's mind set – the federal Endangered Species Act (ESA) mandates that species threatened with extinction cannot have their habitats destroyed by mankind. Some water must be left in our rivers for the silvery minnow, a Rio Grande endangered species, and the Pecos bluntnose shiner, a threatened species in the Pecos River.

Water obligations to Texas on the Rio Grande not met? What's the big deal? This is a tough and complex one. First, it's not just Texas. The actual obligation is to deliver water past Elephant Butte Dam. Almost two-thirds of that water is used by New Mexicans in Sierra and Doña Ana counties, not by Texans. But Texas may be holding the bigger, more worrisome club. New Mexico signed a contract – the Rio Grande Compact – and there is no doubt that the U.S. Supreme Court will enforce it, as it must.

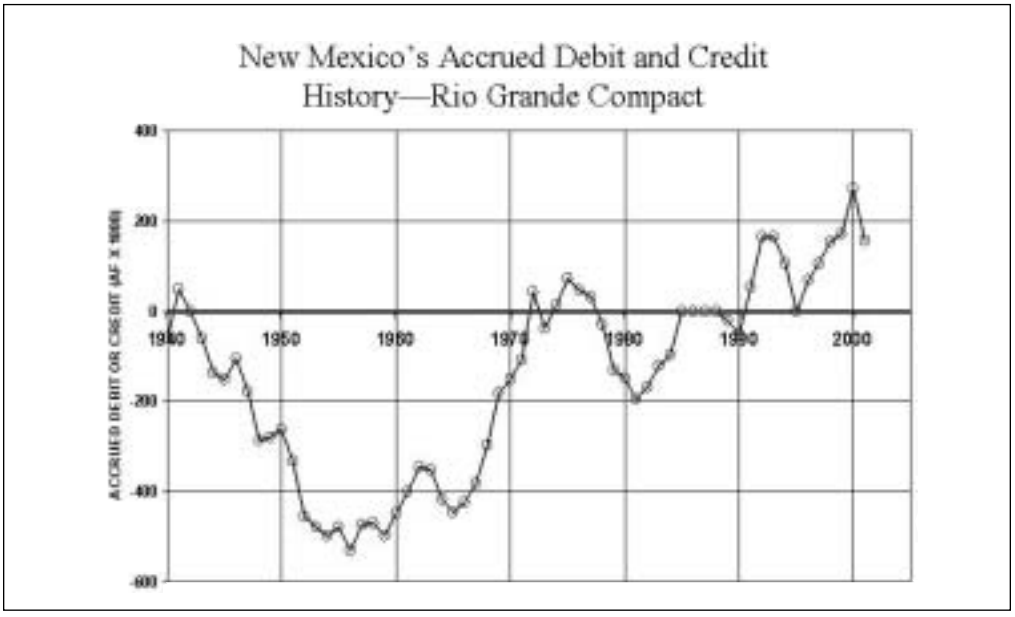

FIGURE 2 - New Mexico's Rio Grande Compact Cumulative Delivery Departure
Interstate Stream Commission

During the drought of the 1950's, New Mexico was behind on water deliveries on the Rio Grande below Elephant Butte Dam to the tune of more than 500,000 acre-feet. That's two and a half times the maximum debt allowed us under the Rio Grande Compact. Fortunately, before Texas could win in court, we were saved by wetter weather and by federally funded channel "improvement" projects. These included channel narrowing, levee changes, and construction of some 50 miles of a low-flow conveyance channel alongside the river above Elephant Butte Reservoir. The low-flow channel, being narrow and straighter than the natural channel, delivered river water more quickly to the lake and, being cut deeply into the flood plain, drained an estimated 200,000 acre-feet of shallow groundwater from the flood plain allu-

vium, which also was delivered to Elephant Butte Reservoir.

On the Pecos River back in the mid-twentieth century, New Mexico also fell woefully behind in its water deliveries to Texas under the Pecos River Compact. New Mexico had to pay Texas $14 million for water it had failed to deliver, but, more importantly, the U.S. Supreme Court said that New Mexico must never again accumulate a water debt on the Pecos River.[7]

A priority call on junior, primarily municipal water rights? It hasn't happened yet because of the huge costs and many obstacles involved. But at some point we will run out of alternatives. And, after all, it is the tool that the prior appropriation system supposedly relies on to make sure that senior water rights are adequately protected.

A WHIMPER, NOT A BANG

We need at least to face up to what got us to this state of affairs. Until recently, we've acted as if the state's water resources, though fixed in amount by physical and legal realities, could somehow provide for our perpetually increasing demands. In the absence of any explicit plan, we've always assumed we could find more water when we needed it.

We haven't recognized any limits to the system's ability to let us use what we claim we need. We've assumed that *averages* are the only numbers we have to be concerned with to administer water; we've not worried about *extremes*, even though ours is a land where extremes are the norm. We've never accepted in a legal sense that the river needs some water too and that the riparian vegetation (including the water-profligate plants we've unwisely imported, like salt cedar and Russian olive) will often get their water regardless of whether there's any water for anything else. Now our failure to act is about to catch up to us.

We throw the word "crisis" around with abandon when we think we need to excite people. But it may be that the crisis we threaten will come as a whimper rather than a bang. If we aren't sufficiently pro-active, the Rio Grande and the Pecos River likely will be in concrete-lined channels, farm acreage in the Carlsbad Irrigation District will be a fraction of its glory days, the farms and farmettes of Valencia and maybe Socorro counties will be overgrown with rows of genuine, simulated-adobe housing developments, the bosques will be gone, and much of our rivers, our heritage, and our quality of life will have been destroyed in the process.

2
Where Do We Need to Go?

There are No Easy Ways Out of This Mess

The scenarios in Chapter 1 shouldn't be carelessly brushed off. Fortunately, while most people are unaware of these looming future costs and some who *are* aware conveniently ignore them in the interest of business as usual, many others are grappling with water supply and demand, regional water planning, state water planning, the silvery minnow and bluntnose shiner, the bosque, the farms, and many, many other interconnected issues.

We truly need for New Mexicans to face up to reality and to expand their pro-active efforts to solve problems. We need to enter wholeheartedly into negotiations that at the start have *every* issue on the table and that continue until every issue is addressed. Is now the right time for this? Yes – emphatically, *yes*. But many of the institutional and individual mind sets of people in water affairs often seem to be impediments to the give-and-take spirit without which all negotiations fail.

Here are some of the factors seeming to thwart real progress in managing our water:

- Nothing relentlessly forces the issue; the most powerful players have not yet lost anything nor been seriously threatened; and in fact most appear to think they can win by hanging tough.
- Most decision makers don't have enough detailed understanding of the system, or of the threats, or, most importantly, of the alternatives that might help fix things.
- Inaction is safer than action in anyone's term of political office, and it certainly is easier.
- Los Angeles, Phoenix, and Denver seen from a distance appear to have solved their water problems; Las Vegas (NV) seems destined to pull some magic rabbit out of the hat (money, money, money). We have always found the water in the past; we appear to think that: *If we build it, water will come...somehow.*

We could just rely on the market, but that won't solve all of our problems. Finding willing sellers has become ever more competitive, and at some point increasing costs will make this alternative even less viable. We could try to buy water from reservoirs in Colorado, but there aren't many of them and that might violate the Rio Grande Compact. Also, Colorado uses its Rio Grande water for irrigation in the San Luis Valley, and remember if we are in a drought, they'll be in it too.

We could drill some big production wells and pump groundwater into the Rio Grande for the downstream users. But that would be expensive, and no one would want such wells to be drilled in their area. Albuquerque's aquifer is already stressed. The people in the Elephant Butte Irrigation District wouldn't want the water to be pumped from their part of the aquifer because it's the up-streamers in New Mexico's "Middle Rio Grande" who are mandated by the compact to deliver them water. More importantly, too much groundwater pumping is part of the reason that we're in the pickle we're in now on both the Rio Grande and Pecos rivers. More pumping only aggravates the problems and takes water away from rivers and streams and the people with senior rights to use that water – clearly a violation of our prior appropriation water rights system.

On the Rio Grande, the pool of water behind Elephant Butte Dam would be down to a minimum by the time the water debt got serious, so lake evap-

oration would already be diminished. To further reduce water loss, we could take out large areas of salt cedar. It's expensive to do, and if we did it the way we've been doing it for the past 50 years or so, it would be at best a very temporary solution because they'd grow back in a few years. Without the salt cedars, the water table likely would rise to the surface in places, where direct evaporation might well take as much water as the plants. By spending even more money we could fix that; for instance, by digging drainage ditches to lower the water table. But that action could also be a problem because it would help drain away what little water remained in the river.

HAVE WE MADE ANY PROGRESS AT ALL?

Yes. We've made some significant progress in the past few years. Litigation under the Endangered Species Act has forced greater communication among most of the entities with vested interests in water resources of the Middle Rio Grande and the Pecos River. Good technical studies directed at an array of topics affecting water resources are underway, and often associated with these are broadened measurement and data-collecting efforts. A number of cities have water conservation programs of varying effectiveness. The State Engineer, his staff, and the Interstate Stream Commission and its staff have evolved from focusing narrowly on water rights administration, lawsuit defense, and monitoring of interstate-stream flows to developing a philosophy of water management, pro-active planning, and modernization of dated regulations that constrain actual management of the state's water resources.[8]

As important as any other of these developments, public awareness of New Mexico's water resources and their limitations has undergone healthy growth. This is an interactive growth involving not just the general public, but legislators, administrators, advocacy groups, water managers, technical specialists, and more.

WE'VE GOT TO DO *SOMETHING* MORE

We outline below an initial handful of changes that would be a wonderful start on the modernization process. But the real, fundamental need is to begin a comprehensive planning process. Creating a balanced program designed to protect what we can of our quality of life, assure that our citizens are treated equitably in the process, and have this operate in an evolving socioeconomic system will be decidedly complex. Planning is the key – resolving these issues cannot be done equitably without planning.

One question is: Planning, by whom? We believe that *all* New Mexicans (or as many as we can corral) should be involved.

A second question is: what vision should guide the planning process? The most obvious answer to the vision question is that we should go where the citizens of New Mexico want to go. Recently we saw the first outlines of a state water vision. In 2000, New Mexicans offered up their basic water values and priorities in a little-publicized polling study by the University of New Mexico Institute for Public Policy. Their collective statement on *relative importance of water issues* reached these conclusions: "Having enough water in our rivers to protect endangered fish and to keep the trees, vegetation and other wildlife along the riverbanks healthy" was second in importance only to, "The quality of water that my family and I bathe in." They also ranked the *value of various uses of water*. The four highest value levels (out of 13) were in order: indoor use in existing homes, irrigation of farms, preserving the native

cottonwood forest and vegetation along river banks..., and providing food and refuge of fish, birds and other animals.[9]

Of course this is not a definitive planning guideline, but one inference is clear. New Mexicans don't envision their state transforming into a high-desert Los Angeles nor their Great River into a stark concrete ditch. The people have said that we should try to conserve these things, while at the same time providing clean drinking water.

We write this in hopes that we can broaden public interest in shaping the state's future by presenting a number of basic changes that are necessary to work our way out of the many messes in which we find ourselves.

3
Our Priority Water Rights System is Flawed

Facing Reality

Water rights in New Mexico are based on the prior appropriation system, known as "first in time, first in right." Priority of water rights is based on the time that the water associated with a right was first used. Those with the earlier priority date – or senior water right – have the right to use the water first before those with later – or junior – priority dates. The prior appropriation doctrine is the bedrock of water allocation throughout the West, including New Mexico. It is enshrined in our Constitution and echoed in our statutes and cases. The authority to administer the system is given by statute to our State Engineer.

No one particularly wants to alter the priority system in New Mexico, and many people resist acknowledging that there is anything wrong with how it works. But we, the authors, submit that New Mexico does not actually have a working priority water rights system. Every day, senior water rights holders are being deprived of the water they need and have a right to use, while junior users freely pump their well water or take water into their ditches.

HOW HAS THIS HAPPENED WHEN OUR LAWS SAY OTHERWISE?

The prior appropriation system evolved many years ago as the West was being settled. When gold miners flocked to the West in the 1800's, the riparian water rights doctrine used in the East – which allowed only the people with property adjacent to surface water to make use of it – didn't work. Because water was scarce in the West and often at a distance from the areas where it was needed, a system was needed to allow for water diversion from rivers and streams to areas of use and to provide predictability and security for economic activity. Thus, miners used the same system to allocate water that they used to allocate mining claims: first in time, first in right. Over time, this principle was extended to water uses other than mining, and eventually it spread throughout the West. When New Mexico became part of the United States, it too codified the prior appropriation doctrine, consistent not only with other Western states but also with some of the customs and practices already in place.[10]

The priority system developed when the West was sparsely populated and people relied mainly on water from rivers and streams. It was most effective in allocating scarce and highly variable surface water supplies. When there were high water flows, everyone – senior and junior water users alike – got water. In drought years or when flows were low, junior water rights holders did without any water at all. It was a simple and ruthlessly effective system with little or no ambiguity.

As more people moved into New Mexico, all of the water in rivers, springs, and lakes became fully appropriated. That is, users were in line to appropriate all the water available in virtually any given year. The increasing competition for river water led to conflicts between New Mexico and its neighbor states, which in turn led to negotiation and adoption of a number of interstate stream compacts dividing up water in rivers that run through several states. The compacts place firm limits on how much river water can be used in New Mexico. For example, the Rio Grande Compact signed in 1938 limits New Mexico's use of Rio Grande waters above Elephant Butte Reservoir (where most of our population is) to 393,000 acre-feet of "native" Rio Grande water in an average year and no more than 405,000 acre-feet in wetter years.[11]

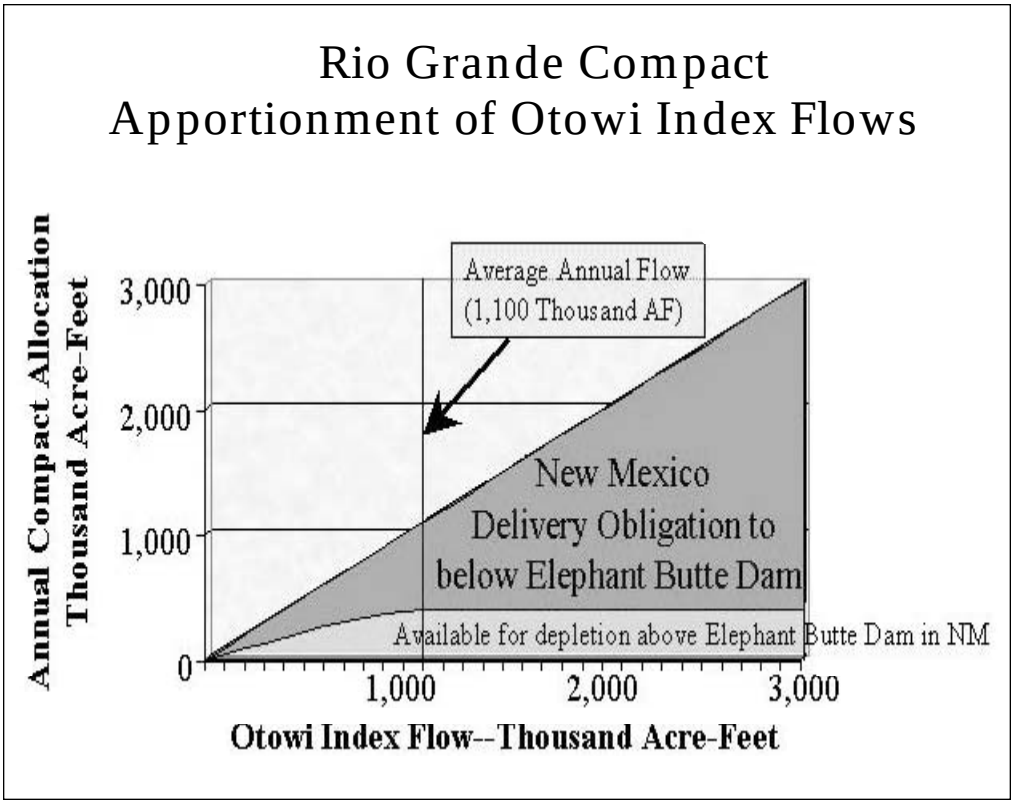

FIGURE 3 - Rio Grande Compact Allocation
Interstate Stream Commission

As the water demands of new municipal and other users increased and as needs increased during dry years, people gradually turned to groundwater to meet their water needs. In time, new technology allowed people to drill deeper wells and pump larger amounts of groundwater. People began to rely on groundwater for more and more of their water supply. Groundwater was seen as an answer to fluctuations in – and limitations of – surface water. When it didn't rain or snow enough, people could just pump water out of the ground.

IN TIME, FLAWS EMERGED

Before long, however, two major flaws became apparent. First, we realized that groundwater aquifers are usually connected hydrologically to nearby streams. When water is taken from an aquifer, surface water can be drawn down into the aquifer, or water that would otherwise have flowed through the aquifer into a stream can be intercepted, reducing the amount of water going to springs, streams, and rivers.[12] Where wells are located close to surface water, the impacts can be immediate. The farther the wells are from streams and rivers, the longer it takes to impact surface water. Most groundwater exploitation, however, ultimately will reduce nearby surface flows – the only question is when.[13]

Second, we found that we have been using groundwater faster than it is replenished or recharged. We are mining – or using up – a non-renewable resource.

When people say that a river system or surface water in New Mexico is

"fully appropriated," they generally mean that even in the wettest years, all water in the river is appropriated. In dry years, junior water rights holders – in theory at least – simply do not use water. Thus, there can be many more junior water rights holders than there is actual wet water. The system ceases to function, however, when many of the junior users rely on groundwater. The groundwater they take ultimately reduces the flow of surface water to senior water rights holders, and once this surface water flow is affected the impairment can't be stopped quickly by simply turning off the well pumps. Even in those cases where the State Engineer has required the pumper to retire surface water rights to offset the pumping effects on the stream, still the system does not work to protect any water rights more senior to those that were retired.

Under these circumstances, the lag time prevents effective enforcement of prior or senior water rights. Junior groundwater users cannot simply turn their water on and off to adjust for daily, monthly, or even yearly variations in surface water flows to ensure that senior surface water users are fully supplied. Furthermore, junior pumping rights often belong to cities and towns, and it is difficult, if not impossible, to demand that uses of water for basic domestic needs cease. To date the state has taken only minimal steps to address this problem of groundwater extraction by junior users that impairs senior surface water rights. As a result, the junior pumpers simply have kept on pumping through droughts and shortages, and it is the senior surface water users who have had to do without the water – precisely the opposite of the "first in time, first in right" system established in our state constitution.

If water demand exceeds supply and the water use of junior users is not being curtailed, then in fact our system is not fully allocated, it is over-allocated. Senior water rights are being impaired. Moreover, we are risking violations of interstate stream compacts by under-delivering water to downstream states. Meanwhile, water demand is steadily increasing.

PRIORITY ENFORCEMENT FIRST FAILED ON THE PECOS RIVER

This is not a new problem. It has been unfolding in New Mexico for more than 60 years. When push came to shove, the priority system absolutely failed to work on the Pecos River.[14] Beginning shortly after the Pecos River Compact was signed in 1948, New Mexico fell behind in making the Pecos River water deliveries to Texas required by the compact, primarily because of the effects of ever-increasing groundwater exploitation in the Roswell Artesian Basin in the Pecos River valley. As a result, Texas sued New Mexico for its violations of the compact. In 1990, a stipulated judgment required New Mexico to pay $14 million dollars in damages to Texas to satisfy its past water debt, and New Mexico was ordered by the United States Supreme Court to increase annual water deliveries to forever avoid incurring any new shortfalls.[15]

In theory, to obtain the water for the increased deliveries, New Mexico should have invoked the priority system and shut off enough junior water rights users to provide the needed water in the Pecos River. That did not happen for two main reasons. First, most junior water rights users in the Pecos valley were groundwater users. Even if all of them had ceased pumping immediately, it could have taken years, even decades, before the lack of pumping resulted in increased water deliveries to Texas. Second, the state was unwilling to live with the economic and social disruption that would

have occurred if a priority call were made and sufficient numbers of water uses were shut down in order to ensure adequate deliveries to Texas. Indeed, a study done for the state after the 1988 Supreme Court decree concluded that carrying out priority calls to comply with the decree would have cost the state nearly $250 million in economic losses.[16]

Rather than invoke a priority call, New Mexico embarked on a costly program, spending approximately $31 million to date (in addition to the initial $14 million in damages) to lease and buy water rights to obtain water to send downstream to Texas.[17] That amount proved to be insufficient. The 2002 legislature authorized up to an additional $30 million to buy additional water rights on the Pecos River.[18]

Thus, when the court demanded enforcement of an interstate stream compact, the state was unwilling to simply shut down junior water users as called for under the prior appropriation system. Instead New Mexico chose to use public money to pay for water rights in order to avoid the economic

Thus, when the court demanded enforcement of an interstate stream compact, the state was unwilling to simply shut down junior water users as called for under the prior appropriation system.

