WATER RESILIENCE IN A TIME OF UNCERTAINTY

How Can Our Water Laws and Policies Better Support Water Resilience?

A report of ideas for improving New Mexico water law and policy from the Utton Transboundary Resources Center's October 2014 conference.[1]

[1] Version 1.0 for Peer Review.

THE UNIVERSITY of NEW MEXICO SCHOOL of LAW

The Utton Center

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Introduction

New Mexicans are increasingly aware of the danger of being unprepared for water shortages. We have seen rural communities run out of drinking water due to both deficient infrastructure and insufficient supplies. Farms have seen dramatic reductions in available irrigation water. Rangelands no longer support our accustomed levels of livestock. This list of impacts from changing precipitation and temperature norms goes on to include rivers running dry, reservoirs sitting empty, and catastrophic forest fires.

Many believe the current drought represents the new norm for New Mexico. Predictive models caution us of a future in the Southwest with altered precipitation patterns and significantly higher temperatures. Now is the time to prepare in earnest for a future with reduced water availability across all of New Mexico's communities.

New Mexico has taken action to address our water woes. In 2014, $89 million of capital outlay money was dedicated to water projects. In addition to physical infrastructure, the State is seeking out the best laws and policies to make the most of our water. In the Fifty-First Legislature, the House of Representatives passed memorials requesting an in-depth analysis of best practices in water conservation and a report on water policy options that includes efficiency, watershed restoration, and desalination.

In response to the call from the Legislature, the Utton Transboundary Resources Center convened over forty experienced water managers, lawyers, scientists, engineers, academics, and students (see Attachment A for a list of the participants) to explore water law and policy options for New Mexico. To encourage imaginative and courageous thinking we imposed The Chatham House Rule, which allows participants to use any information provided at the conference, but prohibits participants from revealing the identity or affiliation of the person who provides that information, nor that of any other participant. Liberated from fear of possible repercussions, the group freely proposed changes to New Mexico water law and policy to help New Mexico incorporate the concept of resilience into its water management objectives and avoid future conflicts over water.

Recommendations to change New Mexico water law are constantly being presented to the Legislature. In preparation for our conference, the Utton Center reviewed numerous reports from recent years that proposed ideas that might make New Mexico more water resilient. While some of the ideas presented here are repeats of other recommendations, they have not yet been fully