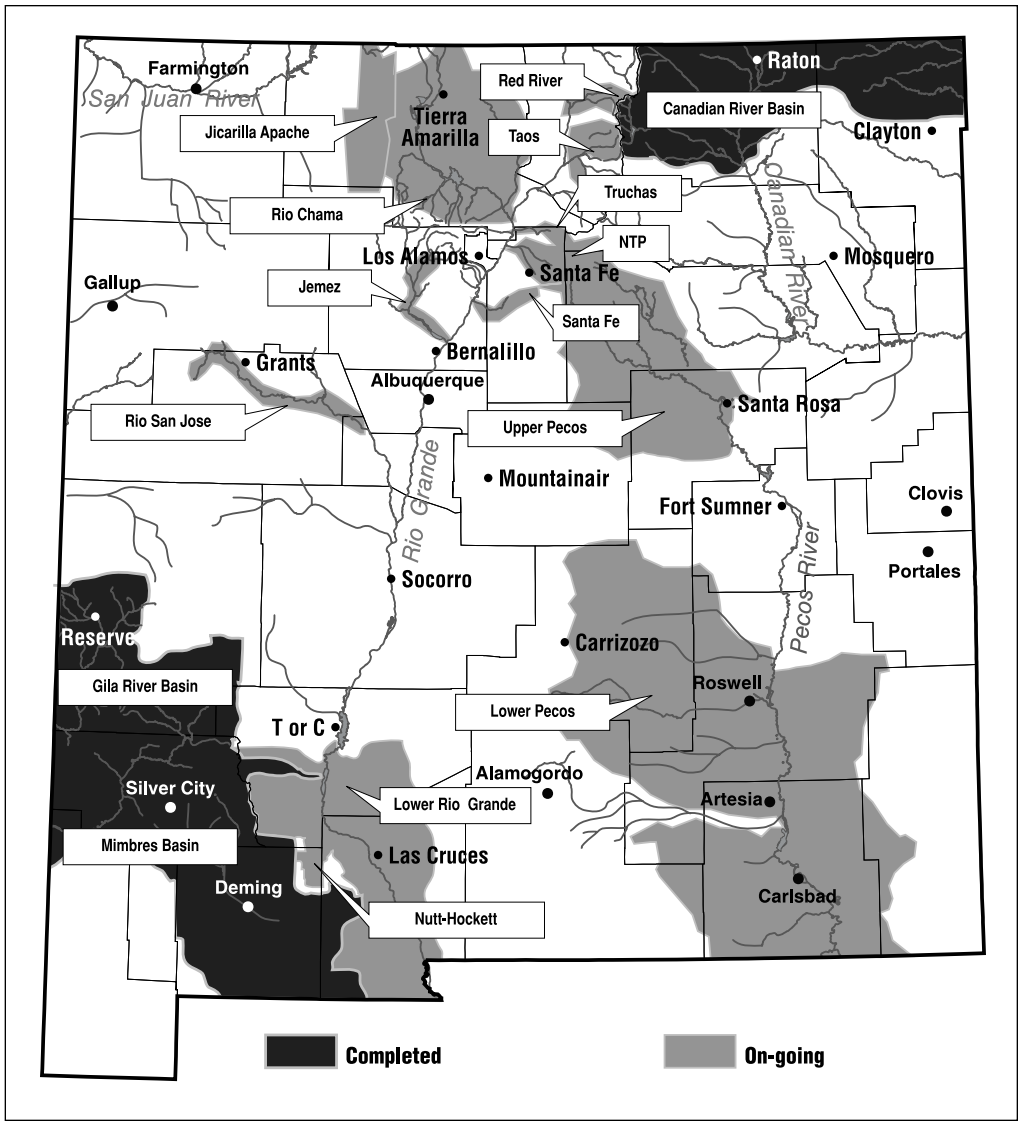

FIGURE 4 - Completed and Ongoing Adjudications
Office of the State Engineer

harm and morass of practical problems that would have been caused by priority administration, even though the necessary water should have been available for free under the priority system. Even now, New Mexico still has not reduced its depletion of Pecos River sufficiently to guarantee compact compliance. The costs of its water acquisition on the Pecos will continue to accrue or a priority call will have to be made.

PRIORITY IS RARELY ENFORCED STATEWIDE – WHY?

All around New Mexico, stream flows are drying up, and senior surface water rights holders are left looking for a way to enforce the priority system and restore their full senior water rights. Surface water rights holders in La Cienega, Placitas, the Gallinas Basin, the Pojoaque Valley, the Gila Valley, the Pecos River and its tributaries, and other rivers, all have complained of dry irrigation ditches while junior users were pumping water from wells or junior users upstream were taking water from the river. Many have sought priority calls. Carlsbad Irrigation District, for example, asked the State Engineer in 1976 for a priority call due to decreasing Pecos River flows resulting from increased upstream groundwater and surface water uses. No priority call was ever made.

The State Engineer's response to these requests has been that he could not initiate priority enforcement in a basin until the adjudication in that basin has been at least partially completed and a court decree entered. There is at least some basis for this position. An adjudication is a "determination of a right to use" water by a court.[19] Until an adjudication has been completed, the validity of water rights is uncertain. Unfortunately, this means that the State Engineer cannot protect even those who have legitimate senior water rights until the adjudication that legitimizes those claims has been completed. Nor can the State Engineer prevent illegal diversions for the same reason; he does not know for certain what uses are legitimate until an adjudication has been completed.

According to the State Engineer, only fifteen percent of the water rights in New Mexico have final adjudication decrees. Eighty-five percent have not been finally adjudicated.[20] A final decree on all the rights in the Pecos Basin will not be entered for many more years. The *Lewis* adjudication on the Pecos River, on file in state court since 1956, is the longest running case in any New Mexico state court; the *Aamodt* adjudication on the Rio Pojoaque, a Rio Grande tributary above Santa Fe, has the dubious distinction of being the longest running, uncompleted adjudication in any federal court anywhere in the country (it was filed in 1966). In the Gallinas Basin, acequias have been dry in the past apparently due to upstream usage by the City of Las Vegas. Although the Gallinas Basin rights have been partially adjudicated, Las Vegas would not agree to priority administration and the acequias were left high and dry. Similar stories are told on virtually every river basin in the state.

We know of only two instances where requests for priority calls resulted in action – both during the 1996 drought. In each case, an injunction was sought against upstream junior water rights holders by one or more downstream pueblos in an ongoing adjudication case. One case involved the three pueblos with water rights in the Jemez River (Jemez, Santa Ana, and Zia pueblos); the other concerned the Tesuque River and Tesuque Pueblo. Neither case involved priority administration by the State Engineer. In both cases, the pueblo senior rights holders and upstream junior rights holders

worked out an agreement that specified how much water the pueblos would be allocated and how much would go to upstream junior users. Because there had been a partial adjudication and because it was clear that the pueblos had valid senior water rights, the parties were able to reach a settlement. In addition, settlement was possible because it addressed only surface water uses, and the parties did not have to deal with the more complex and problematic impacts of groundwater pumping.

If we aren't willing to face the flaws in our priority system, the problems will only get worse.

PRIORITY DOESN'T WORK EVEN FOR THE MOST SENIOR WATER RIGHTS

Indian water rights are a creation of federal – rather than state – law, which applies a different set of rules.[21] For example, tribal aboriginal or reserved water rights cannot be lost through non-use; a reserved Indian water right cannot be altered or reduced as a result of a failure to "use it or lose it."[22] Indian reserved water rights are not limited by the amount of water a tribe used historically or is currently using. Unlike non-Indians, Indian tribes are generally supposed to be guaranteed enough water to supply their reservations and pueblos forever. However, this doctrine of an expanding water right to serve future needs recently has met with resistance in some courts, as the courts seek a method by which tribal water rights can be fully and finally quantified in adjudications, just like water rights of others.

Because of their seniority and the fact that most Indian rights are not subject to loss due to non-use, one might think that the prior appropriation system would work well for Indian tribes and pueblos. In practice, however, many tribes are coming up short. Most tribes and pueblos use far less water than they claim rights to. Tribes have historically lacked the financial resources to fully develop the water to which they are very likely entitled. Meanwhile, stream systems have become fully appropriated by those with junior priority rights, making it harder for tribes to develop those resources. The courts have done little to help tribes remedy this problem. When Acoma and Laguna pueblos sued upstream junior users on the Rio San Jose to try to enforce the pueblos' senior rights, for example, they were thrown out of court and told to await the outcome of a completed adjudication before seeking priority enforcement. This occurred even though an adjudication had not even begun at the time they sought priority enforcement.[23]

Yet another kind of complication arises in many of the older acequias in the northern part of the state, which have some of the most senior, non-Indian water rights in New Mexico. Some of these ditches were never managed under a strict priority system. Rather, they have always relied on sharing (known as "repartimiento") in times of shortage, rather than allocating water on an "all or nothing" priority basis. While the custom may always have been one of sharing, both within and between acequias, there is little acknowledgment of this in the state's water laws.[24] Thus, there is little legal protection for an acequia when someone seeks to reverse the custom and go to strict priority administration.

IS THERE A SOLUTION?

If we aren't willing to face the flaws in our priority system, the problems will only get worse. Our ability to deliver compact-committed water to downstream users becomes questionable. Those people want water, not dollars. The courts won't care that we want to base water decisions on a system

that isn't working! Lots of money will be spent on lawyers, penalties, and judgments for damages. New Mexico will be forced to comply with court orders to deliver wet water regardless of what our water rights system says. As we struggle to meet those obligations, many, many people will probably lose their water rights. The economic losses and social disruption could be enormous.

Failure to adjudicate causes numerous problems.[25] The state's ability to enforce its own priority system is compromised. Until adjudications are completed, the state does not have an accurate accounting or quantification of the demand being made on the system, i.e., of how much water is owed to holders of valid water rights. If water rights have not been validated by an adjudication, the state is hampered in its ability to prevent illegal diversions. Ensuring compliance with compacts is all but impossible, and tribes and pueblos will continue to be harmed as the water available to settle their claims becomes more and more difficult to find. In sum, until adjudications are completed and we know who has rights to how much water, the state will not be able to manage its water effectively.

While our current adjudication scheme is flawed and priority administration is not occurring in most places in the state, we must be very careful about how we change the rules at this stage of the game. Our water management system is based on the prior appropriation doctrine. Completely redesigning the system is not feasible, even if it were desirable. But we must be willing to evaluate problems and to adjust the system as needed to keep it viable. Most particularly, the state needs to examine how to manage the junior groundwater uses that make enforcing a priority call such an economic and political nightmare.

Now after decades of little action, it is imperative that ways be found to expedite adjudication. There will be no instant fixes for these problems in administering the prior appropriation system. But we must find a way to determine water rights short of forty, fifty, or a hundred years of litigation. Changes must be made in the Office of the State Engineer, as well as at the courts handling adjudications, to address the unique nature of these cases (e.g., thousands of defendants, common legal and factual issues) and to ensure that they are completed in a timely manner. A mechanism should be established to enable priority administration to proceed well before final decrees are entered in adjudications.

Fortunately, some change is beginning to occur. Traditionally, the State Engineer has given a low priority to completion of adjudications. Recently, however, he has proposed placing a high priority on their completion and has proposed to dedicate more staff and resources to processing adjudications. He hired a retired Supreme Court justice and a retired court of appeals judge to examine how to improve adjudication efficiency, to obtain agreement on priorities among the courts, legislature, and governor, and to outline what resources are needed by the courts to handle this cumbersome litigation.[26] Some possibilities are already being discussed. Water courts are likely to help facilitate resolution of complex adjudications and priority administration of water rights. Water banks may be an appropriate mechanism to facilitate temporary exchanges of water when a priority call is threatened because of a drought or when failure to meet interstate compacts deliveries is likely.

Adjudications are expensive and won't be completed without adequate funding. The Office of the State Engineer's preliminary cost estimate to

adjudicate non-Indian rights in the state is approximately $170 million dollars.[27] This money won't be available unless the governor and the legislature agree that completion of adjudications is a priority.

Whether through the avenues proposed by the State Engineer or others, this problem must be studied in detail, solutions proposed, and funding provided to speed up and improve the adjudication process.

Recommendations:

• Review and develop options for priority administration of surface and groundwater rights that are hydrologically connected.

• Review and develop options for priority administration of rights that are not fully adjudicated.

• Review current adjudication processes; determine if there are changes that can facilitate completion; and implement necessary changes.

• Establish a 10-year plan and timetable for completion of adjudications and commit requisite resources.

• Review options for offsetting impacts of pumping on more senior water rights in times of drought, especially when there is not a completed adjudication on the stream system.

• Review State Engineer hydrographic survey processes; determine if changes (e.g., remotely sensed mapping data, computer-automated analyses) can expedite these processes; and implement efficient changes.

4 Why Aren't We Planning?

Being Prepared/Making Choices

Chapter 1 described a daunting array of things that are going wrong or are likely to go wrong with our current management of water. We got ourselves to this point for a host of reasons. One important reason was our failure to acknowledge the limits of our water resources and to figure out how to use only as much water as we have available. Another reason was our failure to plan ahead to prevent the problems we now face.

At this point, New Mexico can follow three routes. We can continue the status quo, which is to do little planning for our future. Or we can use improved information to respond more effectively to current crises, such as our inability to meet our Pecos River compact obligations. Or we can take action to deal with the fundamental problems that loom on the horizon and figure out how we want to address them before we face the urgency and frenzy of a crisis. We can improve our management of water and we can prevent or ease crises, but that means we need to start with some basics.

DO WE KNOW HOW BAD IT IS?

How would you react if the state:

- did not know how much money it had or how much money was being spent?
- knew that in many accounts expenses exceeded income, but it only had plans to deal with the shortfall for some, not all, accounts?
- had made few plans to maintain or protect its current assets, fund needed infrastructure, protect valuable or important resources, or set aside funds for emergencies?

Fortunately, that is not how New Mexico manages its money. Each state agency has an accounting system that tracks all income and expenditures. The Department of Finance and Administration monitors each agency to ensure it keeps accurate, up-to-date accounts of money spent and received. Balanced budgets are prepared annually for the state and for each agency. The state has a fund set aside for dealing with emergencies or unforseen shortfalls. To protect our future, we established a savings account (the permanent fund) consisting of revenues from extraction of non-renewable resources like oil, gas, and other minerals and fuels. The state legislature identifies priorities, such as education, and appropriates funds for that priority in the budget. Budget decisions are made by the state's elected representatives in a public process.

We have not been nearly as responsible about our water resources, which – like public monies – are among the most important of our public resources. We do know that in many cases we are spending more than we have. We are only now beginning to quantify how much water we have and how much water is being used at local, regional, and state levels. Most water uses are not metered, and where they are, metering results often are not reported to the state. When metering results are reported, it appears that there is little systematic analysis of what the numbers tell us. We have some gauges along our major rivers, but many diversions and most return flows are not metered. We know a lot about our most heavily exploited underground aquifers, but we will always need to know more.

WE NEED THE FACTS/WE NEED WATER BUDGETS

We are well along in developing regional water budgets. A number of

municipalities and counties now have water budgets, and the state has taken the initial steps towards developing a state water budget. Water budgets, like financial budgets, consist of:

• assets or an inventory of available water supply, including precipitation, stream flow data and surface water yields, storage amounts, evaporation, groundwater data, water level draw downs based on depletion amounts, waste water availability, and water quality impacts on availability;

• debits or an inventory of current demand based on type and location of use and water source, population projections and projected water demand by use; and

• an understanding of the relationship between supply and demand, i.e., at what point did or will demand begin to exceed supply?

"[G]iven present uses in the basin, the available supply..., on average, is virtually consumed within the Middle Rio Grande region."
– S.S. Papadopulos & Associates[28]

A water budget allows us to understand the limits of our water supply over time and in drought periods. Once we have a fairly accurate assessment of water availability and projected uses, we can decide how to balance supply and demand. If a local government wants to add a new water use, it will know if water is available. If no water is available, it will need to decide which existing use is to be eliminated or it will have to purchase water from another source. These decisions are no different than those made every day by governments, businesses, and families based on their financial budgets. When a municipality wants to provide a new service or build a new building, unappropriated money must be available, some expenses must be cut to free up money for the new use, or the municipality must figure out how to raise new money. In the end, there must be a balanced budget.

WHAT IS WATER PLANNING?

Water planning is informed decision-making.[29] It has four fundamental components:

• **Facts and information**. In addition to water budgets, we need other information. We need to know how surface and underground water interact with each other. How does water quality impact water quantity? What technical and legal constraints exist to reducing demand or increasing supply?

• **Vision and Policy**. What do we want for our future? What are our policies regarding growth, protection of our rural and cultural heritage, economic vitality, environmental protection? Can we identify common goals or priorities? A plan needs to be responsive to people's needs and desires.

• **Solutions and Strategies**. A plan integrates the facts or information with the vision or policy to develop solutions to problems. It answers questions like: Do we need new infrastructure? How much water can we conserve? How do we manage demand? A plan provides a way to resolve or minimize conflict, to solve problems, and to make informed choices. A plan is comprehensive; it outlines how we accomplish our goals given existing water supply and demand, both now and in the future. A plan should be consistent with other local, regional, and state planning as well as land use plans,[30] and a plan needs to be ongoing.

• **Implementation**. Once we determine how we intend to meet demand with available supply, in most cases our elected officials will need to pass ordinances or laws or budget monies so the plan can be implemented and enforced.

SO, WHERE ARE WE IN THE PLANNING PROCESS?

With respect to *Facts and Information*, we are quite far along. We know a great deal about water budgets in major river and aquifer systems (we have dozens of budgets, historically, perhaps a hundred). The principles of surface water-groundwater interaction are well understood. When anyone says more information is needed, it's always about local details, and knowing all details is impossible. Nevertheless, as we reiterate throughout this report, far more complete metering and gauging of water uses throughout the state must be a top priority. Better quantification of our water uses will be a key factor in developing needed water plans and for better management of our water supplies.

Vision and Policy. Throughout this report you will hear us say: plan, plan, plan. Plan for what? Plan to fulfill a statewide vision. Only when we have that vision can those policies enumerated above – growth, heritage protection, economic, and environmental protection, etc. – be created. So we need that vision, and we need leaders to guide us in creating and implementing that vision.

What do we want New Mexico to look like 50 to 100 years from now? Answer that question, and the broad concept of a vision is ready to be outlined. Earlier we have mentioned the University of New Mexico Institute for Public Policy poll, which in 2000 showed that New Mexicans statewide place a very high value on providing water to preserve both agriculture and our riparian habitat. These water uses ranked barely below providing drinking water for existing homes. Certainly the poll didn't ask respondents to make any of the difficult choices that the real world requires.

Nevertheless, the poll is a clear declaration of the public's voice and values. It starts us on the process of defining what the people of New Mexico want the state to look like in their childrens' lifetimes, and in that process identifying what tradeoffs public consensus suggests should be made in order to get there. We suggest that this points the way to defining the vision for water that is so important for planning. If we can get this far, then we can start the complex process of outlining *Solutions and Strategies*.

Water planning is now occurring regionally. In the 1980's, the legislature decided that water planning would best be accomplished on a regional level and allowed regions to determine their own boundaries. As a result, boundaries between regions are more political than hydrologic. There are 16 regions in the state. Each region is charged by statute with the following tasks:

- determine the region's available water supply and future water demand
- review the region's "public welfare" and water conservation
- determine how the region will meet demand with supply.[32]

Four regional water plans have been accepted by the Interstate Stream Commission, the governmental body given authority over regional water planning by the legislature.[33] A few other regions are close to completing their water plans; many regions are still evaluating supply and demand. Once regional water plans have been completed, we will have taken a major step forward. Each region will have information not now available and will have initiated its own water management plan.

New Mexico has also begun to develop a state water plan. In 1998, the legislature appropriated $750,000 to develop a "framework state water plan." The appropriation is being used to update an assessment of water resources

"Aside from the small amounts of water that presently are surplus to current requirements in New Mexico, the only way in which water requirements can be met is by using existing water supplies more efficiently or by using water supplies for a different purpose than they are now being used."

– New Mexico Water Resources Assessment for Planning Purposes, 1976[31]

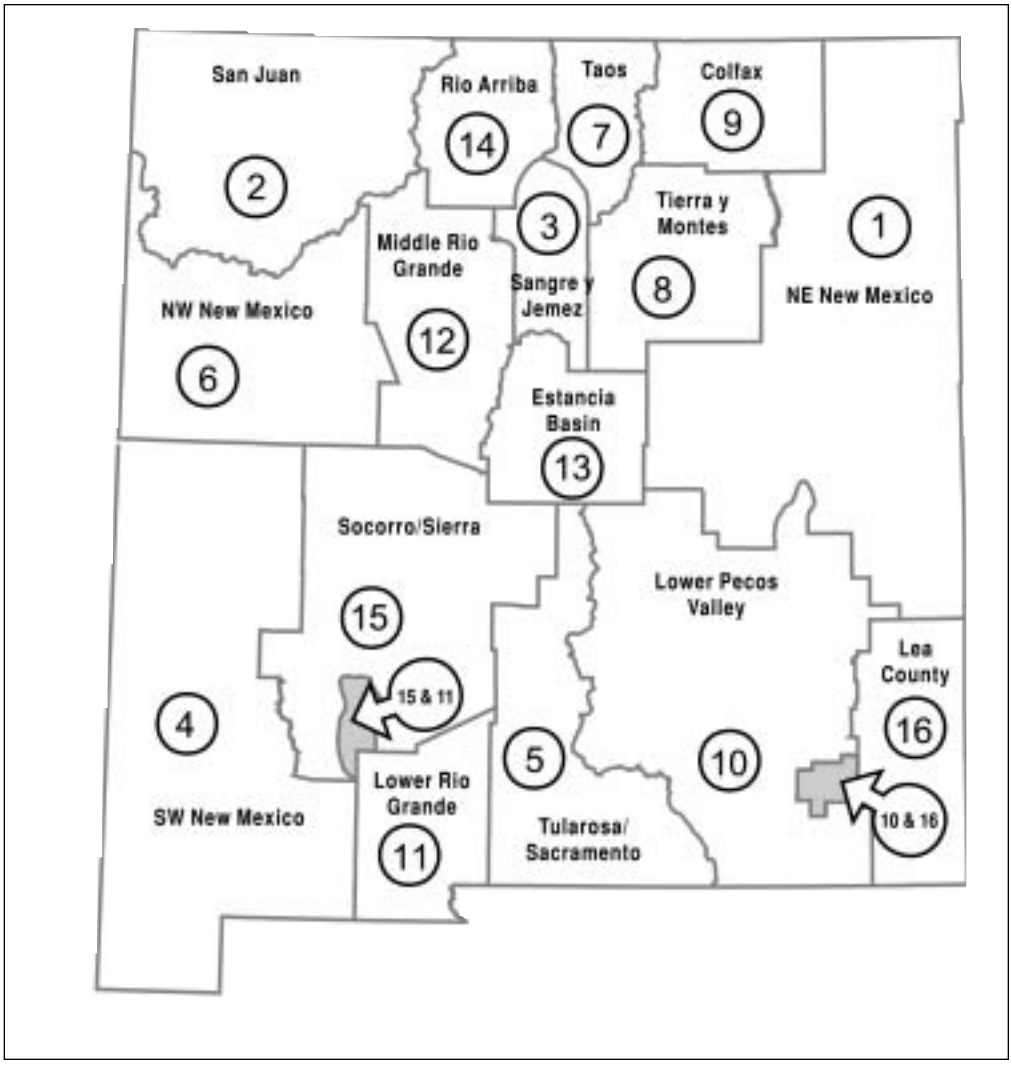

FIGURE 5 - Regional Water Planning Regions
Interstate Stream Commission

that was completed in 1976; to use existing information to develop water budgets and future demand scenarios for river and groundwater basins; to evaluate the adequacy of available data and measurement and monitoring systems, including Geographic Information System (GIS) mapping; and to evaluate evidence of deteriorating watersheds. The "framework is also intended to establish the technical basis for the plan, develop a "critical path" and time frame, and estimate the costs of completing a state water plan.[34] In addition, the Interstate Stream Commission has initiated public hearings throughout the state to discuss a state water plan.

WE NEED A STATE WATER PLAN

While completion of regional water plans will be a step forward, regional water planning by itself cannot solve our problems. The most fundamental water issues are much bigger than any single region. Moreover, water planning must involve programs and mandates of multiple state agencies as well as federal agencies.

Furthermore, regional water plans will inevitably be inconsistent with

one another. For example, if one region plans to buy up water in another region to meet its future needs and the region containing that water wishes to retain it for its own growth and economic well-being, what happens? We need a process to ensure that regions respect each other and that they do not harm values held by the state. And underlying these problems is the fact that a state is more than a sum of its parts. What do we want for New Mexico's future? We can only advance if there is a process for agreeing upon common goals and solutions.

Using regional water plans, we need to collate the available information and develop water budgets for all the rivers and groundwater basins in the state. Rivers and aquifers cross the boundaries of water planning regions, not to mention state and international boundaries. Ensuring that we meet interstate compact delivery requirements is the state's obligation, not a regional issue. When a severe drought comes, regional solutions may be inadequate and state resources may be needed. A state plan must enable us to address all of these problems and many more.

An important part of statewide water planning is preparing for droughts. New Mexico has a "Drought Plan," a document that focuses on interagency communication, monitoring, and data sharing, with some mitigation activities. Unfortunately, it is not yet a substantive action plan. Much more work needs to be done to develop explicit, step-by-step techniques for preventing or mitigating the worst of drought stresses while assuring compliance with interstate river compacts. In addition, an open discussion about identifying the difficult choices and decisions that inevitably accompany drought-related planning would educate the public.

Once issues are identified and prioritized, we can begin to identify, analyze, and compare solutions. We can examine the trade-offs associated with the various alternatives. We can look for long-term solutions and ways to implement those solutions.

Developing a state water plan must be done in a way that involves the public to the greatest extent possible. Water planning regions have been creative in figuring out ways to both assimilate complex technical information and ensure that all members of the public have a meaningful voice in the process of developing regional water plans. The same principles can be applied on a statewide level.

Even though we are well into the computer era, the Office of the State Engineer has only partially computerized its paper records of water rights into an electronic data base referred to as WATERS, the "Water Administration Technical Engineering Resource System." Data have been abstracted and entered for five water basins, but as of this writing 27 remain.[36] The Office of the State Engineer estimates that at the current rate, it will take about 16 years to complete transferring paper records to the WATERS database.[37] A completed and easily accessible computerized data base is necessary for all planning and management; this process must be accelerated. We cannot wait 16 years to begin to plan and manage our water resources.

Finally, there still is no mention of a state water plan anywhere in the state's laws, and this omission needs to be remedied quickly.

Public Wants Water Planning

New Mexico residents feel strongly that it is "important for New Mexicans to come to an agreement soon on a plan for managing our water to avoid increasing conflict over water in the future."[35]

LINK LAND USE AND WATER PLANNING

Land use decisions are made at the local level by city councils and county commissions, while water use is administered by a state agency, the Office

of the State Engineer. Therefore, the two – land use and water use – are not readily linked. As populations increase and water demand equals or exceeds water supply in more and more communities, it becomes more important to consider water availability when making land use decisions. A local government will need to coordinate its land use with its water use if it expects to have sufficient water to meet its projected growth.

The water planning process outlined here would enable a local government to:

• Prepare a realistic water budget that balances supply with present and future demand.

• Ensure that water is available for things it has determined are priorities (affordable housing, parks, or economic development for example).

• Connect water planning and land use planning.

• Develop measures to protect and balance agricultural, environmental, economic, municipal, and cultural uses of land and water.

• Enable growth and development to be consistent with land use and water plans.

• Prepare for drought years.

Recommendations:

• Increase funding to accelerate completion of WATERS.

• Continue to work with regional water planners to ensure that all regional plans are completed within three years and that regions continue to address how they will meet demand with available water supplies.

• Conduct polls to ask what people want New Mexico to look like in 50-100 years and what tradeoffs are acceptable to achieve it.

• Enact legislation that mandates creation of a state water plan addressing the following needs:

- accurate information that comes from measuring, metering, and monitoring water supply;
- water budgets at the local, regional, and state level;
- a connection between water budgets and water use;
- management of the state's water resources;
- a vision for the future;
- drought planning;
- public involvement;
- adequate funding; and
- a connection between water and land use planning.

• Link land use and water planning at the local and regional levels.

5 Protecting Groundwater Resources

Groundwater is a Non-Renewable Resource

About half of the water used in New Mexico comes from aquifers – those underground geological strata that will yield water readily to wells. Annual groundwater depletions have increased from less than a half million acre-feet in 1940 to one million acre-feet in 1965 to about 1.4 million acre-feet in 1990.[38] More significantly, 90 percent of New Mexico's population uses groundwater for its drinking water.[39] This is the highest percentage anywhere in the western United States and the fourth highest in the United States.[40] While there is a huge amount of groundwater in the state (thought to be around 20 billion acre-feet), only one-fourth of that is relatively fresh water.[41]

Of course 5 billion acre-feet of fresh water is still a huge amount. So why are we worried? It's because that water is spread so unevenly over the state. Some groundwater, as in parts of the Rio Grande Valley, the Roswell Artesian Basin, and parts of New Mexico's High Plains, is in great aquifers. But this is the precisely the groundwater already being heavily exploited or over-exploited that is central to the concerns in this report. The rest, cumulatively still a huge amount, is spread widely in smaller volumes in limited aquifers, remote locales, fluctuating (therefore unreliable) volumes, great (therefore uneconomic) depths, of marginal quality, or occurs in other situations that makes it unavailable for other than local or smaller-scale use.

Unfortunately, because we traditionally have elected to "administer water rights" rather than manage our water resources, we find ourselves relying more and more on a groundwater resource that is being used up. In areas where there is no recharge from surface water, the State Engineer usually assigns the groundwater basins a forty-year life and assumes that new appropriations do not impair existing users so long as the water in the aquifer will last each permittee (including the *last* to get a permit) at least 40 years.[42] In stream-connected aquifers, the State Engineer allows mining of groundwater at rates that exceed the rate of aquifer recharge. When these policies were developed, it was hoped that additional water could be obtained when needed from new water projects. The consensus now is that large-scale, new water projects will not be built and that new water imported from outside the state is not likely in the foreseeable future. After all, other states are also finding their populations increasing and their water reserves diminishing, just like New Mexico.

In some areas of the state, aquifers are declining at an alarming rate. This is true for parts of the Ogallala aquifer, a giant non-recharging aquifer that stretches through eight states, including much of the eastern part of New Mexico. As the State Engineer Office stated in a 1999 report, "concentrated pumping in Curry and Roosevelt Counties in New Mexico as well as Bailey county in Texas will de-water large portions of the most productive areas of the basin as early as the year 2010."[43] The Albuquerque aquifer is also suffering major declines. In some parts of the city, the water table has been lowered 150 feet, and the rate of groundwater mining in the Middle Rio Grande is estimated at about 60,000 acre-feet per year.[44]

We cannot continue to mine our groundwater aquifers at the current rate. Not only will we run out of water – in some places quite soon – but using more water will reduce river flows, dry up many springs, and often lead ultimately to subsidence problems on the land surface. Finally, as we discussed above in Chapter 3, holders of senior surface water rights suffer impairment of their rights from excessive groundwater pumping.

Given that New Mexicans are so dependent on non-renewable groundwater, we should be more concerned about protecting this resource from overuse. Described below are some of the problems and some proposals to improve New Mexico's groundwater management.

THE WAY THE SYSTEM WORKS NOW

Until the State Engineer "declares" a groundwater basin, people are allowed to drill new wells without needing any approval whatsoever from the State Engineer. New wells in undeclared groundwater basins have been the source of many of the problems such as those in the Pecos River Basin (see Chapter, 3 above), where groundwater exploitation has dried up important springs and caused marked reduction of Pecos river flows, leading to claims of impaired senior surface water rights along the river.

Square Miles in Declared Groundwater Basins

1970	40,067
1980	71,706
1990	86,073
1997	102,598
1998	107,925
2000	110,345

TABLE 1
Office of the State Engineer

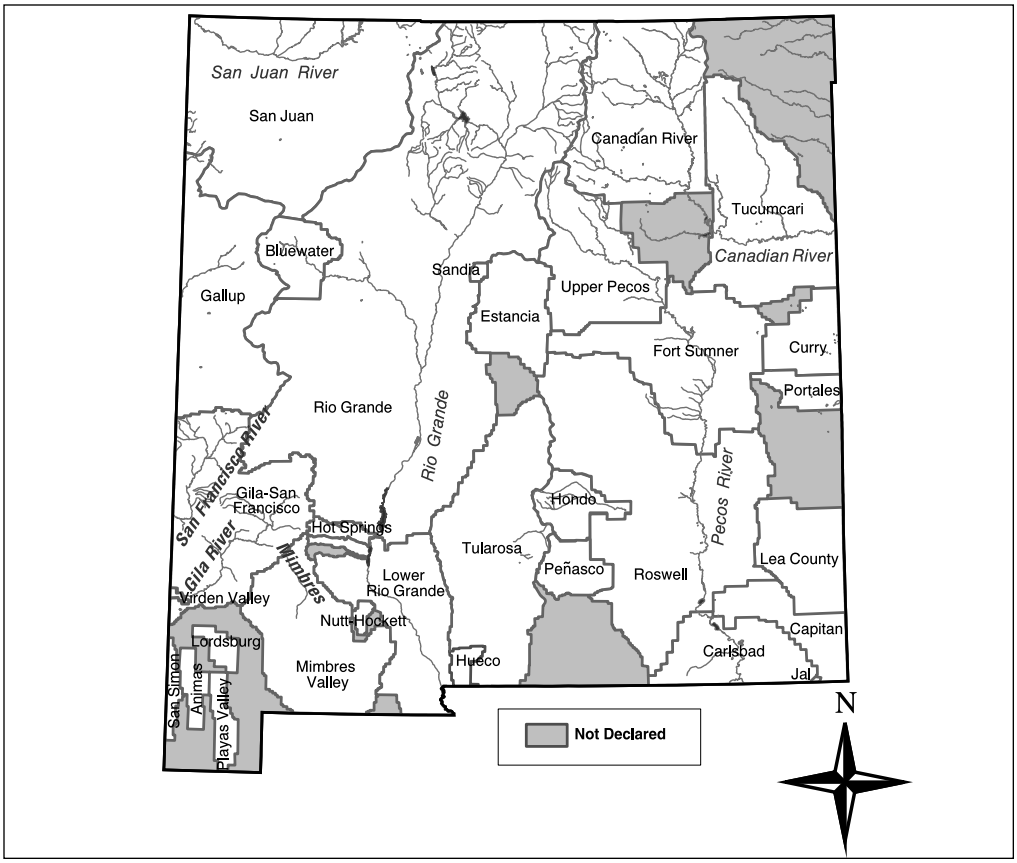

FIGURE 6 - Declared Groundwater Basins
Office of the State Engineer

Once a groundwater basin has been declared by the State Engineer, new wells require a permit. Even so, pre-basin water rights unfortunately are not compiled or evaluated after the basin is declared until the basin is adjudicated. By statute, the State Engineer can approve applications for new water uses only if there exists unappropriated water and if the new use of water will not impair existing water rights. As noted above, in basins isolated from stream systems, impairment is allowed so long as the basin will provide water for the 40-year period designated by the State Engineer as the "life of the basin."

In stream-connected aquifers, the State Engineer now makes an effort to protect senior surface water rights and to keep the river "whole" for purposes of delivering water to downstream users, including Texas and Mexico as required by interstate stream compacts and treaties. The State Engineer considers the timing and extent of any impacts anticipated from pumping on existing surface water rights in the streams and, in theory, allows new appropriations of groundwater that will impact surface water only if there is no impairment to senior water rights owners and if the applicant buys and retires existing surface water rights to protect the river from further surface water flow reductions.

Even so, the safeguards against ever-increasing impairment of surface water rights through groundwater exploitation sometimes remain inadequate. State Engineer models often have overestimated return flows, thus underestimating surface water depletions from pumping. Surface water rights that have been provided by applicants to offset depletion often have been rights never exercised regularly or fully, which is exactly why they were for sale, whereas the new groundwater permit tends to be fully exercised.

In addition, pre-basin water rights – those that come from pumping before a groundwater basin is declared – carry with them the right to deplete surface water up to the full amount of the right. Not only are these rights not separately listed in compilations of surface water rights, but they have the disconcerting impact of causing surface water depletions that are delayed but increase year after year over a long period of time. All in all, impacts of pumping on surface water flows are inexorably increasing in many places in the state.

In a few places, the opposite is taking place. Some cities are pumping groundwater, running sewage through water treatment plants, and discharging the effluent into a river at a greater rate than the accumulating negative impacts on surface flow resulting from pumping the groundwater. The Albuquerque water treatment plant, for example, is estimated to be the fifth largest tributary to the Rio Grande in New Mexico. Meanwhile, the city's groundwater mining has lowered the water table more than 100 feet under much of the city in the past 40 years.

LACK OF METERING

Unfortunately, only the largest wells in the state, and certainly not all of them, are metered. Domestic wells are not required to be metered unless they serve more than one household.[45] We do not know how much groundwater we are withdrawing, much less how much of the withdrawals are depleted, how much is returned to rivers as recharge, or what the effects of pumping are on surface water. Without this information, we cannot develop an accurate and detailed water budget for the state's groundwater use.

THE DOMESTIC WELL EXEMPTION

There is one significant exception to the prohibition of new uses of water that will impair existing users – the so-called "domestic well statute."[46] This law provides that anyone (except within a few municipalities) may obtain a state permit for a well to be used for domestic supply – no matter what the consequences for anyone else's water rights. State Engineer regulations allow up to three acre-feet per year to be pumped,[47] even though the State Engineer estimates gross withdrawals per residence to average 0.35 acre foot per year.[48]

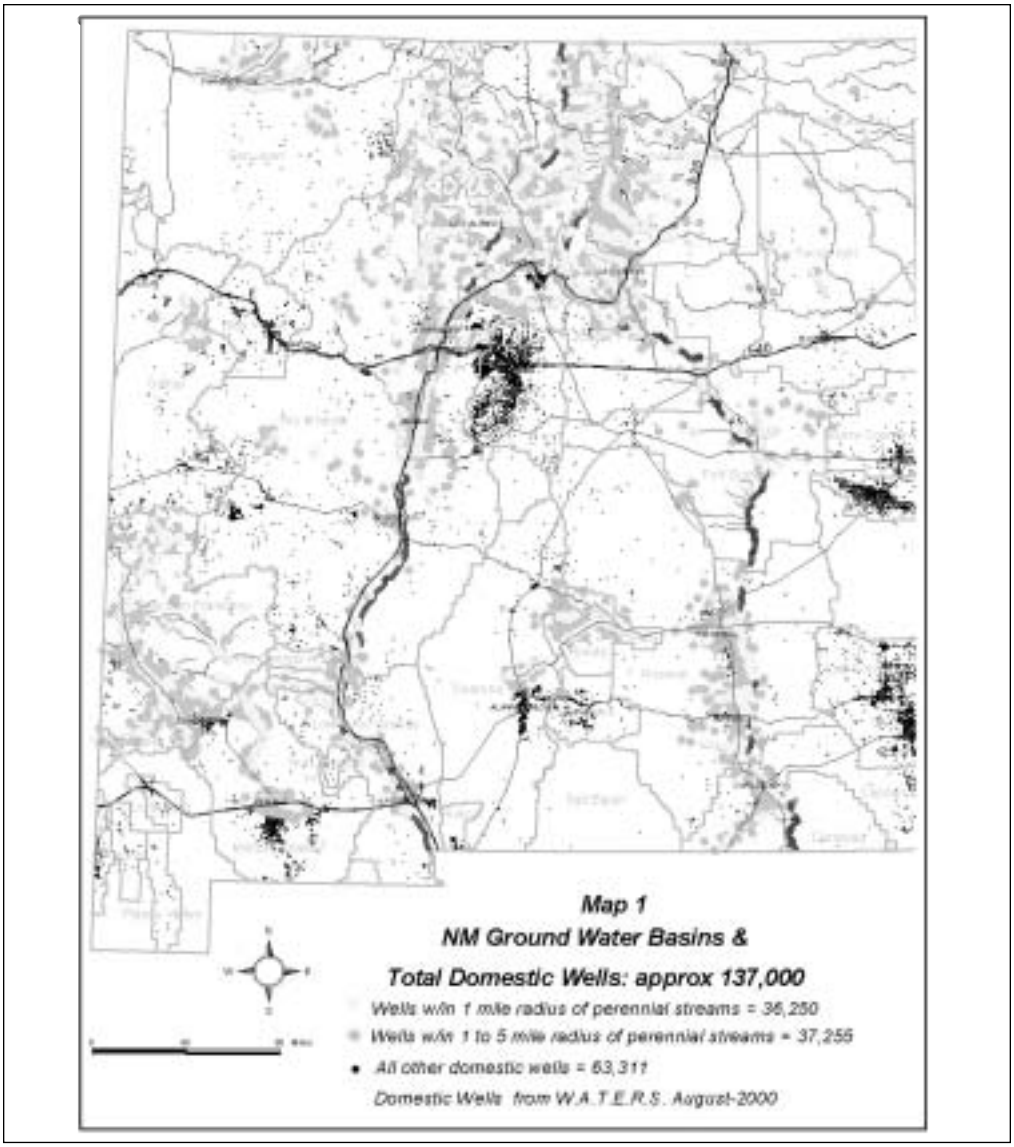

FIGURE 7 - Domestic Wells from W.A.T.E.R.S., August 2000
Office of the State Engineer

The State Engineer Office now estimates that about nine percent of New Mexico's residents rely on domestic wells.[49]

When the "domestic well" statute was enacted in 1953, people believed that domestic wells would not have much impact on aquifers. The State Engineer Office has issued about 140,000 domestic well permits since then, and it continues to issue thousands of new permits each year.[50] In 1999, for example, nearly 6000 domestic well permit applications were received and approved.[51] Even though the State Engineer believes that domestic wells cumulatively are impairing surface water rights in some areas as well as impairing the state's ability to meet its compact obligations, he has not amended the regulations to reduce the amount of water allowed to domestic wells to less than three acre-feet per year.

The most recent State Engineer Office report on domestic wells estimates

that the potential annual domestic use groundwater withdrawals range between about 48,000 and 137,000 acre feet per year (assuming the average amount withdrawn ranges between 0.35 and 1.0), about 45 percent of which is estimated to be net depletions.[52] Yet, with 140,000 domestic wells permitted at three acre-feet each, the actual withdrawals and depletions legally could be as high as ten times these amounts. We simply don't know.

The State Engineer has concluded that the domestic well statute gives him no discretion to deny a domestic well application and no grounds for investigating whether a domestic well would potentially impair senior water rights. Thus, although many of the tens of thousands of domestic wells in the state, when considered cumulatively, are impairing senior water rights, they continue to be approved automatically. Whether or not the State Engineer can constitutionally grant domestic well permits for wells that will impair existing water rights,[53] it is plainly bad policy to ignore the impacts of those wells in areas where groundwater aquifers are already overtaxed and where groundwater demands are depleting water from fully-appropriated stream systems.

While the State Engineer has yet to amend the groundwater regulations specifying a production limit, he has agreed that domestic well production may have additional restrictions imposed by local governments. Santa Fe County, for example, limits domestic wells in certain areas to 0.25 acre-feet per residence. In addition, in a few adjudications, including in the *Aamodt* water rights adjudication in the Pojoaque valley, the court limited domestic wells to providing indoor water use only (although a subsequent agreement in *Aamodt* has been reached that allows use of up to 0.7 acre-feet per residence per year). Pursuant to a court order in *Arizona v. California*,[54] on the Gila River, the State Engineer grants domestic wells permits only for indoor use. Finally, in new guidelines for the Estancia Valley, the State Engineer proposes to allow future domestic wells only to supply water for indoor uses.

SOME SOLUTIONS

Given the increasing population and corresponding increasing water demands in New Mexico, we do not think that the state realistically can reduce its groundwater use to a truly sustainable level any time soon. We simply have grown too dependent on use of non-replenishable groundwater and, to date, have not shown any willingness to limit water use to the amount that is available or to take the steps necessary to link growth to water availability.

Putting aside questions of whether sustainable groundwater use is possible, or even desirable, we believe there are many steps that can and should be taken to improve the state's management of its groundwater and begin to approach a more sustainable level of use. At minimum, these steps will help to reduce water waste, reduce impairment of senior water rights, and ensure that we use our groundwater in the manner that most benefits the people of the state.

Metering and Reporting

Metering and measuring water is a cornerstone upon which effective and equitable water management depends. Whether the tiered groundwater regulatory system described below is adopted or not, we must require metering on most, if not all, wells and return flows, and require reporting of the results

to the State Engineer. Metering not only provides crucial data on water use, it also can reduce water use,[55] presumably because the metering data gives immediate and accurate feedback to water users. Without metering, it is difficult to develop and apply a water budget.

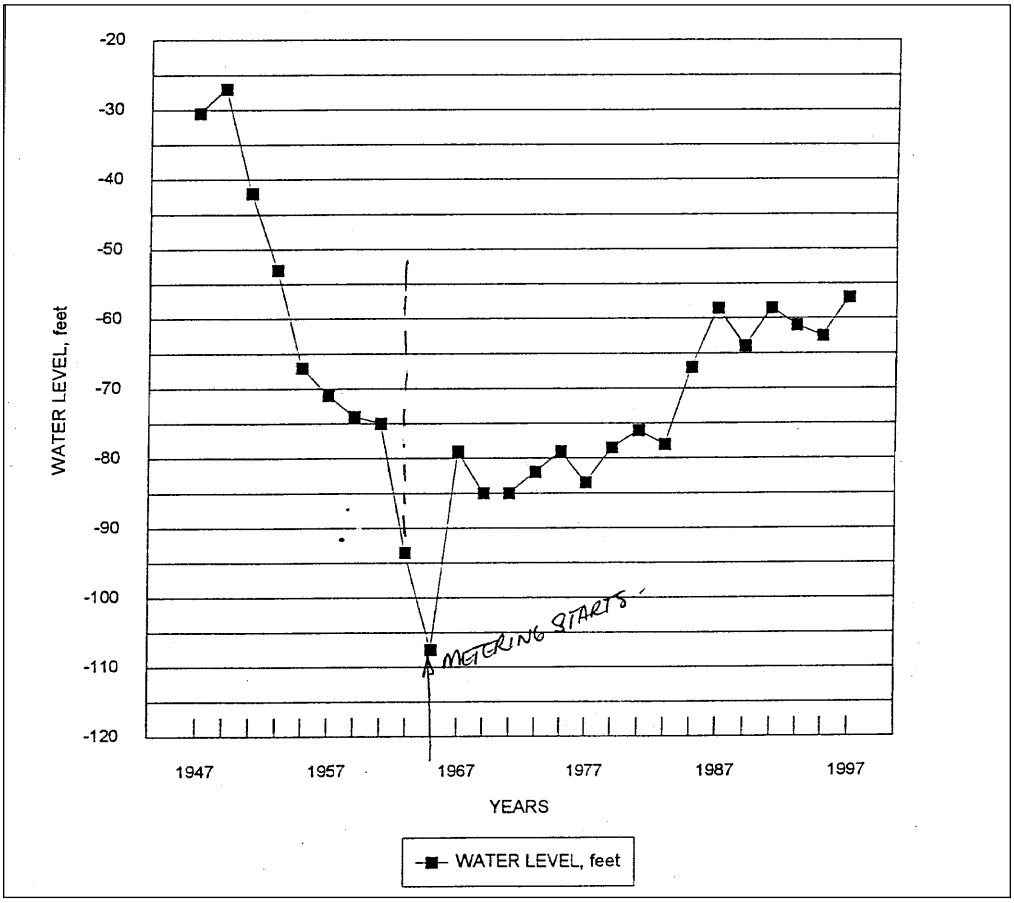

FIGURE 8 - Roswell Artesian Basin Well Levels
New Mexico State University - Agricultural Service Center[56]

And as described below, the degree to which metering and reporting to the State Engineer are required could vary according to the degree of groundwater problems in the area if a tiered system is adopted. Issues that need to be considered include whether the requirements would affect existing wells or only new wells, whether meters should be required on wells with very limited output, and how reporting to the State Engineer would be implemented.

Water Management Areas

Some areas of the state are experiencing severe groundwater declines and shortages. In other areas, demand is not yet outstripping supply and there is no immediate need to alter the current regulatory system. This variation in impacts on available groundwater calls for a layered or tiered regulatory system, with greater controls where the impacts are more severe and where communities' water supplies are most threatened.

We support a three-tiered groundwater management system for the state. The most aggressive would be for "critical management areas" (CMA's), those areas with excessive groundwater level declines or where

existing water rights are being impaired. The second tier would be an intermediate set of regulations for "stressed water management areas," where population density is sufficient to have a significant impact on water supply and the area is at risk of becoming a CMA but the problems are still less severe than those in a CMA. Measures could be taken in stressed water management areas that would be designed to prevent the need to designate them as CMA's or at least delay designation for some time. The third tier would be for areas that are sparsely populated and where wells are dispersed and have a minimal impact on water supply and on other users, i.e., "minimal impact areas"; changes in these areas would be minimal, if any.

Recently, the State Engineer has developed basin-specific groundwater management "guidelines" for three areas with serious aquifer overuse problems: the lower Rio Grande (below Elephant Butte Reservoir), the Middle Rio Grande valley, and the Estancia Basin.[57] CMA's are established where groundwater levels are declining rapidly and where the saturated thickness of an aquifer is expected to go below specified minimum levels within the 40 year planning period. The guidelines, among other things, attempt to protect CMA's by imposing extra limitations on pumping in and adjacent to those areas.[58] The guidelines' restrictions on CMA's include some limits on domestic wells (required metering, prohibition on outdoor watering) and a prohibition on new appropriations.

We applaud these new guidelines, but suggest there is a need for a more systematic process to establish and manage stressed and critical management areas throughout the state. Some question whether guidelines are mandatory – which they must be to be effective. The State Engineer's response is that the formal process for promulgating regulations is rigid, time consuming, and does not allow regulatory ideas to be tested, modified, or discarded and replaced as administrative experience is gained. Thus, in an environment of regulatory change, guidelines may provide a reasonable first step toward regulations.

Ultimately, regulations should set forth the criteria for designating the boundaries of each type of area and the mechanisms by which the boundaries are determined and changed. Annual water level declines exceeding a certain amount, diminution of surface flows in the area, water quality problems, and close hydrological connection to fully appropriated stream systems could be criteria for designation of stressed or critical management areas. Regulations should also be adopted to set forth the management requirements for stressed and critical management areas. Measures such as restrictions on domestic wells, prohibition of new appropriations, and limits on new wells near CMA's should be considered for these areas.

Domestic Wells

Several steps might be taken to address problems surrounding domestic wells. A first step would be to inventory existing wells more accurately and to estimate what impact they are having on the aquifers and where.

Second, domestic wells must be regulated. There is absolutely no reason for the State Engineer to continue to issue three acre-feet per year permits to every domestic well applicant. In the *Aamodt* litigation for example, the proposed cap on domestic well usage at 0.7 acre-feet per year is roughly 19,000 gallons per month or almost five times the water used by an average family

in Santa Fe. Clearly a limit of 0.5 acre-feet per year or less would not be unreasonable.[59]

In CMA's, where an aquifer is in dire straits, new domestic wells should either be prohibited unless existing water rights are acquired to offset the impacts, limited to 0.25 acre-feet per year, or limited to indoor use, with less strict limits in stressed management areas. Where a public water supply is available, domestic wells could easily be prohibited (and are in some limited areas). Except in "minimal impact areas," the developer or homeowners for all new developments should be required to acquire sufficient water rights to supply the development rather than relying on domestic wells. Metering of all new domestic wells should be required, and retrofitting meters on existing wells should be considered. Existing wells could be restricted to their historical use amounts – consistent with existing law that requires that a water right exists only for that water that has been beneficially used – which in almost all cases will be significantly less than three acre-feet per year. Residents would still be free to acquire additional water rights and transfer them to their residence if they wanted to have supplemental water. Acceptance of mandatory metering of domestic wells for existing wells could be greatly enhanced if the state provided at least partial funding. Meters can cost from about $85 to $250.

Third, for effective regulation of domestic wells to occur, the domestic well statute, Section 72-12-1, will have to be amended. A first step was taken in 2001 when the legislature enabled municipalities with water systems to prohibit new domestic wells near existing water lines. The State Engineer should have additional discretion to condition or deny new domestic well permits in areas where new wells would impair the right of existing users or hinder the state's ability to make interstate stream compact deliveries.

Recommendations:

• Create a tiered groundwater management system with appropriate safeguards to protect areas where groundwater supplies are threatened.

• Increase measuring, metering, and reporting of water diversions and consumption.

• Amend domestic well regulations and statutes to reduce the amount of pumping allowed and remove the statutory requirement that all domestic well applications must be approved in order to prevent new domestic wells from impairing existing water rights or negatively impacting interstate stream compact deliveries.

"Water...symbolizes such values as opportunity, security, and self-determination... Strong communities are able to hold on to their water and put it to work. Communities that lose control over water probably will fail in trying to control much else of importance." – Helen Ingram[60]

6 Urban Development and Rural Stability

Do We Have to Sacrifice Our Rural Communities?

We all know the old saw: water runs uphill to money. What that really means is that cities and developers are buying up rural water throughout the West. Is this desirable? Why should we care?

GROWTH PRESSURES

The nation's fastest growth is occurring in the West. New Mexico ranked as the 12th fastest growing state by percentage of population in the U.S. in the last census.[61] Along with this growth has been a significant increase in withdrawals of water for new uses.

All of this growth has taken place even though New Mexico has very little water. In fifteen minutes, more water flows down the Columbia River in Oregon than flows in the entire state of New Mexico in a year.[62] And more than half our surface water flows in the Animas and San Juan rivers in the relatively unpopulated northwestern part of the state.[63] Virtually all our water is already appropriated.

Where will the water come from to supply all this growth? Until recently, it has been assumed that the water would come from agriculture. Finding more water for new development was "not . . . considered a problem because irrigation rights could be bought and transferred to provide the supply for the increasing population."[64] It is said that transfer of ten percent of agricultural water rights to municipalities would provide enough water for the state's population to double.

Transfers of water from rural to urban areas, however, are fraught with problems. Most important, transfers of water have impacts on the people and communities from which the water is being transferred and that are not parties to the transaction. The most serious of these may be the economic consequences associated with transfers of significant amounts of water. When farms are dried up, communities shrivel. Demand for farming-related goods and services declines, which in turn harms others providing goods and services to the community. With reduced economic activity, banks view the community as failing and financial support withers. As a result, the local tax base contracts and local institutions like schools, libraries, and fire protection suffer.[65] The Owens Valley in California, which was literally dried up when Los Angeles diverted most of the water in the valley, is perhaps the best illustration of how devastating transfers of water from agriculture to urban areas can be.

DO NEW MEXICANS WANT TO PROTECT THEIR RURAL AREAS?

Now that cities and developers are searching aggressively to buy up more water, many people resist a future where rural areas are dried up to support urban growth. The regional water plans of Socorro and Sierra counties and the comprehensive land use plan of Socorro County, for example, envision maintaining a rural economy and lifestyle and retaining local water supplies in their water planning region to meet increasing demand. The Estancia Basin regional water plan shares those concerns and aims. In a similar vein, water rights transfers to new uses from long-established rural communities are being protested more frequently.

In the statewide poll conducted by the University of New Mexico's Institute for Public Policy, nearly 2,000 respondents were asked to indicate whether they agreed with ten statements. The statement "We shouldn't put farmers out of business just so cities can grow" ranked third out of ten, behind only the importance of keeping water in rivers "to provide a green corridor and protect habitat for wildlife and vegetation" and of planning to manage our water to avoid future conflicts.[66] Similarly, "irrigation for farms" ranked third in a list of thirteen values; indoor use in existing homes ranked first, and "indoor use for new housing and developments" ranked fifth.

Assuming that the majority of New Mexicans do not want to dry up our rural communities, the state should address the issue of how to support reasonable urban growth without sacrificing rural communities.

People living in the rural parts of the state do not want to lose their water to urban growth. The UNM poll suggests that this view is shared by many New Mexicans in urban areas as well. Assuming that the majority of New Mexicans do not want to dry up our rural communities, the state should address the issue of how to support reasonable urban growth without sacrificing rural communities. Failing to take action will mean that, by default, rural communities will inevitably fall prey to the "Owens Valley" syndrome – a prospect that we believe the people of this state would not welcome.

WHAT STEPS COULD WE TAKE TO PROTECT RURAL AREAS?

If, in fact, New Mexico wishes to protect its rural areas, there are a number of actions we could take, some of which overlap:

Regional Water Plans

The state could provide that if a regional water plan states that water needs to remain in that region to protect the viability of rural areas, that provision must be honored, unless the State Engineer determines that there is a compelling public interest in allowing the water to be transferred elsewhere.

State Water Plan

A state water plan could articulate a policy that rural areas are not to be sacrificed to provide water to growing urban areas and should specify appropriate actions to further that goal. For example, cities could be mandated to meet stringent water conservation goals, or the State Engineer could be mandated to deny transfers out of rural areas if there would be a significant, negative impact on the rural area as a result. (See Chapter 7 for a discussion of agricultural conservation.)

Area of Origin Protection

Often water is transferred from one area, the "area of origin," to another area some distance away. Many states have enacted "area of origin" protection statutes. New Mexico could consider enacting a similar statute. Nebraska[67] and Kansas[68] both require that the benefits of leaving the water in the area of origin be considered. Arizona,[69] Idaho,[70] Montana,[71] Wyoming,[72] California,[73] Nevada[74] and Utah[75] all have different forms of restrictions on out of area of origin water transfers. There are also statutes in Arizona, California, Colorado and Nevada[76] that require various forms of limited compensation for the harm to the area where the water rights transfer originates. Right now, the only protection offered in the New Mexico water code for areas of origin is the problematically vague requirement that water transfers not be "detrimental to the public welfare of the state."[77]

Local governments could adopt ordinances or other policy positions that

would require that measures be taken to protect their rural neighbors from raids on their water supplies. For example, the Santa Fe City Council has taken the position that it does not "seek to purchase and transfer agricultural water rights, water rights that are native to the Rio Grande watershed; and that instead [the City] will go after imported water and possibly leasing agricultural water rights."[78]

Standards for Review

Some water rights transfers will prove to be more harmful to a rural area than others. The state could develop standards by which the impacts are analyzed, such as the degree of harm or benefit, whether the benefit or harm is short-term or long-term (see endnote 79 for suggested standards). Depending on the degree of harm, the transfer might be granted, granted with certain conditions to mitigate the harm, or denied altogether.[79]

"Win-Win" Opportunities

There do not always need to be winners and losers. With some creative approaches, we may be able to find "win-win" solutions. Some examples exist. In southern California, for example, the Metropolitan Water Board subsidizes lining of canals in the Imperial Irrigation District and the District leases the conserved water to the Board for 35 years, leaving the remaining water in rural areas.[80]

State Assessment Process

New Mexico could adopt a process similar to that required under the federal National Environmental Policy Act (NEPA) that would require that impacts of proposed changes in water use be evaluated and that ensures that there is adequate input from all affected parties.[81] This aspect of NEPA has been faulted for allowing opponents of projects to create delays and for producing overly complex and detailed analyses. The intention would be to avoid excessive delays while still assuring that all relevant issues, both positive and negative, are openly noted for the public to review.

Drought Options for Leasing Water

Under this concept, a farmer could sell a "Drought Option" to a city which the city could "call" in a water-short year. The farmer can price the option higher than his profit would be if he kept the water in a drought year (rather meager at best), and the city can avoid paying for a right it would not exercise in most years. Farming would be incrementally more profitable, and therefore more stable, and city life would be slightly more costly but much more secure. Limits need to be placed on such calls; otherwise the option would amount to a "slow transfer."

Recommendations:

• Include provisions in the state water plan requiring that regional water plan policies regarding water transfers out of the region be adhered to unless a compelling public interest is demonstrated in allowing such transfers.

• Consider enacting other area-of-origin protection legislation.

• Explore the complex options for allowing farmers to lease water rather than sell water rights and benefit financially from allowing temporary use of their

water rights or otherwise benefit from conservation in water use. Some of these options may best be considered under the broad heading of water banking (see Chapter 8).

7 Water Conservation

Developing Lifestyles Appropriate to a Semi-Arid Climate

Most of us love what water brings: large green trees providing shade in the summer, lush lawns and gardens, pools and fountains. Many of us seek to recreate lusher, wetter environments in this arid climate. We often give little thought to habits that are wasteful when water is scarce: running water continuously while washing dishes or brushing our teeth; taking long, luxurious showers; watering plants in the middle of the day; hosing off a patio, street or sidewalk.

But our water supply has limits. Although water supplies may have been adequate in past years with normal to above average precipitation, Las Vegas, Santa Fe, and other communities have had to make water use reduction mandatory in drought years. Many other areas have implemented voluntary water conservation measures. Communities are correctly concerned that if they continue to grow, demand will soon exceed supply even in years without drought conditions. Agriculture and ranching have always suffered when rainfall has been less than normal.

As demand begins to equal or exceed supply, we have two options. We can find new water sources for our favorite uses, or we can reduce demand. Population growth throughout the West has made it harder and harder to find new sources of water. Even if some new sources of water are available, they may not be adequate or they may be prohibitively expensive. Reducing water use – conserving water – increases the available water supply. Every gallon saved is a gallon that doesn't have to be found elsewhere. That may be true, but as we will discuss shortly, getting people to conserve requires that they be shown some clear benefit. Nonetheless, water conservation can go a long way toward ensuring that a community has enough water to meet demand.

It is critical that state, regional, and local governmental bodies immediately begin to develop and implement water conservation plans. It takes time for governmental bodies to make choices that the community accepts as equitable, to make the transitions that are needed in order to minimize disruption, and to institutionalize water conservation. It takes time to educate the public, to change attitudes and expectations, and for people to change their lifestyles.

Underlying many evaluations of whether a conservation strategy should be adopted is a determination of whether or not a new use of the conserved water will result in increased "consumption" of water. Preventing new consumptive uses of water has become an important water management goal of the Office of the State Engineer and Interstate Stream Commission. In many areas of the state, new consumptive uses of water will impair the rights of existing users and further deplete surface water flows that are needed to maintain our interstate stream compact deliveries.

Water conservation opportunities traditionally are recognized in urban, rural, and riparian environments. Of these, urban conservation is the most discussed and most easily implemented. Ways to conserve water in agricultural and riparian settings are less understood, less easily implemented, or more costly. For these reasons, agricultural and riparian conservation will require more attention and resources at the state level. A fourth opportunity for conservation, often overlooked, is the potential for reducing the amount of direct evaporation from the water surfaces of our storage reservoirs. In the following discussions, the more difficult issues are discussed first.

RURAL AGRICULTURAL USE

Because approximately 75 percent of surface water and groundwater in New Mexico is withdrawn for agriculture in New Mexico,[82] one might expect

that significant resources would have been committed to agricultural water conservation. Agriculture, however, faces a number of impediments to aggressive water conservation. These include:

• Under our prior appropriation water rights system, water must be put to a beneficial use and cannot be saved and used at a later time. If agricultural water is conserved and not used, it is subject to the forfeiture provisions of our water code – otherwise known as "use it or lose it." If the water is not used for a long enough period, the right to use the water will be abandoned. These are legal impediments and will need to be revised; a farmer is not going to invest in water conservation only to lose the benefits from the conserved water.

• The State Engineer believes that the farmer's marketable "water right" relates only to the water that is actually consumed by the crop she / he is growing, not the full amount that is diverted from the stream or aquifer to convey water to or from the field. This severely limits opportunities for benefits to the farmer if she / he conserves water (by lining a ditch, for example) as it is being conveyed to or from a crop. Generally speaking, the best opportunities for conservation may be in reducing the losses in delivering water to the crop, rather than in reducing the actual amount of water consumed by the crop.

• If a farmer were to "conserve" and sell water that was not consumed by the crop but diverted to convey water, the overall consumptive use is increased because the sold water now will be consumptively used rather than left to recharge aquifers or return to the river. As a result, the amount of water available to meet downstream obligations to farmers or obligations resulting from interstate stream compacts is reduced, which is not acceptable given our need to meet interstate stream compact deliveries and to protect the rights of senior users. Only water that was previously consumed and subsequently conserved should be transferred to a new consumptive use.

Agricultural Water Conservation[83]

In southern New Mexico, a project that combines installation of high flow turnouts and laser leveling of fields in pecan orchards and alfalfa fields has resulted in a reduction of two acre inches of water each time a one acre field is irrigated.

Also in southern New Mexico, modifying existing spray irrigation to apply water closer to the ground and reduce evaporation from water sprayed out higher and further from the crop (Low Energy Precision Application) has resulted in a 35 percent savings in water usage.

CONSUMPTIVE AND DIVERSIONARY USES OF WATER

Consumptive water use means that after the water is used, it is no longer available. Most often consumptive use of water occurs through evaporation by vegetation (evapotranspiration), or evaporation from open water in ponds, rivers, and reservoirs, or from the ground where it has been applied to provide water to a crop.

Water that has been "diverted" but not consumed remains in the system. Very little water is consumed for domestic uses, for example; most of it goes to waste water treatment plants or septic tanks. Often waste water or treated effluent is reused or returned to the river where it becomes available for reuse downstream. Likewise, more water is diverted to deliver water to crops than is consumed by the crop; the excess water also returns to the stream or underground aquifer.

Some "conservation" will be achieved from "conserving" water that would otherwise be returned to the local aquifer or stream system and be available for reuse or for meeting interstate stream compact delivery requirements (lining of ditches for example). If that water is converted to a new consumptive use, however, there is less water available in the system than there once was.

• It is not always clear that agricultural water conservation measures should be implemented. If a ditch is lined, for example, the water that had seeped out of the ditch may have been important for recharging the underlying aquifer. And ditches in many old acequia systems, many but not all in rural northern New Mexico, support cottonwood stands and wetlands that few want to lose.

• Another problem is cost. The state has worked with the agricultural community to develop a list of conservation measures such as laser leveling of fields, drip irrigation, more effective head gates, etc. Most of these measures cost money. Farmers argue persuasively that they should not be required to bear the financial burden of conservation measures without some benefit in return. Even the cost of metering water use – a first step toward water conservation – is often prohibitive for many small farmers.

In spite of the obstacles facing agricultural water conservation, the question remains: can New Mexico afford not to conserve water used for agriculture? We believe the answer is no. We are past the point in time when limits on water availability have made agricultural water conservation critical. Too many demands are already being made on surface water supplies. Unless the rate of groundwater depletion is slowed, more and more areas will find themselves without any groundwater at all. We must figure out how to make agricultural conservation work now and not wait for an even bigger water supply crisis before we act. We also need to determine which, if any, conservation measures should or could be funded by the state or federal government.

RIPARIAN CONSERVATION –- A MAJOR WATER USE THAT HAS NEVER BEEN ADDRESSED

Recent studies have highlighted the amount of water used by riparian areas, i.e., water used by the plants that line streams and rivers. It is estimated that in the Middle Rio Grande between the Cochiti Dam and Elephant Butte Dam riparian transpiration and river evaporation together account for about 37 percent of the total water depletion in the area.[84] Compare this to estimated depletions of about the same amount for irrigated agriculture and only five percent for urban consumption.[85]

Salt cedar removal projects over the past fifty years in New Mexico have achieved virtually no long-term water savings. We have learned a lot from our many failed projects. We have learned that salt cedars must be permanently replaced by other vegetation that uses less water in order for water savings to be sustained. While this involves significant cost and ongoing management, it is possible.

Newer studies are identifying better ways to minimize the regrowth and to replace salt cedar groves with native vegetation, thereby simultaneously reducing riparian water consumption and improving wildlife habitat. Both the Bosque del Apache south of Socorro and Santa Ana Pueblo north of Albuquerque have major projects underway addressing replacement of salt cedar and Russian olive thickets with native vegetation. But to successfully benefit from reductions in riparian transpiration, we need to know and do more. We need funding to ensure that we learn how to effectively and convincingly reduce riparian losses without sacrificing wildlife and fish habitat. Once we know how to reduce riparian losses and to keep the exotic tree species out, we will need the funds to put our knowledge into practice.

"Snow Not Filling New Mexico's Water Needs"
Albuquerque Journal, January 27, 2002

"Water Affecting Growth: Espanola City Council Extends Moratorium"
Albuquerque Journal, February 13, 2002

"Water May Be The Brake in Torrance, Business Outlook"
Albuquerque Journal, August 20, 2001

"Chimayo Meeting Centers on Water Woes"
Santa Fe New Mexican, July 17, 2001

"Dry Taps Common in Subdivision"
Albuquerque Journal, June 21, 2001

"City Planners: Water Supply Might Be Gone Within Decade"
Santa Fe New Mexican, August 3, 2000

"Rainfall Helps, But Water Needs To Be Conserved"
Roswell Daily Record, July 16, 2000

"Weather Poses Water Problems"
Quay County Sun, August 30, 2000

"Meteorologist Predicts Decades-long Dry Spell"
Santa Fe New Mexican, August 20, 2000

"Aquifer Under Duke City Shows Marked Decline"
Albuquerque Journal, September 22, 2000

RESERVOIR EVAPORATION SUPPRESSION

Large reservoirs, as we mentioned earlier, result in huge amounts of water lost through evaporation. Some four decades back the announcement of an evaporation suppression material that could be floated on water surfaces to reduce evaporation generated considerable excitement in the West. The possibility that this serious source of water depletion could be reduced was a heady prospect. Unfortunately, the promise was short-lived. While the material was inexpensive, reportedly worked fine on small ponds, and seemed non-toxic to aquatic life based on tests, when spread on large expanses of water, wave action disrupted the suppressing layer and allowed evaporation to proceed.

New research has been undertaken recently due to the increasing importance of conserving water in arid parts of the world. This research, which includes a limited investigation at Sandia National Laboratories, is looking for new chemical compounds that would help accomplish these goals. Progress currently seems to hold promise. Tests reportedly are underway at several pond sites in this state.

Perhaps a better approach is to simply move the water to places where there is less evaporation. That could mean moving water in hot desert area reservoirs (e.g., Elephant Butte) to higher elevations, more northerly reservoirs, or it might mean moving the water into underground storage (see discussion in Chapter 8).

URBAN CONSERVATION

Because urban areas generally must meet constantly increasing demand, state statutes allow municipalities, counties, and some water systems to acquire water as long as it will be put to beneficial use within 40 years.[86] Consequently, if a city or utility successfully implements conservation measures and reduces its water usage, it is not subject to the "use it or lose it" mandate that so often blocks conservation in other areas. Cities will be able to retain conserved water to meet future demand (or compensate for inadequate supply in drought years) and delay or avoid the need to acquire new water supplies.

For urban areas, water conservation has many advantages over finding new water supplies. Some water conservation measures rely on merely changing attitudes and habits and are therefore relatively inexpensive. For example, some municipalities have achieved a ten to 60 percent reduction in water use in times of drought through inexpensive, voluntary public programs.[87] Other measures may be more expensive, such as toilet exchange and rebate programs, but they are often more reliable than expecting to build new dams, sink new wells, or buy more water rights. Still other measures may be unpopular, such as increasing the price of water or changing the pricing structure to encourage conservation. Pricing is a mechanism that works,[88] but there will only be public support for increased prices if each segment of the population pays its share and the public perceives the pricing system as fair and equitable. Even mandatory conservation measures are often easier and cheaper to implement than dealing with the difficulties associated with finding new water supplies.

Once those first steps to conserve water have been taken, which are usually easy and cheap, additional measures, more difficult or more expensive, should be considered.

HOW DO WE NEED TO PROCEED?

Before embarking on a significant water conservation program – particularly one with mandatory requirements – a community will need to take some preliminary steps.

First, the need for water conservation must be clear. Water companies, cities and counties, regions, and the state will need to develop good water budgets based on an accurate measuring of supply and demand.

Second, conservation measures must be studied prior to implementation. If measures are adopted without fully understanding their effectiveness or potential consequences, a conservation program will lose its credibility and support from the community.

Third, public education will be essential. The public will need to know what the likelihood of water shortages is and which alternatives work before we can expect people to change their behavior and expectations or to accept sacrifices in certain severe circumstances.

Fourth, people will be more likely to accept and support conservation measures if they feel the measures are fair and equitable and that the measures will improve their lives and community. If a gallon of water is saved to be made available for a new use, has that in any way benefitted the water saver? Once the easy steps have been taken, some conservation alternatives will have negative impacts on some portion of the public. For the most part, measures will be seen as equitable if the measures that cause the least harm have been selected or if the sacrifices are shared. Governing bodies will also need to take measures to make compliance easier, such as providing materials or passing ordinances that authorize new conservation measures.

Conservation should be only one component of a community plan to address growth and sprawl where they are a problem. Few will be willing to make water sacrifices if they feel these sacrifices do not help the community, but only open the spigot for yet another subdivision. Similarly, in communities that rely on surface water people may want to link water conservation to river protection by providing that some of the water conserved by people will be left in the river to protect fish and wildlife.[90]

Fifth, governmental bodies must not exempt themselves from water conservation measures, unless there is clear justification for doing so.

Finally, the State Engineer should adopt specific measures to implement provisions in the water code mandating that he not approve new applications or applications for transfers of water unless the applicant is already taking measures to conserve his or her existing water and unless the applicant also has plans to conserve the new uses of water.

RESOURCES NEEDED AT THE STATE LEVEL

Once the easy measures have been taken, water conservation becomes more complicated. Most people, businesses, small governmental bodies, and farmers do not have the resources to evaluate what the next, best steps should be. They will need more information on what measures are effective under what circumstances. We need to learn the answers to endless questions about the viability of new concepts and ideas. Is it more effective for a city to retrofit toilets or washing machines? How effective is the aquifer recharge from agricultural irrigation? Is it more important to allow aquifer recharge or to line ditches to conserve water? What are the differences between water conservation and drought measures?

How Water Conservation Can Increase Water Supply

- In New Mexico, almost eight percent of water use was for municipal consumption in the mid-1990's. A ten percent reduction would result in a savings of more than nine billion gallons, enough for 170,000 people for one year.
- If all New Mexicans turned off the faucet each time they brushed their teeth, we could save many millions of gallons of water a day.
- Indoor use accounts for about 50 percent of residential use, with up to 75 percent of that amount used in the bathroom. Installing a highly efficient or ultra low-flow toilet and showerhead can reduce total indoor use by approximately 20 percent without any change in lifestyle.
- Xeriscaping can reduce outdoor water use by 50 percent or more.
- Retrofitting water-saving devices in buildings and residences can result in a high benefit-to-cost ratio of 25:1. [89]

If the benefits from answering these questions are potentially significant and are applicable across the state, the state can – and should – provide the resources to find many of the answers. Good information will make savings from water conservation possible and reduce the number and cost of mistakes as we struggle to find adequate water supplies.

This is best done by the state, where priorities can be established and adequate funding provided. The state should provide a central, comprehensive clearinghouse where information is available and easy to access and should also provide funding for water conservation research and education. Farmers could benefit from the results of the most recent research on agricultural water conservation. Communities, businesses, and individuals would benefit from workshops on issues like how to make water systems work better, what are the most effective rate structures, how to lower demand over the long-term, how to get demand down quickly in a drought, model ordinances for landscaping, and other best management practices. And the state could provide opportunities to share experiences and learn from others.

The state may need to enact legislation or regulations to promote conservation through removing or modifying disincentives, such as the "use it or lose it" rule, and adding incentives and mandatory measures. Residential and commercial building and plumbing codes could be amended to require the installation of water-saving fixtures.[91] Funds could be made available to small communities to enable them to develop conservation plans. Measures are needed in severe drought years or for an ongoing drought. Legislation might be required to create "win-win" situations, such as enabling cities to pay for agricultural conservation measures that prevent drying up farm land and enable cities to use the conserved water.[92] Perhaps the state could pay for salt cedar removal and riparian restoration (or should cities or other entities who need more water pay to control salt cedar so that they can have the water that is saved?).

The era of large, new water projects is over. The time has come to invest in water conservation in much the same way we used to invest in water projects.

Recommendations:

• Establish a system for complete measurement of water supply and water use to provide the information needed to make good decisions about what conservation measures work and should be implemented.

• Examine and resolve dilemmas posed by agricultural water conservation.

• Enforce provisions in the water code that provide that the State Engineer not approve applications if they are contrary to conservation of water in the state.

• Increase funding to the State Engineer Water Use and Conservation Bureau to design and implement research on the best avenues for conservation, provide conservation information to the public, develop model conservation ordinances, and develop and help implement the conservation component of the state water plan.

• Where appropriate, enact state water conservation legislation promoting agricultural, urban, and/or riparian water conservation and provide increased funding as appropriate.

Water Conservation Works:[93]

* *Intel Corporation, Albuquerque*. Intel replaced its use of fresh water with recycled water enabling the plant to use about the same amount of water even as it increased its chip production by about 70 percent.

**El Rey Inn, Santa Fe*. Between 1995 and 1997, the El Rey achieved a water savings of 16 percent by installing low-flow toilets and shower-heads and from customers who were willing to forego daily washing of sheets and towels in response to water conservation cards placed in every room.

**Mississippi Potash, Carlsbad*. Use of recycled water resulted in a water savings of 52 percent.

**Tuscarora Inc., Las Cruces*. Recycling cooling water and installing a reverse osmosis unit and meter resulted in a water savings of 12.4 percent.

8 Other Major Issues and Solutions

In Chapters 3 to 7 of this report, we have focused on what we believe are the most important steps for New Mexico to take immediately to begin to manage its water sensibly and effectively. We believe the state should focus on those high priority issues first. Nevertheless, there is no shortage of other hot-button water issues, many of which are often mentioned as the key topics or problems of the day. We discuss some of these topics below and take the opportunity to set forth additional ideas that we believe merit further examination as we search for solutions for our water future.

WATER MANAGEMENT

WATER BANKING

Cities, large irrigation districts, small acequias, water conservation advocates, and environmentalists – in fact most of the state's water rights holders, water rights seekers, and water activists – have expressed an interest in the concept of water banking. What they do not share is agreement on just *what* water problem(s) this device should be applied to solving and how it would work.

Some forms of water banking already exist, although they have not been labeled as such.[94] Conservancy districts and irrigation districts have statutory authority to control water rights that are part of their system. If some of their irrigators want to rest their fields, there is a mechanism for the district to lease the unused water rights to other irrigators in the district. If irrigators want to leave farming, they can transfer their water rights to the district for use by others on the system, assuming there's money available for the purchase. These districts generally do not have statutory authority for water banking outside of their districts.

There are many institutional or administrative forms that water banking could take. Among the variations are:

• *A centralized clearinghouse for people who wish to lease or sell water.*

A centralized source of information for people who wish to lease, sell, or buy water would be valuable, although it is not clear that this needs to be done by a public agency.[95] Using a water bank merely as a mechanism for sellers, buyers, lessees, and lessors to find each other would have no impact on the current statutory protections; leases and transfers of water would remain subject to review and approval by the State Engineer.

In addition, it should be noted that conservancy districts and irrigation districts already act as a clearinghouse for their members. Leases and sales of water are restricted to the district or ditch, there is no change of use, all water rights usually have the same priority date, and such leases or change of place of use generally are not reviewed by the State Engineer.

• *A "bank" to store water for use at a later date.*

In 1999, the legislature enacted the Ground Water Storage and Recovery Act which enables certain governmental entities to add, store, and withdraw water in aquifers.[96] The point here is that water is being stored for use later. The Ground Water Storage and Recovery Act only allows one entity to store and use water at a later time. If needed, the Act could be amended to provide that underground storage may also be utilized for water that is being stored by one party for use by another party at a later point in time.

Reservoirs are also places to store water that is not needed immediately, but there is very limited reservoir storage space in New Mexico that is not already committed to specific entities and uses. Moreover, even without any formal water banking mechanism, those entities that own storage space in reservoirs (e.g., Albuquerque's space in Abiquiu, Middle Rio Grande Conservancy District's space in El Vado) have for many years leased that storage space to others to store water for future use without need for a water bank to facilitate such transactions.

- *A water bank to promote the conservation of water.*

Because there is a threat that water rights will be forfeited or abandoned if they are not used, there is no incentive to conserve water, even when there is no need to "use" all of the water a person has the right to use. Some people hope that water banks could facilitate the use of conserved water by other parties and enable a person to receive payment for conserved water, providing an incentive to conserve that does not currently exist. Certainly, if a water bank is established, it could be established in such a way as to create conservation incentives. The first step, as noted above in Chapter 7, is to figure out how the state can promote use of conserved water without creating new consumptive uses of water.

- *A water bank that facilitates leases or sales of water rights.*

Some people hope that a water bank could facilitate a water market. Current statutes require that all leases and transfers of water rights be reviewed and approved by the State Engineer. These transactions are subject to public notice and may be subject to protest, a process some see as too cumbersome to facilitate a market for water. Some proposals for a water bank contemplate an alternative that would promote a water market in New Mexico and facilitate leases and sales of water rights by setting up an alternative to the current review and approval process. This is probably the most controversial of the options. Another complicating factor is that leased water is not a reliable source of water for the long-term; when the term of the lease expires, the water may no longer be available either because the owner wants to use it or because someone else is willing to pay a higher price. Because it is not good public policy to create a reliance on a source of water that is not dependable, the market for leased water may be less than expected.

- *A specialized water bank with limited goals.*

There is interest in using water banks to promote limited goals. One is to create acequia water banks that would allow some members to let other irrigators in the system use their water in years when they don't need it or in drought years. As noted above, irrigation and conservancy districts already have this authority. Other people have discussed a water bank that would provide for environmental or other public purposes, such as leaving water in rivers and streams for fish and other wildlife, flushing salt accumulations, or diluting contamination. Finally, water banks may be valuable for facilitating short-term leases of water in drought years or in response to other short-term crises.

AREAS OF CONCERN ABOUT WATER BANKING

One problem with water banking is that the possible variations are many, making it hard for people with different views to talk about what a water bank is. In addition, a number of concerns about water banking have been

raised, the most common of which are:

• New Mexico's statutes require that the State Engineer approve leases and sales of water to ensure that existing water rights are not impaired and that leases or sales of water are not contrary to the conservation of water or the public welfare of the state. Many people feel that the authority to approve or deny leases or new uses of water should remain with the State Engineer, that we should not create two classes of water leases and transfers, particularly if one class avoids the protections that exist in our current statutes.

• Until a water right is adjudicated, there is no certainty that the right actually exists. Because a very small percentage of water rights in New Mexico have been adjudicated, a water bank that relies only on adjudicated water rights may not accomplish very much.

• We know that we cannot afford to allow increased depletions of water, and no water bank should enable that to occur either by design or by oversight. If water banks are used to promote conservation of water, there needs to be true conservation of wet water. We should not create a mechanism that increases consumptive uses of water.

We know that we cannot afford to allow increased depletions of water, and no water bank should enable that to occur either by design or by oversight.

• Water banks have the potential to facilitate transfers of water rights from low-income communities or regions to higher income communities or regions (e.g. from rural areas to cities), particularly if the water banks are not limited to a single region. Many people would argue that New Mexico should not promote transfers of water that will weaken the economic viability of our rural, agricultural areas.

• It is critical that there be strict and independent accounting of water placed in and then removed from a water bank or storage facility.

AGREEMENT IS NEEDED ON HOW A WATER BANK WOULD WORK

Water banking legislation has been introduced more than once in the past several years, but each time the proposed legislation has faced stiff opposition, often for many of the reasons listed above. That changed in 2002 when a bill was passed in response to an emergency situation on the Pecos River. The bill applies only to the Pecos river below Sumner Dam and is intended to help New Mexico ensure there will be adequate water to make mandated deliveries to Texas.[97]

Water banking proponents are hoping that this is only a first step and that experience gained from the operation of this bank will convince potential opponents that water banking works.

Because the water banking legislation passed in 2002 was narrowly drafted to respond to an emergency, questions remain. Should there be a statewide bank or regional water banks, and should there be public or private water banks? Are we talking about leased rights only, or would a water bank also be used to buy and sell water rights? Does New Mexico wish to promote a water market? What agency, if any, would have authority over the banks and how much authority would the agency have? How would the powers given water banks relate to the authority of the State Engineer? Who pays the costs to start up and operate a water bank? There is no agreement on these or other issues. There is only general agreement that "the devil is in the details."

NEXT STEPS

Rather than focusing on designing a water banking system, we need to

begin by clarifying and then getting agreement on what it is we are trying to accomplish that cannot be accomplished without a water bank. Only after we identify the purpose of a water bank and agree on objectives for a water bank should we move on to designing one.

Suggested objectives include:

- No increase in consumptive uses of water.
- No negative impact on New Mexico's ability to deliver water as required by interstate stream compacts.
- Strict accountability required.
- Water must be easily measured.
- Valid water rights would be required.
- No negative impact on the public welfare or conservation of water within the state.
- Water banks must not be mechanism to evade current constitutional and statutory protections.

Recommendation:

- Work to clarify and agree on the purpose of a water bank and objectives for a water banking system before drafting legislation.

REORGANIZATION OF STATE AGENCIES DEALING WITH WATER

Introduced during the 2000 legislative session, SB 730 (132 pages long) proposed to "consolidate water quality / quantity management functions from multiple agencies, boards and commissions into one agency with one board."[98] The bill did not pass, but there may be interest in introducing a bill that proposes reorganization of state agencies that deal with water issues in the year 2003 or later.

Many people, including the authors of this report, agree that it may well be advisable for New Mexico to reorganize the governmental organizations that oversee our water quantity and quality. We believe, however, that making such statutory changes in the immediate future is not a high priority for the following reasons.

First, as noted above, New Mexico faces urgent challenges in the management of its water resources. We believe the challenges described in this report are the highest priorities and other changes should wait until the most critical issues have been addressed. Reorganization, by itself, will do nothing immediately to address our water crisis. To take on a major agency reorganization in the next several years would take the state's attention away from very real problems and would almost certainly delay immediately needed, meaningful changes.

Second, a major governmental reorganization linking water quality with water supply administration should be examined and addressed only in the context of a complete review of the state's water laws. We recommend that the state undertake an overall review of its water laws to determine what changes are needed to modernize our system and enable it to better address the problems discussed herein. This first-ever, balanced review of water law will need to be non-partisan and expeditious and produce a report that reviews the present legal framework and recommends changes designed to

serve the state in future resource management. Such a review could consider whether governmental reorganization is necessary, and if it is, how best to accomplish it.

Finally, water management affects everyone in the state. It is important that New Mexicans support the changes and that the agencies that have administrative powers be credible. Therefore, we recommend that the process developed to study the problems and propose changes include significant opportunities for public participation.

Recommendation:

• Delay reorganization of state agencies until after a thorough examination of water laws – both quality and quantity – has occurred.

DRINKING WATER

Drinking Water Unavailable or Inadequate

Most community water systems in New Mexico are small systems operating in rural and often unincorporated areas. Many of these systems rely on volunteers. The smaller and more rural the community, the more likely it is that local resources are inadequate – even when water rates are very high – to support running, maintaining, and especially upgrading the water system when necessary. This is increasingly true given new, mandated operating and reporting requirements.

In New Mexico, there are 644 community water systems. These systems include municipal, town, and village water systems (15 percent) which have municipal powers, and water and sanitation districts (2 percent) which are created by a vote of residents of the area and have taxing authority. In addition, there are mutual domestic water systems (29 percent) which are incor-

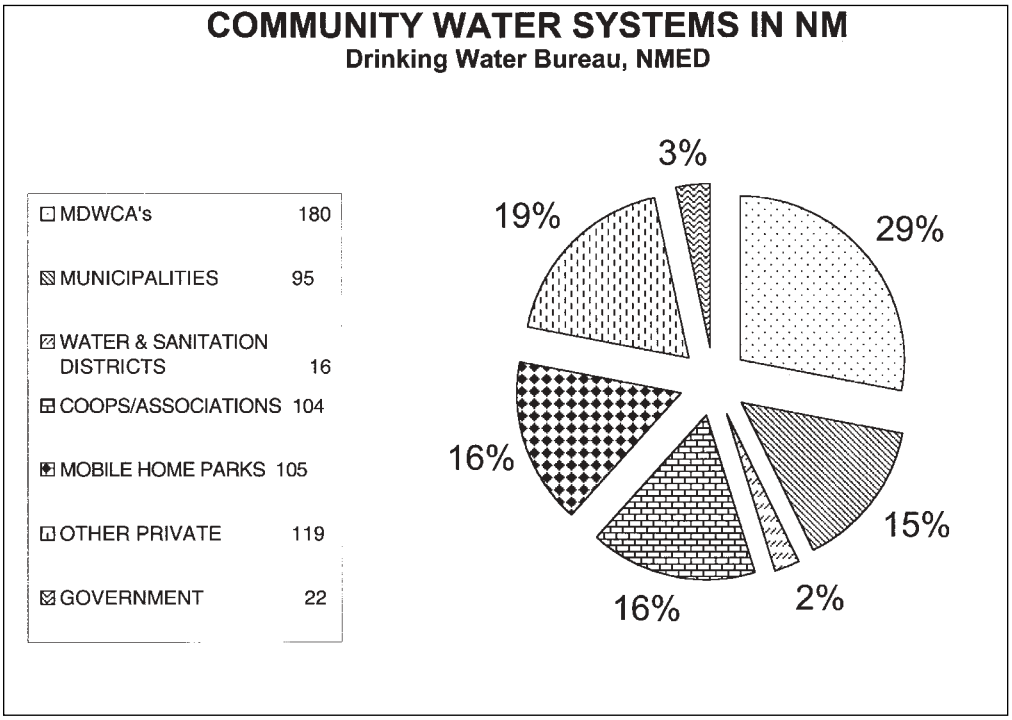

FIGURE 9 - Community Water Systems in New Mexico
New Mexico Environment Department, Drinking Water Bureau

porated under the state Sanitary Projects Act and are limited governmental entities empowered to run only water and sewer systems; they have no taxing authority. Private, non-profit cooperatives and associations (16 percent), private, for profit systems (19 percent) as well as mobile home parks (16 percent) are also all generally small systems. These latter three types of private systems can, and often do, eventually choose to incorporate as mutual domestic water systems.

Many of these systems were built between the 1940's and 1970's. Now after some 30 to 60 years of existence, many are in trouble. Their infrastructure, built for minimal sums, is failing and needs to be upgraded. Many of these communities are growing and have not been able to obtain additional water supplies either because they are not available or because they are too expensive. In addition, the Office of the State Engineer assigned varying amounts of water rights to some of these systems, ranging from 125 gallons per day per person to as low as 15 gallons per day per person.[99] Consequently, many of these systems lack adequate water rights to serve their communities.

In addition to inadequate infrastructure and often inadequate water rights, community water systems are continually faced with new operating and reporting requirements, such as the new standard that lowers the amount of arsenic allowed in the water and other water quality standards under the Safe Drinking Water Act.[100] Nearly 80 percent of the violations of the Safe Drinking Water Act in the state occur in the small, older mutual domestic water systems. There are a number of organizations that support these water systems and some funding, usually low-interest loans, is available. But these resources are not adequate and often do not cover needed planning expenses and engineers' studies. As a result, the viability of these systems is threatened. As expenses for operating and upgrading infrastructure increase, more and more of these systems find that they are not yet able to be self-supporting. Additional financial support is critical.

Over the last couple of decades, a number of new communities, known as "colonias," have sprung up along the Mexican border and elsewhere in the state, most of which lack any water supply system at all. While there is a federal program to help fund infrastructure for colonias, to qualify for federal funds, a colonia must have existed and been generally recognized as a colonia prior to October, 1989, and must be located within 100 or 150 miles (depending on the agency) from the U.S.-Mexico border. These two requirements eliminate many communities from the colonias designation, making unavailable federal program grants and low interest loans for the planning, construction, and improvement of water systems.

Recommendations:

- Increase funding for small community water systems and establish a permanent revenue fund to support the continuous needs of small water systems for maintenance and upgrades.
- Increase training, planning, and engineering support.
- Increase cooperation among the various agencies that regulate and support community water systems.
- Examine the inequities in the amount allowed per person among mutual domestic water systems.

CHANGES IN RESERVOIR OPERATIONS

A universally recognized problem with New Mexico's water management concerns our storage of water. By far the largest reservoir in the state is also nearly its worst (and among the worst in the country) in terms of amount water lost to evaporation. Elephant Butte Reservoir, where evaporation averages about six feet a year (compared to 2.4 feet at El Vado Reservoir and three feet at Abiquiu Reservoir), loses between ten and 35 percent of its stored water every year by way of net evaporation.[101] Evaporation losses at Elephant Butte average about 140,000 acre-feet per year (ranging from 40,000 to 250,000 acre-feet), which is about one-third of all the Rio Grande water that New Mexico is permitted to consume under the Rio Grande Compact.[102] Under the terms of the compact, however, New Mexico cannot move its water storage from Elephant Butte to other less wasteful locations without unanimous consent of all of the compact commissioners. Nor can any new reservoirs be constructed on the Rio Grande without similar action.

Nevertheless, given the huge evaporation losses being suffered at Elephant Butte, the state must seriously review all options for moving some of the storage currently at Elephant Butte to one or more upstream locations or underground in order to reduce evaporation losses. One possibility for accomplishing this would be to store more water at Abiquiu. Abiquiu Reservoir on the tributary Chama River, where annual evaporation is about half that at Elephant Butte, has the physical capacity to store a substantial amount of additional water. Moving water storage upstream to Abiquiu would encounter three serious problems. The first, as mentioned above, is the Rio Grande Compact, although the commissioners already have agreed to allowing increased Abiquiu storage temporarily. The second is the certain opposition of people currently using Abiquiu (combined with the opposition of those associated with recreation at Elephant Butte). Because the storage capacity above the 200,000 acre-feet level has not been used to date (it currently is authorized only for temporary flood control – not for long-term storage), residents and recreationists have constructed facilities at the historic high-water level, and they do not want to lose these. Third, Congressional reauthorization would be required to increase the permanent storage capacity above 200,000 acre-feet.

Another possibility that must be considered is whether any new upstream reservoirs could or should be built on the Rio Grande or its tributaries. It's common to say that the day of constructing new dams and reservoirs in beautiful mountain valleys is long past. It may be true. From the perspective of water management on the Rio Grande, however, this idea has something going for it. The benefits would be well distributed among the three states signatory to the Rio Grande Compact. Colorado has quite limited reservoir capacity that can aid in managing irrigation water for the many highly profitable farms in the San Luis Valley, and, as noted below, Texas too could benefit.

One reservoir proposal that has been repeatedly floated in the past is to build a high-altitude reservoir at Wagon Wheel Gap near Creede in southern Colorado. Such a high altitude reservoir would lose very little water to evaporation. We can assume, however, that the environmental costs would be very significant. Nevertheless, it is at least conceivable that the cumulative environmental impacts of such a proposal might be offset by environmental benefits, including reduced downstream reservoir storage and increased

water supply, some of which could be used to benefit the river and riparian environment. The proposal at least should be on the table in any review of options for moving storage from Elephant Butte to less wasteful locations.

Another proposal that could perhaps be combined with more upstream storage is to reduce the level and hence lake size at Elephant Butte (and control phreatophyte incursion on the newly exposed land at the lake head), since that would correspondingly reduce evaporation losses. As noted above, this would be costly to the lake's recreation. And it would complicate downstream water delivery arrangements under the Rio Grande Compact, in part by limiting the amount of stored water that is available for release on demand by the down-streamers, and in part by undercutting the compact provision that wipes out water debts (in both directions) any time the reservoir overtops its capacity and runs over the spillway. We certainly recognize how complicated and controversial making this proposed adjustment a reality would be. But given the size of the potential benefits, its consideration is justified.

Another idea would be available only if and when there was a spill at Elephant Butte. When this reservoir fills and runs over its spillway, not only are any standing compact water debts between upstream and downstream entities on the Rio Grande erased, but for the remainder of that year upstream entities are free to use water without accounting for it under the compact. Hence, any available water can be stored if storage capacities are available. The Cochiti, Jemez, and Galisteo dams are operated primarily to intercept flood waters, store peak volumes to prevent downstream flooding, then release it a short time later. Thus, they and some other reservoir volumes (such as the majority of capacity at Abiquiu) that are dedicated to flood control could be used to hold and manage water available because of Elephant Butte spills. While simple in concept, a variety of negotiations and policy changes would be needed to allow this, and when the system is operated this way, continuing hands-on management and judgment would be required to properly and safely distribute the water while still providing flood protection.

In sum, the state must consider all options for avoiding the gigantic evaporation losses that we currently experience at Elephant Butte. The amounts of water lost are so vast as to require that we give all reasonable options serious consideration.

Recommendation:

• Analyze all alternatives to current full storage at Elephant Butte, including options that would require amendment of the Rio Grande Compact, amendment to the Rio Grande Project authorization, and/or other federal and state legislation.

UNDERGROUND STORAGE

As the above section on reservoir storage underscores, above ground water storage in this climate wastes an enormous amount of water. New Mexico is an obvious location for use of underground water storage, especially as the technology evolves and makes such storage more feasible, both technically and economically.

The state legislature recently changed the law to allow certain entities to inject water underground into cones of depression created by pumping and enable the water to remain the property of the city.[103] (Before this, when water owned by an entity was mingled with other water, it became public water

available for appropriation.) To date, no permits have been issued under this new program.

Capital and operating costs required for such systems are likely to be significant. The first entity to start using the process will probably be the City of Albuquerque. Albuquerque has some advantages that will aid in getting an underground injection program started. First, the large cone of coalesced depressions around its wells will contain the injected water and not allow outflow and loss from its enhanced groundwater pool. In addition, Albuquerque's wells are already correctly placed in a general sense for injection. What Albuquerque doesn't have is knowledge of how to best prepare each well to serve as an injection well; knowledge required for the actual injection process that will minimize mechanical clogging of the aquifer at the well bores; and knowledge required to assure chemical compatibility between the injected water and the locally variable mineralogy of the aquifer. In addition, it is likely that the "sticker shock" of underground injection will prove to be surprisingly high. Nevertheless, underground storage will probably play an important role in New Mexico's future water management, and Albuquerque would be a good place to start this system.

Because we anticipate that underground storage will become increasingly viable and necessary in New Mexico, we believe that the state statute should be amended to allow entities other than cities – the state for example – to obtain underground storage permits. If the state were also granted underground storage authority, another mechanism would be available to it for active water management and reduction of evaporation losses.

Recommendation:

• Amend underground water storage statutes to allow other governmental entities such as the state to obtain permits for underground storage.

IMPOSING WATER CHARGES

It's time to think about how the state should pay for the costs of increased water management. Few New Mexicans who divert water pay anything for water itself. What they do pay for is the cost of acquiring the water, of constructing the works necessary to deliver the water, sometimes for treating it, and for transporting it to the point of use.[104] As the state finds it necessary to spend markedly greater effort and funds to study water resources, manage them more pro-actively, clean up what we have allowed to become contaminated, adjudicate through our maze of claimed rights, cajole or force conservation, and take the lead in negotiations aimed at living within our water means, it may decide to fund its efforts through some form of user or transfer fee plan.

Making this change would not be easy. Nor could it be done in a way that would impose substantial new costs on long-time water rights owners who have long relied on our existing water rights system and who already have to shoulder the costs of protecting their rights by protesting water rights transfers that would harm them or their communities. However, any who agree that the marketplace is an efficient way to assign value should find this proposition interesting. Among the advantages is that water is price-sensitive.[105] So both conservation and effective negotiation become easier when the product has a monetary value.

Recommendation:

• Study the need for user or transfer fees to fund water management and/or promote water conservation.

ENVIRONMENTAL CONCERNS

Water usage is no longer addressed solely through the mechanisms of state and federal-based water rights. Federal environmental laws such as the Clean Water Act and the Endangered Species Act have established other legal regimes that must be integrated into the water rights system. This intertwining of environmental and water supply issues reflects the reality that clean water is the source of all life on earth. In the past, when there was an abundance of clean water available, allowing unlimited human uses of water still left plenty for the fish, wildlife, and plants that also depend on it. This is no longer true. As a result, environmental and water rights laws are colliding the world over, forcing new compromises and new solutions.

As this report is directed to state-based water supply issues and solutions, in this chapter we address secondarily some of our environmental concerns.

WATER QUALITY

The focus of this report is water supply – not water quality, an equally important subject. While the close relationship between water quality and water supply may seem obvious to many of us, it is often overlooked. Water that is contaminated cannot be consumed by humans or put to many other uses unless and until it is cleaned up. According to the latest state water quality report, 52 percent of New Mexico's streams and 83 percent of its lakes have impaired water quality.[106] Groundwater contamination from underground storage tanks and releases of other hazardous substances has removed significant, additional supplies of our water as well. In addition, not only is most groundwater too saline to use, but in some places where groundwater has been over-mined, salt water has invaded fresh-water aquifers and contaminated wells.

We must protect our water quality in order to protect our water supply. In some instances, that means that we must stop mining our groundwater. In addition, when we improve water quality and convert non-useable water into useable water, we increase our water supply. The technology exists to decontaminate (and/or desalinate) water and thereby increase useable water supplies, but these cleanup or purification processes almost always produce some residual water that is very high in undesirable constituents. And this water too must be disposed of in environmentally acceptable ways. The bottom-line issue is whether this whole cycle is cost-effective, especially compared to conserving water and reducing water demands. (See section below on desalination.)

Recommendation:

• Protect water quality in order to protect our water quantity.

ENDANGERED SPECIES

The federal Endangered Species Act (ESA) was enacted to protect and recover endangered and threatened species and to provide a mechanism for

conserving the ecosystems on which those species depend.[107] Two requirements of the ESA most directly affect water management in New Mexico. First, the ESA requires that federal agencies, in consultation with the U.S. Fish and Wildlife Service, ensure that their actions do not jeopardize the continued existence of endangered species or destroy or harm habitat that has been listed as "critical" for such species.[108] This requirement is triggered by any and all actions that are "authorized, funded, or carried out by" a federal agency. For example, if the federal government is providing funding for a new water diversion project, there will have to be consultation with the Fish and Wildlife Service to ensure that the new project will not jeopardize the continued existence of any threatened or endangered species, such as the Rio Grande silvery minnow or the Pecos bluntnose shiner.

A second key ESA requirement is its prohibition against "taking" of a listed species unless an incidental take permit or statement has first been obtained from the Fish and Wildlife Service. "Take" means kill, harm, harass, or other similar action detrimental to members of the listed species. It is unlawful to "take" even one member of a listed species without an ESA incidental take permit. If, for example, a water diversion dries a river and as a result endangered fish die, that is considered to be a "take."

Most wildlife in New Mexico and, of course, all fish require rivers and riparian areas. Because virtually all of our rivers are dammed, narrowed, dewatered, and otherwise changed from their natural state, the fish that are native to our rivers have dramatically declined. Most have gone extinct from many stretches of rivers. At the same time, some stretches of all of our major rivers contain fish that are listed as threatened or endangered under the ESA. These species are, by now, familiar household words from news reports in some areas: Rio Grande silvery minnow, Pecos bluntnose shiner, Gila trout, razorback sucker, to name a few.

Because virtually all of our rivers are dammed, narrowed, dewatered, and otherwise changed from their natural state, the fish that are native to our rivers have dramatically declined.

These fish, not surprisingly, need water. They need other things too, like slow, shallow or backwater flows, free-flowing stretches of river not blocked by dams, and often high spring runoff flows. The problem is that we have spent the last 120 years doing a myriad of things that have had the unintended consequence of eliminating precisely the environment that these fish need. In fact until recently, the fundamental premise of our prior appropriation water rights system has been that you must take water out of rivers and use it in order even to have a water right. Nothing in our state water law protects rivers or the fish and wildlife that depend on them.

The ESA requires that these fish be protected. This requirement raises all sorts of questions, not to mention ire and consternation. How can the fish be protected without taking away people's water rights? Who has to pay for this protection? Do the species now have their own water right that trumps even the most senior water rights? How do you allocate responsibility for protecting the fish when the harm has been caused over many decades by an accumulation of actions by many people and agencies over hundreds of miles of river and across state boundaries?

Depending who you ask, you will get very different answers to these questions. There has been considerable litigation under the ESA on the Rio Grande, Pecos, and Gila rivers that has raised these and other issues. Some people have called for amendments to the ESA to give humans' water rights clear priority over the species or to otherwise attempt to minimize the disruptions to water allocation that is being caused by the ESA. Competing slo-

gans, “Fish versus Farmers” and “Live River or Dead Ditch?” have filled airwaves and bumper stickers.

The debate over our rivers fueled by the ESA has been long overdue. As the recent polling data shows, New Mexicans value their rivers and want to protect both rivers and the wildlife that depend on them. Yet, until fish were listed as endangered under the ESA, absolutely nothing was being done to protect our rivers. Indeed, the southwestern U.S. is full of former rivers – Salt River in Phoenix, Santa Cruz River in Tucson, and the Los Angeles River in Los Angeles are some of the more well-known – that are now dry ditches. But we need look no further than our own Rio Grande to see a river that is often a dry ditch (especially below Caballo Dam) due to human activities.

Protecting our rivers will be very difficult, given all the demands that are being placed on the water in them. With enough sweat, tears, and money, however, it can be done – at least partially. The rivers cannot and will not be restored to their pre-human state. But they can be greatly improved and protected from further degradation.

Notwithstanding the controversies and hot tempers surrounding the ESA and our rivers, we do not advocate amendment of the ESA or state law to address the situation. Rather, we believe that the actions advocated in earlier chapters of this report such as water planning, conservation, and groundwater management will all help to protect our rivers and the endangered and threatened species that depend on them. Furthermore, experience on the San Juan and Upper Colorado Rivers shows that endangered species issues can be addressed when all the stakeholders get together and figure out solutions under the prompting of the ESA.

Recommendation:

• Comply with the ESA through a variety of short-term and long-term measures, including planning, conservation, and groundwater management, and involve all stakeholders in helping to devise solutions.

WATERSHED PROTECTION

Over the years, people have suggested that one way to increase water supplies is to cut trees in watersheds. The assumption is that fewer trees will mean less evapotranspiration and thus more water in rivers and aquifers. This idea surfaced during the drought of the 1950’s, and it has surfaced again over the last few years. Recent attention has focused particularly on heavily forested areas in national forests, where the combination of fire-suppression, grazing, and other management practices over the past century or so has led to many areas of dense thickets of small-diameter trees that use large amounts of water lost in evapotranspiration.

Many studies the world over address experiences in watershed management that have affected water supply. The results of these studies are complex and varied, but some generalizations can be made. First, increases in water yield are proportional to the amount of precipitation in an area. Generally, significant increases in water yield are possible only where the annual precipitation is greater than 16-20 inches.[109] Thus, for example, the data suggest that management of pinon-juniper areas is unlikely to yield any substantial water increases. Second, water yield increases are far greater in wet years than in dry years.[110] Unfortunately, that is the opposite of when the water is most needed. Third, the increases are closely correlated to the num-

ber and size of trees that are removed: the more extensive the logging, the greater the water yield increase. Probably at least 20-25 percent of the basal area must be removed to produce a measurable increase in runoff.[111] Fourth, any increase in water yield decreases over time, sometimes quickly (sometimes disappearing in just a few years) and sometimes slowly, depending on the area. The results are reminiscent of our experience with salt cedar and other phreatophyte removal: water yield increases until the plants grow back. The only way to make such water salvage permanent is to find a way to keep the evapotranspiration down permanently without harming the ecosystem – something which we have yet to figure out how to accomplish.

Most of the early water yield studies in the forests of Arizona were terminated because the results were mixed and because the need to manage the forests for other values, such as timber, recreation, wildlife, and other forest values outweighed the limited increases in water yield. Now, the need to manage forests for a wide variety of uses is, if anything, even greater. Near populated areas of course, a predominant concern is how to manage forests so as to avoid catastrophic, high-intensity fires. Indeed, finding a new forest management scheme that prevents such fires throughout the forests is an urgent concern that probably overrides the need for short-term, potentially limited increases in water yield. It is possible that whatever combination of management techniques ultimately is found to best avoid such unnatural, high-intensity fires may also have the benefit of increasing water yields, but that remains to be seen. It will take a long time to study the problems and settle upon new management requirements that accomplish our goals. It will take far longer to carry out these prescriptions. Any resulting increases in water yield are likely to be small and a long time in coming.

Indeed, finding a new forest management scheme that prevents such fires throughout the forests is an urgent concern that probably overrides the need for short-term, potentially limited increases in water yield.

This is not to belittle the danger from catastrophic fires in watersheds. The resulting erosion could severely damage our water supply for decades. Thus, our goal must be to manage our forests in a way to keep them healthy and productive in all respects over the long-term. That is what is required by our forest management laws, and it is what makes the most sense. It is unrealistic to count on forest management to produce significantly increased amounts of water in the foreseeable future, but we do need to protect the water supplies that come from our watersheds.

Recommendations:

• Before proceeding with attempts to increase water yields from watersheds, conduct a detailed study of potential water gains (including their timing and duration) and costs, and develop a long-term watershed management plan that ensures compliance with all applicable federal and state laws.

• Manage watersheds to protect water supplies from catastrophic high-intensity fires and maintain a healthy watershed.

INCREASED SUPPLY

DESALINATION

Worldwide, desalination is seen as a light at the end of the tunnel. It can be true in the United States and in New Mexico as well. Former Senator Paul Simon said that almost 70 percent of the world's population lives within 50 miles of oceans and seas.[112] Desalination in coastal areas of the United States would be relatively cheap, both in dollars and in environmental impacts.

Serving the coastal population's domestic needs with desalinated seawater would free up fresh water upstream on the country's rivers, benefitting another large part of the population. Ultimately that would include New Mexicans.

Moderate to high salinity exists in a large part of the groundwater resources of New Mexico. About three-quarters of the estimated twenty billion acre-feet of groundwater in New Mexico is brackish and cannot be used absent desalination. The entire state uses only about three million acre-feet of water per year. So salinity precludes human use of hundreds of years worth of water. Desalination may never markedly benefit large-volume water users such as irrigators in this state; except in unusual circumstances, the cost might not be recoverable from agricultural revenues.

There are problems besides cost to overcome. One is to find environmentally benign ways to dispose of water containing very high concentrations of dissolved solids that is an inevitable residue of desalination. Additionally, we must be certain that projects to tap brackish or saline groundwater supplies do not ultimately simply take more water out of over-appropriated surface water systems or have other adverse effects such as land-surface subsidence.

As technologies improve and as competition for potable waters increase, selected municipalities are becoming interested in this water source. Indeed, Alamogordo is reportedly well along in its consideration. And El Paso, faced with a rapidly dwindling underground fresh water supply and an inability to acquire sufficient Rio Grande water from nearby farmers, is actively planning a desalination plant for brackish groundwater. The El Paso plant is currently anticipated to supply nearly 30 million gallons a day (about one-fourth of the city's water needs) and is currently scheduled to come on line in 2005. We can expect other cities the Southwest to follow suit in the future.

Sandia National Laboratory has a research project on desalination. Given the importance of desalination for long-term water supply and water management, our national laboratories should be given a mandate, with funding, to dramatically reduce the cost of desalination. This topic is nicely matched to the skills of some of Sandia Lab's scientists and engineers. Their research aim should be that within a few decades we in New Mexico, and elsewhere in the United States, would find it more economical to desalinate our brackish and saline waters than to build and operate the infrastructures needed to import fresh water from increasingly scarce outside sources. The same research can lead to better ways to remove other contaminants from water so that we don't keep adding to our own water shortages. We in New Mexico could at some future time discover that we can even import desalinated sea water for municipal use.

Recommendation:

• Support research efforts on desalination, and promote New Mexico's national laboratories taking the lead in research to reduce the costs and environmental effects of desalination.

9 Conclusion

The twenty years from the mid-1970's through the mid-1990's were extraordinarily wet for New Mexico. The extra precipitation and an increased reliance on groundwater created an illusion that we can support all of the growth that has occurred and will continue to occur. Not only are we now learning that in many parts of the state we have reached the limits of our water supply, but we also may face decreased precipitation. A serious one year drought or a few continuous years of less serious droughts would cause all kinds of havoc. All of us who were here during the years 1996, 2000, and 2002 have a foretaste of the problems that lie in wait. People who were here during the 1950's drought can describe how hard it was then, and the state's population will soon be triple that of the 1950's[114] so we can only imagine how much more difficult a similar, long-term drought will be if it happens in the near future.

If we fail to grapple with how we manage water, even though we might be lucky enough to avoid a major crisis somewhere in the state, we may find in five or ten or twenty years that we have lost much of what we value in our state. We will rue our failures to protect this state we all consider so special. We must begin to manage this resource much more carefully and wisely than we have up to now. Even without the possibility that we are entering a dry cycle,[115] we must make these changes thoughtfully and soon.

Almost everyone would agree that we have problems. But if we are going to fix the problems, we need to agree on the solutions. This paper outlines what we believe are the most important steps that need to be taken. The changes need to occur in several areas.

WATER MANAGEMENT (Not Water Administration)

In many cases, the improvements that are necessary can be accomplished without legislation, often by the State Engineer. Where the necessary administrative action is not occurring, legislation may be required to spur action. The items listed below therefore could be accomplished with or without legislation. We presume that these actions will be carried out either by or with input from the Office of the State Engineer and in some cases federal agencies.

Priority Water Rights System

Our water administration system is founded on the prior appropriation system. As described in Chapter 3, the system simply is not working. The State Engineer is taking some steps to improve matters, but time is critical and we need results sooner rather than later. We need to speed up the adjudication process, develop a timetable for completion of adjudications, and commit requisite resources. We must also confront and review options for priority administration of surface and groundwater rights that are hydrologically connected and for administration of water when rights have not been fully adjudicated.

Planning

Almost everyone would agree that we cannot afford to continue the status quo. We must manage water rather than simply administer water rights. To do that, we must agree on a vision for New Mexico and then develop a water management plan for fulfilling that vision. We will always need to

know more about our water resources. But we know a great deal now – fully enough to get started in planning what actions we need to take and on how to implement those changes. Regional water plans have helped the regions understand problems and process. Starting on a state water plan now is essential to further that process, both to help prevent crises and also to facilitate moving toward a future we want.

"Additional population growth will only cause these crises to worsen unless bold action is taken."
- Water in the West: Challenge for the Next Century[113]

Groundwater

With few exceptions, groundwater is a non-renewable resource. As we use up our groundwater supplies, they become unavailable for drought years or to help us meet our water needs in the future. We cannot afford to completely squander this essential resource before searching for better ways to manage it. Of course, we are using groundwater up much faster in some areas of the state than in others, and of course it is in those areas that demand is accelerating. Those are the areas where steps need to be taken to protect the resource. One step is increased measuring, metering, and reporting of diversions in order to understand the magnitude of depletions. A tiered groundwater management system with appropriate safeguards to protect areas where groundwater supplies are threatened is another step.

Conservation

The usual solution to increased demand has been to find new supplies of water, but it has become harder and harder to find new sources of water because everyone else is also searching. Reducing water use is another solution to this problem. We are starting to see the benefits from urban water conservation, but we are a long way from effective water conservation in agriculture, and we've hardly begun thinking about riparian areas. The dilemmas posed by agricultural water conservation need to be examined and solved, and much more needs to be learned about the possibilities of conserved water from riparian areas. For conservation to be effective, the state needs increased emphasis on information, research, coordination, and leadership from the Office of the State Engineer. The State Engineer, in turn, needs authority and support from the legislature and the governor.

LEGISLATION

Changes to the Water Code

We cannot expect to prevent crises or water shortages if we do not plan. State statutes authorize regional water planning, but there is no statutory authorization or instructions to guide a state water plan. The state faces a number of challenges that could – and should – be addressed by state water planning legislation. These include: the need for accurate information that comes from measuring, metering, and monitoring water supply; water budgets at the local, regional, and state level; a connection between water budgets and water use; a vision for the future; drought planning; public involvement and acceptance; and a connection between water and land use planning.

The state's groundwater resources cannot be adequately protected without amending the domestic well statute to delete the requirement that all domestic well permits be automatically approved regardless of impact. Legislation may be necessary to reform and speed up adjudication process and facilitate conservation.

Funding

Ten years ago, water was not considered to be much of an issue. We have learned a lot in that time, but we have only just begun to make the changes that are needed. Many of them require funding to implement. Regions have begun to identify major projects that will need to be undertaken to enhance water supplies. Much more metering and research is needed to protect existing supplies. Water planning requires resources. We cannot expect all of the costs of water conservation to be assumed by people who do not have the resources and will see no benefit. We need to be willing to pay what it takes to protect our water.[116]

INDIVIDUAL ACTION

Water is a public resource shared by everyone in the state. During the last few years, we have come to understand that we have reached the limits of available water supplies. There can be no new or increased uses of water supply unless an existing water use is decreased or we figure out how to import water from somewhere else or we increase depletions of our non-renewable groundwater supplies. What we want for our future should impact what choices are made.

There are also many options for how choices are made. One option is to continue the status quo. Or, each constituency can choose to fight to defend their rights to water. If this strategy is chosen, there will be winners and losers, and the choices that are made may have more to do with who is a better strategist or has the most money than with what result will benefit the most people.

A third option is to work together on options that share the pain and maximize the benefits. This option would appear to be envisioned by 2000 poll conducted by the University of New Mexico Institute for Public Policy. Most respondents agreed that it is important for New Mexicans to "come to an agreement soon on a plan for managing our water to avoid increasing conflict over water in the future." People statewide also appear to share a number of the same priorities: The highest four value levels (out of 13) were: (1) indoor use in existing homes, (2) irrigation of farms, (3) preserving the native cottonwood forest and vegetation along river banks..., and (4) providing food and refuge of fish, birds and other animals.[117] This poll and regional water planning efforts are indications that New Mexicans can come together to plan.

If we are to move toward a future where shared values are protected, New Mexicans will need to take a number of steps:

First, we must all become more knowledgeable about water in our state.

Second, we will need to become more involved in decision-making and planning.

Third, the public needs to make its voices heard. The legislature, State Engineer, local officials and the many others are more likely to support change if there is support among their constituencies.

In conclusion, we ask that you take this report as a call to action. Attend informational events about water. Join in water planning efforts. The more who join in the process of ensuring that we the people of New Mexico do the planning for our future, the more confident we can be that we can prosper, and at the same time preserve our state's grace and grandeur.

How New Mexico Manages Water

The New Mexico statutes give authority over water to the State Engineer who is appointed by the Governor and confirmed by the New Mexico Senate. The State Engineer must approve applications for new water rights, or to change the point of diversion, the purpose or place of use of water (usually referred to as a **transfer**). The State Engineer must deny any application when he determines that the application will result in **impairment** (i.e., diminished supplies or water quality) to existing users or is contrary to conservation of water within the state or detrimental to the **public welfare** of the state. The State Engineer also is required to deny applications for new appropriations when he determines that unappropriated water is not available. When an application is filed, parties may file a **protest** based on any of the grounds the State Engineer may use to deny an application. If an application is protested, the protestant may request a hearing. Decisions of the State Engineer may be appealed to the district court.

An **adjudication** is a lawsuit filed to determine "all rights to the use" of water within a stream system. The adjudication begins with a **hydrographic survey** of the stream system that maps all water diversions, including both surface and groundwater. The priority date declared by the water user is deemed the priority date until the right receives a final adjudication order when the amount of the water right is also approved.

The New Mexico Environment Department has primary authority for water quality, although the State Engineer may consider water quality in his consideration of applications.

The Prior Appropriation Doctrine

When the East was settled, people acquired their water from natural water courses on or adjacent to their land, and their right to use that water was based on the proximity of their land to a stream or lake. Those rights are referred to as **riparian water rights**. Because of the West's aridity, people needed to divert water to places away from the stream or lake. Consequently, New Mexico and other western states (except California) developed a different system to govern water that is referred to as the **prior appropriation doctrine**. That doctrine appears in New Mexico's Constitution and contains the two principles that guide New Mexico's water law:

1. Priority of appropriation shall give the better right.
2. Water may be used only for beneficial purposes.

An **appropriation** refers to the right to use water for a beneficial purpose. **Priority of appropriation** is often summarized as "**first in time, first in right**." This means that a person or entity who obtained a water right at an earlier point in time has a **senior** water right and those with a later date of acquisition have **junior** rights. A senior water right holder is entitled to receive the full amount of the water to satisfy his/her right before junior water right holders receive any of their water right.

Beneficial use has not been defined; only waste is considered to be a non-beneficial use of water. New Mexico has not adopted a "priority of use" statute as have some other western states. Therefore, the priority date is the only factor that gives preference for one use over another use. A water right may be **forfeited** or **abandoned** for non-use.

Establishing Water Rights

Generally, New Mexico statutes provide three ways to obtain a **water right**. Anyone who used surface water prior to 1907 or used groundwater prior to the State Engineer asserting authority over the groundwater basin (referred to as a "**declared basin**") was not required to apply for a permit from

the State Engineer. For these water rights, the **priority date** is the date the water was put to beneficial use.

Another type of water right is obtained by filing an application with the State Engineer. Such applications are necessary for surface water rights established after 1907 or for groundwater rights after the date a groundwater basin was declared. For these rights, the priority date is the date the application was filed with the State Engineer. When water rights are transferred or the place or purpose of use is changed, the water right retains its original priority date.

A third type of right is allowed for **domestic or stock wells.** These rights are also known as **"72-12-1" water rights** named for the section of the water code that requires the State Engineer to approve automatically all applications for a well to supply a household for domestic uses, livestock and irrigation. A regulation adopted by the State Engineer allows domestic well users to use up to 3 acre-feet per year.

Regional Water Planning

The New Mexico legislature enacted a statute in 1987 enabling regions in the state to plan for their water future. Regional water plans are to determine a region's available water supply, future water demand, and how the region will balance demand and supply and to consider the **public welfare**.

Federal Water Rights

On federal lands (e.g., Indian Reservations, Forest Service, Park Service, Bureau of Land Management) water rights have been **reserved** for the exclusive use of the reserved federal lands. The priority date of **federal reserved water rights** is the date the land was reserved or held in trust for a federal entity, and not the date the water was put to beneficial use. On tribal lands, these rights are also known as the **Winters doctrine rights**. The State Engineer generally does not have administrative authority over federal water rights.

Interstate Stream Compacts

Streams and rivers often run through more than one state. Interstate compacts that divide up the flow of the river are signed by all of the states through which a stream or river runs. Compacts are signed by Congress. New Mexico is a party to eight compacts: Upper Colorado Basin, Rio Grande, Pecos, Colorado, Animas-LaPlata, La Plata and Canadian rivers, and Costilla Creek. New Mexico is obligated to deliver the amounts specified in the compacts to downstream states and these obligations impose significant constraints on the water supply available for use in New Mexico.

This fact sheet was drafted by Consuelo Bokum for use in the regional water planning process.

Glossary

Abandonment: A legal principle used to describe water rights that are lost permanently when a person ceases to use water with the intent to stop using those rights.

Acequia: A community ditch system.

Acre-feet/Acre-foot: The amount of water that would cover an acre to a depth of one foot, equivalent to about 325,829 gallons (e.g., three acre-feet is nearly a million gallons). "Acre-foot" is abbreviated "af"; "afy" indicates "acre-feet per year."

Adjudicate/Adjudication/Adjudicated right: An adjudication is a lawsuit to "determine the right to use" water (N.M. Stat. Ann. § 72-7-17 (Michie Repl. Pamp. 1997)). The State Engineer can file suit or request the Attorney General to file suit on behalf of the state to clarify the status of water rights within an entire system, or a water-right holder who feels a right is impaired by a neighbor's diversion may bring a suit against that individual or entity, so that the court can establish the relative priority and the amount of the rights.

In an adjudication, all claimants to water within the basin to be adjudicated are made parties to the suit. The court then directs the State Engineer to conduct a hydrographic survey of the stream system, which amounts to a detailed map of the stream system with all water diversions, including wells, acequias and the like, marked on a map. The court uses the hydrographic survey to establish individual water rights within the stream system, including priority dates and amounts of each right.

Water rights are considered property rights that can be sold or leased. However, a water right grants only the right to use water that belongs to the state rather than granting outright ownership of the water itself.

Appropriation: A ground or surface water right that is put to beneficial use.

Aquifer: A saturated zone of rock or soil beneath the land surface that is capable of yielding water to wells.

Area-of-origin protection: Protection of the economic viability of an area from which the water is to be sold and transported away, usually to another hydrologic basin. Potential negative impacts when water rights are transferred away from an area may include a lowered tax base and desertification of previously irrigated land.

Beneficial use: Generally all uses of water from which acceptable, defined benefits are derived. The New Mexico Constitution and statutes require that waters may only be appropriated for beneficial use.

Compact: An agreement between states that has been approved by legislatures of the states that are parties to the compact and by the U.S. Congress. Compacts apportion the water in interstate rivers among the states that are parties. New Mexico is a party to eight compacts, affecting all of the major rivers that flow across its state line and obligating New Mexico to deliver water to other states. No matter how vested a water right within the state might be, if using it violates a compact, the water cannot be used.

Consumptive right: This defines the portion of the water right that may be evaporated or used up rather than returned to the hydrologic system. The

consumptive right is usually specified in a permit.

Consumptive use: Water that is transpired or evaporated and thereby lost to the system. A consumptive use is similar to "depletion" (see below).

Curtailment: In the context of water rights, curtailment refers to reducing a junior water right in the event of water scarcity in order to satisfy a senior water right.

Declared basins/Declaration of a basin: The State Engineer can "declare" a groundwater basin having reasonably ascertainable boundaries to be under his jurisdiction for the purpose of administering rights to the groundwater. In areas outside of declared basins, permits or licenses are not required to appropriate groundwater.

Declared right: A declared water right is one claimed to have been perfected prior to the area coming under the State Engineer's administrative control. When a basin comes under State Engineer control, claims to water rights must be filed. For groundwater, State Engineer control is asserted with the declaration of the groundwater basin (after which a well may be drilled only with the permission of the State Engineer). For surface water, State Engineer authority dates from the enactment of the Territorial Water Code in 1907.

A declared right is taken at face value so long as no change is proposed; the State Engineer does not attempt to establish whether the full amount of the declared right has actually been put to beneficial use since the time the right was declared to originate. However, if the right-holder subsequently applies to the State Engineer for a permit to change the ownership, place, or purpose of use of the right, the State Engineer does examine whether the right exists and in what amount (see Permitted right). The validity of a declared right is also examined during an adjudication.

Depletion: The portion of a withdrawal that is evaporated, transpired, or incorporated into crops or products, or otherwise consumed and removed from the water environment (similar to Consumptive use).

Dewater/Dewatering: The practice of pumping out and disposing of "nuisance" groundwater that floods underground mine workings or other subsurface features.

Diversion right: A diversion right describes the amount of water that can be diverted from a stream or a ditch or can be pumped from a well, some of which may be returned to the hydrologic system, for example by seepage from an unlined ditch into the ground to recharge groundwater. Similar to the concept of withdrawal, it is a concept used in conjunction with consumptive rights to determine a water right and return flow credits.

Domestic well right: Domestic well rights are known as "72-12-1" rights after the section of New Mexico law under which they are established. This law provides that the State Engineer "shall" grant a permit to any household to withdraw groundwater for domestic use. Traditionally, the amount of the right has been typically interpreted as three acre-feet per year. (These rights were defined at a time when most households in New Mexico had a garden and some stock – a horse, a cow, a few chickens.)

Evapotranspiration (ET): The combined processes of simple evapora-

tion and plant transpiration through which liquid water is converted to water vapor and lost from the water system.

Forfeiture: Failure to use a water right for a beneficial use for four years constitutes forfeiture of the right. Forfeiture does not necessarily occur if circumstances beyond the control of the owner have caused non-use. Before the State Engineer can declare forfeiture, he must notify the owner of this intent and allow one year for the water to be put back into beneficial use. Forfeited water reverts to the public and becomes subject to further appropriation.

Hydrographic survey: A detailed mapping of surface water and groundwater diversions and of the areas in which the water is beneficially used, as well as indicating the priority date for each right.

Hydrology: The science that treats the waters of the earth, their occurrence and movement, their chemical and physical properties, and their depletion and replenishment.

Injection well: A well that is used to place fluids into an aquifer or geologic formation. An example is an artificial recharge well used to inject treated water into an aquifer to mitigate groundwater mining.

Junior right: A water right with a more recent priority date (date first put to beneficial use) and, therefore, theoretically subject to curtailment in times of scarcity.

Licensed right: A licensed right is acquired when the holder of a permitted right presents proof of beneficial use to the State Engineer; that is, a survey by a licensed surveyor or analysis by a professional engineer, showing all aspects of the diversion and quantifying the amount of water diverted. The State Engineer critically examines these proofs, concurs with or corrects the amount of water held by the permittee, and then issues a license. A licensed right theoretically can be curtailed or redefined during a basin adjudication. (See also Permitted right and Declared right.)

Mining/Groundwater mining: Extraction of groundwater at a rate that significantly exceeds replenishment. Mining usually implies that continued exploitation at this rate will damage the aquifer or make it unusable.

Permitted right: In practice, a permitted right is established through the following procedure. The right-holder applies to the State Engineer for permission to divert a specified amount of water at a specified location for a specified use. Such an application for a water right permit must be advertised for public notice and may be protested. If the application is granted, the State Engineer issues a permit to carry out the diversion, subject to conditions he deems necessary.

The permittee then drills the well or otherwise carries out the diversion, and within a time period specified in the permit, provides proof to the State Engineer that the diversion was completed. Theoretically, adequate proof is followed by issuance of a license. Typically, however, the permittee forestalls that step by routinely filing annual requests for extensions of time to submit final proof of application of the water diverted to a beneficial use. (See also Licensed right and Declared right.)

Prior appropriation: The prior appropriation doctrine, common in the

West, is used to rank (or prioritize) water rights. Generally, this ranking is summarized by the phrase "first in time, first in right." Any water right acquired prior to another right is considered the "senior" right, and any right acquired later is a "junior" right. A senior water right holder theoretically is entitled to the full amount of the right to water before the junior user is entitled to take any water.

Priority call: An action to stop junior water rights users from taking water before the needs of senior water rights holders are satisfied.

Recharge/Recharged/Recharging: Under natural conditions, the process that adds water to groundwater storage, usually from infiltration of rainfall or stream flow. Artificial recharge is also possible, when humans induce recharge through wells or by impounding water to aid infiltration.

Return flow: Water that is returned more or less directly to the hydrologic system rather than being evapotranspired or otherwise consumed.

Return flow credits: A permittee may be allowed to divert much more water than s/he has rights for, since the right generally is interpreted to be the amount of water actually consumed. Any enterprise that diverts water, consumes some fraction, and returns the rest back to the system, may apply to the State Engineer for a return flow credit, expressed as a percentage of diversion.

Riparian/Riparian area: The environment adjacent to streams and rivers where water is usually relatively abundant; this term usually refers to the vegetation found alongside streams.

Safe yield: Safe yield is a concept sometimes applied to groundwater resources. Generally, safe yield means using only that amount of water which is supplied to the system by renewable resources such as stream flow and precipitation.

Senior right: A water right with an older priority date (date of origin), which theoretically takes precedence over more junior rights when water is in short supply.

Transfer: This term is used to denote a change in the place or type of use of water right, such as switching from surface water to groundwater.

Vested right/Vested water right: The term "vested right" is imprecise as it relates to water. It sometimes is used to describe a declared, permitted, or licensed water right, in which case "vested" simply means that the right is formally recognized, though not necessarily quantified. Another definition of "vested" is a right that has been put to beneficial use, particularly when that use originated before State Engineer authority existed. Several additional categories of vested rights exist outside of rights established through state law. These include:

a. Interstate Compacts. See Compact above. Although groundwater is not specifically treated in all of these agreements, the agreements do affect groundwater as well as surface water because of the hydrologic interrelationship of the two. Interstate compacts in New Mexico cover the Upper Colorado River Basin, the Rio Grande, Pecos, Colorado, La Plata and Canadian rivers, Animas-Las Plata Project, and Costilla Creek.

b. Federal reserved water rights. The legislation establishing Federal reservations such as national forests, national parks and Bureau of Land Management grazing lands by inference granted sufficient water to those lands for them to fulfill their purpose. The amount of Federal reserved rights rarely has been quantified. Since 46 percent of the land area of New Mexico is federally owned (*see* L. Harris, *New Mexico Water Rights, Miscellaneous Report #15*, Las Cruces: New Mexico Water Resources Research Institute, 1984), and many upper watersheds and recharge zones are on federal land, it has been calculated that 77 percent of the average runoff in the drainage area of the Rio Grande originates on federal reservations (*see* C. Wheatley et al., *Study of the Development, Management and Use of Water Resources on the Public Lands*, 1969; cited in *U.S. v. State of New Mexico*, 438 U.S. 696, (1978)). This leaves considerable uncertainty as to how much water is available to allocate to downstream users.

c. Indian water rights. Ten percent of the land in New Mexico lies within the boundaries of Indian reservations. Just as the land was "reserved" for the various tribes, sufficient water was reserved for the reservations to be viable places for the Indians to live (i.e., the *Winters* doctrine; see *Winters v. U.S.*, 207 U.S. 564, 28 S.Ct. 207, 52 L.Ed. 340 (1908)). Since Indian reservations were generally established early in the process of Americans moving into a given territory, by the doctrine of prior appropriation their water rights are generally among the most senior in a stream system. Also, in New Mexico, rights formally assigned to pueblos under Spanish and Mexican law are recognized by the U.S. Government under the terms of the Treaty of Guadalupe Hidalgo.

d. Non-Indian pueblo water rights. The Mexican government made land grants to "colonization pueblos" in pre-Territorial days; each pueblo was entitled to use the waters flowing through and around its boundaries. Las Vegas, for example, claims an 1835 pueblo water right based on a land grant to its Mexican predecessors.

Endnotes

1. Census Bureau, *Thirteenth Census of the United States*, taken in the year 1910, with supplement for the state of New Mexico, 1910.

2. "N.M. Population Increases 20% Since 1990 Poll," *Albuquerque Journal*, December 29, 2000.

3. 2000 Census, www.census. gov. The growth rate from 1980 to 1990 was 16.3 percent. The Bureau of Business and Economic Research, *The Census in New Mexico: Population and Housing Characteristics for the State and Counties from 1980 and 1990 Censuses*, University of New Mexico, 1992.

4. "San Juan-Chama Project water" is water that is transported from the San Juan-Colorado river system over the Continental Divide and into Heron Reservoir and the Rio Grande. This federal water project has been in operation since the early 1970's and provides about 96,200 acre-feet of water per year in the Rio Grande, or a little less than one-tenth of the water that flows in the Rio Grande between Espanola and Elephant Butte Reservoir. This water is not subject to the delivery requirements of the Rio Grande Compact and is considered entirely distinct from "native" Rio Grande water.

5. After finding that New Mexico had violated the Pecos River Compact by underdelivering water to Texas for many years, the United States Supreme Court barred New Mexico from incurring any further delivery deficits under the Compact. *Texas v. New Mexico*, 482 U.S. 124 (1987).

6. *See* www.geology.about.com/cs/paleontology/index_2.htm; *see also* http://web.utk.edu/~grissino/.

7. *Texas v. New Mexico, supra* note 5.

8. Office of the State Engineer and the Interstate Stream Commission, *Draft White Paper: New Mexico's Water Supply and Active Water Resources Management*, July 2001. Available from the Office of the State Engineer or from www.ose.state.nm.us.

9. John R. Brown, Nancy Carrillo, Hank Jenkins-Smith, *Attitudes and Preferences of Residents of the Middle Rio Grande Water Planning Region Regarding Water Issues*, UNM Institute for Public Policy, University of New Mexico, 2000. This report also summarizes the attitudes and preferences of people statewide. The results can also be found in J.R. Brown, "Focus 1: Water Issues in New Mexico and the Middle Rio Grande," *Public Opinion Profile of New Mexico Citizens*, 12:2, Albuquerque, UNM Institute for Public Policy, Summer 2000.

10. *See* Ira G. Clark, *Water in New Mexico: A History of Its Management and Use*, University of New Mexico Press, 1987, 41-53.

11. N.M. Stat. Ann. §72-15-23 (Michie Repl. Pamp. 1997); Norman Gaume, "New Mexico's Obligation and Compliance Under the Rio Grande Compact," *The Rio Grande Compact: It's the Law!*, 44th Annual New Mexico Water Conference, New Mexico Water Resources Research Institute, 1999, 133-140.

12. A basic hydrologic principle states that in most areas where ground and surface water are hydrologically connected, for every gallon pumped from the ground, there will be ultimately one less gallon of water flowing down the connected river, stream or spring. Office of the State Engineer and the Interstate Stream Commission, *supra* note 8, 9.

13. Beginning in 1956 in the Middle Rio Grande basin, the State Engineer began to require when new groundwater permits were issued that appropriators acquire and retire surface water to offset the impacts of pumping on sur-

face water. While this requirement theoretically protects surface water in an average year, it does not protect senior water rights holders if the retired right is not sufficiently senior to augment surface water during low flows.

14. *See* G. Emlen Hall, *High and Dry: The Texas-New Mexico Struggle for the Pecos River*, University of New Mexico Press, 2002.

15. *Texas v. New Mexico*, 494 U.S. 111 (1990).

16. Norman K. Whittlesey, Henry Robison, and Joel Hamilton, *Economic Effects of Irrigated Land Retirement in the Pecos River Basin*, 1993.

17. New Mexico Office of the State Engineer and Interstate Stream Commission, *2000 - 2001 Annual Report*, 2001, 10-20. The amount includes $3 million that is in escrow pending closure of a water rights purchase.

18. HB 451, 2002 Legislative Session. *See* www.legis.state.nm.us.

19. *See* N.M. Stat. Ann. §§72-4-13 to 72-4-20 (Michie Repl. Pamp. 1997).

20. "In almost a hundred years, we have adjudicated less than 15% of the state's agricultural waters. At the rate we are progressing with adjudications, we still have another 600 years before we complete adjudicating the entire state." Thomas Turney, "Cracking the Adjudication Nut," New Mexico Water Law, Continuing Legal Education Seminar, Santa Fe, New Mexico, August 9, 2001. Available from the Office of the State Engineer or at www.ose.state.nm.us.

21. *See*, e.g., *Winters v. United States*, 207 U.S. 564 (1908); *State ex rel. Reynolds v. Aamodt*, 618 F.Supp. 993 (D. N.M. 1985); *Arizona v. California*, 373 U.S. 546, 597 (1963).

22. *Winters v. United States*, 207 U.S. at 577; *Arizona v. California*, 373 U.S. at 600.

23. *United States v. Bluewater-Toltec Irr. Dist.*, 580 F.Supp. 1434 (D.N.M. 1984), aff'd, 806 F.2d 986 (10th Cir. 1986).

24. Although the 1848 Treaty of Guadalupe Hidalgo assured protection of existing property and water rights and the state's water code acknowledges historical acequia customs and usages, the New Mexico Constitution makes no exceptions from the prior appropriation doctrine for "repartimiento." *See, e.g.*, N.M. Stat. Ann. §§ 73-2-47 to 73-2-50 (Michie Repl. Pamp. 1997); New Mexico Constitution, Article XVI, Sec. 2. N.M. Stat. Ann. § 72-9-2 (Michie Repl. Pamp. 1997) provides for sharing within an acequia (generally members within an acequia all have the same priority date), but not between acequias.

25. Other states have made the commitment to complete their adjudications. "Arizona, Idaho and Montana have invested millions of dollars to quantify rights so that their system of priorities can actually be fairly and accurately administered...." A. Dan Tarlock, "Prior Appropriation: Rule, Principle or Rhetoric," 76 *NDLRev*. 881, 883, 2000.

26. Turney, *supra* note 20.

27. *Id.*

28. S.S. Papadopulos & Associates, Inc., *Middle Rio Grande Water Supply Study*, 2000, ES 2, 3.

29. David Getches, "Water Planning: Untapped Opportunity for the Western States," 9 *Journal of Energy, Law and Policy* 1, 1988. *See also* Jennifer H.

Smalley, *An Overview of Water Planning in Four Western States*, New Mexico State Engineer Office and the Regional Water Planning Dialogue, 1993.

30. Lora A. Lucero, "Water and the Disconnects in Growth Management," *The Urban Lawyer*, Vol. 31, Number 4, 1999, The National Quarterly on State and Local Government, submitted to the ABA Land Use Planning and Zoning Committee. Available from the authors of this report.

31. United States Department of the Interior, Bureau of Reclamation in cooperation with the State of New Mexico, *New Mexico Water Resources Assessment for Planning Purposes*, 1976.

32. New Mexico Interstate Stream Commission, *Regional Water Planning Handbook*, 1994, 6.

33. The five regions whose plans have been accepted by the Interstate Stream Commission are the Estancia Basin, Northeast New Mexico, Lower Pecos Valley, Lea County, and Tularosa Basin and Salt Basin regions.

34. New Mexico Office of the State Engineer and Interstate Stream Commission, *supra* note 17, 10-34.

35. John R. Brown, *supra* note 9.

36. New Mexico Office of the State Engineer and Interstate Stream Commission, *1999-2000 Annual Report*, 6-2. The five underground basins for which abstracting and data entry are completed are: Lower Rio Grande, Nutt-Hockett, Tularosa, Hueco, Hot Springs, and Las Animas Creek.

37. *Id.*

38. Peter Thomas White, "New Mexico Water Law: Current Groundwater Issues," Continuing Legal Education Seminar, Santa Fe, New Mexico, August 25, 1994, 2.

39. New Mexico Water Quality Commission, *Water Quality and Water Pollution Control in New Mexico 2000*, 2002, 1; New Mexico First, *Water: Lifeblood of New Mexico*, 1988, 79.

40. William M. Alley, Thomas E. Reilly, O. Lehn Franke, "Sustainability of Ground-Water Resources," USGS Circular 1186, 1999, 2.

41. New Mexico First, *supra* note 39, 30.

42. See *Mathers v. Texaco*, 77 N.M. 239, 421 P.2d 771 (1966). In the Mimbres Basin, which is very marginally "stream-connected," a twenty-year life was assigned in 1974, which expired in 1994. The Office of the State Engineer is still administering the basin on that basis.

43. Senate Joint Memorial 7, 2002 Legislative Session. *See* www.legis.state.nm.us.

44. S.S. Papadopulos & Associates, Inc., *supra* note 28, 60, App. G, Figure G-4.

45. *See* Office of State Engineer, *Rules and Regulations Governing Drilling of Wells and Appropriation and Use of Groundwater in New Mexico* (Groundwater Rules), Section 1-15-2.

46. N.M. Stat. Ann. §72-12-1 (Michie Supp. 2001).

47. Office of the State Engineer, *supra* note 45, Section 1-15.4.

48. Office of the State Engineer, *Domestic Wells in New Mexico: The impact of, and problems associated with domestic water wells in New Mexico*, December,

2000, 5. Available from the Office of the State Engineer or at www.ose.state.nm.us.

49. *Id.* at 1.

50. Comments of State Engineer Thomas Turney on SB 478, Underground Water Permits, Senate Conservation Committee, February 9, 2002. Available from the State Engineer's Office or at www.ose.state.nm.us.

51. *Id.* at 6.

52. Office of the State Engineer, *supra* note 48, 19.

53. The N.M. Constitution, Article XVI, Section 2, specifies that only unappropriated waters are to be appropriated and that "priority of appropriation shall give the better right." In many areas of the state where domestic well permits are being granted, the State Engineer is no longer granting permits because all of the water has been appropriated or the rights of existing users would be impaired.

54. 376 U.S. 340 (1964).

55. Guy Fipps, *Potential Water Savings in Irrigated Agriculture for the Rio Grande Planning Region (Region M) - Final Report*, Texas A & M University System, 2000, Table VI-1 (savings of 10-20 percent observed in water use in two irrigation districts when metering installed).

56. This graph was presented by Carl Barnes to the ISC Agriculture Water Conservation Committee appointed by State Engineer Thomas Turney in 1996.

57. Office of the State Engineer, *Lower Rio Grande Guidelines*, Jan. 1999; *Middle Rio Grande Administrative Area Guidelines for Review of Water Right Applications*, Sept. 2000; *Proposed Estancia Underground Water Basin Guidelines for Review of Water Right Applications*, July, 2001. Available from the State Engineer's Office.

58. *Id.*

59. Indeed, in its recent *Proposed Estancia Underground Water Basin Guidelines for Review of Water Right Applications*, the Office of the State Engineer proposes a 0.5 acre-feet per year limit to pumping from domestic wells.

60. Helen Ingram, *Water Policies: Continuity and Change*, University of New Mexico Press, 1990, 5.

61. 2000 Census, *supra* note 3.

62. Thomas C. Turney, *Comments to Legislative Interim Water Committee*, Santa Fe, May 8, 2001, 2.

63. *Id.*

64. United States Department of Interior, *supra* note 31, 200 - 201.

65. See Albert Schaffer and Ruth C. Schaffter, *Social Impacts on Rural Communities, Water Scarcity: Impacts on Western Agriculture*, 1984.

66. John R. Brown, *supra* note 9.

67. Neb. Rev. Stat. § 46-289 (1984).

68. Kan. Stat. Ann. § 82(a)-1502 (1989).

69. Ariz. Rev. Stat. Ann. § 45-172(5) (Supp. 1985).

70. Idaho Code § 42-108 (Michie 1989).

71. Mont. Code Ann. § 85-2-301(2)(i) (1985).

72. Wyo. Stat. § 41-3-114 (Supp. 1993).

73. Cal. Water Code, §§ 10505, 11460 (West 1971 and Supp. 1985).

74. Nev. Rev. Stat. §533.363(1) (Michie Supp. 1991).

75. *East Jordan Irrigation District v. Morgan*, 860 P.2d 310, 315, 321 (1993).

76. Ariz. Rev. Stat. Ann. § 45-472 (1987); Cal. Water Code §§12931-38 (West 1971 & Supp. 1985); Colo. Rev. Stat. § 37-45-118(b)(IV) (1973); Nev. Rev. Stat. § 533.370 (Michie Supp. 1991).

77. *See* N.M. Stat. Ann §§ 72-5-23, 24 (Michie Repl. Pamp. 1997).

78. Santa Fe City Council Minutes, January 14, 1998, 23.

79. David Benavides, an attorney who works for Community and Indian Legal Services of Northern New Mexico and who represents acequias, proposes the following standards:

1. Does only one person benefit in the move-from community or do many people?

2. Is whatever benefit that occurs a one-time benefit or do benefits recur over time?

3. Is the water right severed from the community or does ownership remain in the community?

4. Is the new economic activity flowing from the water right occurring in the community or is it removed from the community?

5. Does the transaction contribute to the economic development of the community or does the transaction perpetuate, or even worsen the state of underdevelopment that existed?

6. Is agricultural land taken out of production or not?

These standards are based on contemporary notions of rural economic development: development cannot be highly dependent on external forces; local economies need to be regenerative rather than of a one-time or sporadic nature; it is essential for local economies to maintain their renewable resource base; and development is not really occurring if poverty and underdevelopment persist, i.e., if the benefits are not equitably felt, even though many transactions take place. *See* Frederic O. Sargent, Paul Lusk, Jose Rivera, Maria Varela, *Rural Environmental Planning for Sustainable Communities*, Island Press, 1991.

80. *See* David Benavides, "The Social Costs of Moving Water in Northern New Mexico," *Water and Growth in the West*, Natural Resources Law Center, 2000.

81. Texas provides one model for a state NEPA. In order to incorporate public interest criteria in Texas's water code into its regulatory program, the Natural Resource Conservation Commission defines and applies the public interest criteria through submission of a social, economic and environmental impact statement. Office of Water Management, "A Regulatory Guidance Document for Applications to Divert, Store or Use State Water" 23 (March 28, 1994) (draft available from the Texas Natural Resource Conservation Commission, Office of Water Resource Management). The impact statements are modeled on the federal National Environmental Policy Act (42 U.S.C. §

4321 *et. seq.*) requirements, but the information required in the statements has been modified to reflect the factors needed to process a permit application. Telephone conversation with Bruce Moulton, Environmental Scientist and Policy Specialist, Water Policy Division, Texas Natural Resource Conservation Commission, August 30, 1994.

82. Brian Wilson and Anthony A. Lucero, *Water Use by Categories in NM Counties and River Basins, and Irrigated Acreage in 1995*, New Mexico State Engineer Office, Technical Report 49, 1997.

83. Conversations with Rudy Garcia April 15, 2002 and Scotty Savage, November 16, 2000, Natural Resources Conservation Service, USDA.

84. S.S. Papadopulos & Associates, Inc., *supra* note 28, Table 5.3.

85. *Id.*, Figure ES-4.

86. N.M. Stat. Ann. §72-1-9 (Michie Repl. Pamp. 1997).

87. Alice Grisham and William M. Fleming, "Long-Term Options for Municipal Water Conservation," Journal AWWA, March, 1989, 35.

88. *See* Tom Ash, *Gaining Water Use Efficiency (Reducing Water Use Demand) in the Jemez y Sangre Region*, February 2002, 1, 5-6.

89. The figures in this section come from: Alice Grisham and William M. Fleming, *supra* note 87, 35, 36, 39, 41; Brian C. Wilson and Anthony A. Lucero, supra note 80, 3; Brian C. Wilson, *Water Conservation and Quantification of Water Demands in Subdivisions: A Guidance Manual for Public Officials and Developers*, New Mexico State Engineer Office Technical Report 48, May 1996; *Divining Rod*, New Mexico Water Resources Research Institute, Las Cruces, Summer, 1992, 4; *Agua Action*, State Engineer Office, Water Conservation Program, 1994.

90. In a survey that asked New Mexico residents to agree or disagree with ten statements, the statement that received the most agreement was "Keeping water in rivers to provide a green corridor and protect habitat for wildlife and vegetation is important." John R. Brown, *supra* note 9, 5.

91. Alice Grisham and William M. Fleming, *supra* note 87, 39.

92. William deBuys, "Building Consensus for River Preservation," Testimony before the Water and Natural Resources Committee, June 8, 2000.

93. New Mexico Office of the State Engineer, *A Water Conservation Guide for Commercial, Institutional and Industrial Users*, 1999, 10.

94. *See* N.M. Stat. Ann. §§ 73-13-4, 73-9-14, 73-10-17 (Michie Repl. Pamp. 1997).

95. Indeed, at least one private entity lists water available for sale. *See* www.WaterBank.com.

96. "Governmental entity" includes Indian nations, tribes or pueblos or state political subdivisions, including municipalities, counties, acequias, irrigation or conservancy districts. *See* N.M. Stat. Ann. § 72-5A-3 (Michie Supp. 2001).

97. *See* HB 421, passed during the 2002 legislative session and signed into law. *See* www.legis.state.nm.us.

98. SB 730, Water Resources Department Act, presented to the Senate Conservation Committee on March 1, 2001. *See* www.legis.state.nm.us.

99. Mary Humphrey, Esq., "Facts About Mutual Domestic Water Consumer Associations," 2000. Available from the author.

100. The New Mexico Water Trust Fund Board created to oversee the New Mexico Water Trust Fund and Water Project Fund estimates that there are 114 community water systems in New Mexico that will need to be upgraded to meet the new arsenic standard. The board estimates that ratepayers in those systems will see monthly rate increases ranging from $87.23 among small systems to $38.58 for larger systems. Thomas C. Turney and Tom K. Pollard, "Protect New Mexico's Waters Protect New Mexico's Future," presented to the New Mexico Legislature, January 2002.

101. U.S. Army Corps of Engineers, "Reevaluation of the Rio Grande Operating Plan," 1989, 37.

102. Middle Rio Grande Water Assembly, "Middle Rio Grande Water Budget," 1999.

103. Ground Water Storage and Recovery Act, N.M. Stat. Ann. § 72-5A-1, et. seq. (Michie Supp. 2001).

104. While no one pays the state for use of water to which one has a state water right, of course people do pay others to acquire such water rights. In addition, people must pay the costs of construction, operation, and maintenance of water delivery systems. For example, federal water project contractors pay for operation and maintenance of those projects and, in some cases, for some of the construction costs of the project. Sometimes they actually pay a small amount for the water itself. And residents of cities and sometimes subdivisions or other governmental entities pay for the water supplied to them by the entity. But the fact remains that the state has never charged anything but minimal administrative charges for granting of water rights permits, which allow people to use water that belongs to the public until it is diverted and used by a permittee.

105. Brian C. Wilson, *supra* note 89, 19.

106. New Mexico Water Quality Control Commission, *supra* note 39, 1.

107. 16 U.S.C. § 1531(b).

108. 16 U.S.C. § 1536(a).

109. P.F. Ffolliott and D.B. Thorud, "Vegetation Management for Increased Water Yield in Arizona," *Tech. Bull 215*, Agricultural Experiment Station, University of Arizona, 1975; J.M. Bosch and J.D. Hewlett, "A Review Of Catchment Experiments To Determine the Effect Of Vegetation Changes On Water Yield and Evapotranspiration," *J. Hydrology* 55: 3-23, 1982.

110. Duke Engineering & Services, *Water Supply Study*, Jemez y Sangre Water Planning Region, New Mexico, prepared for Jemez y Sangre Water Planning Council, Sangre de Cristo Water, and City of Santa Fe, Santa Fe, New Mexico, 2001; C.A. Troendle and R.M. King, "The Effects of Timber Harvest on the Fool Creek Watershed, 30 Years Later," *Water Resources Research* 21(12):1915-1922, 1985.

111. The amount of water yield increase is correlated with the "basal area" of trees removed. Total "basal area" is the area you get if you add up the cut surface areas (which is calculated by squaring the radius of each tree and multiplying that number by (3.14)) of all the tree trunks from the cut trees.

112. *See* Paul Simon, *Tapped Out: The Coming World Crisis in Water and What We Can Do About It*, Welcome Rain Publishers, 1998, 91.

113. *Water in the West: Challenge for the Next Century*, Report of the Western Water Policy Review Advisory Commission, 1998, xii.

114. In 1950, New Mexico's population was 681,187; in 2000 it was 1,819,046. *See* www.census.gov.

115. Jeff Tollefson, "Forecast: Dry Times," *New Mexican*, March 25, 2002, 1.

116. In 2001, the legislature passed Water Project Finance Act, §§ 72-4A-1, *et. seq*., (Michie Supp. 2001). The governor signed the bill, but vetoed the funding appropriation. The Water Project Fund is intended to be funded from the earnings on the Water Trust Fund, creating a predictable revenue source to fund the many water projects needed in New Mexico. The New Mexico Water Trust Fund board has identified the following needs: regional water supply systems, watershed and flood control projects, arsenic treatment projects, and endangered species collaborative projects. See Turney, supra note 100.

117. John R. Brown, *supra* note 9.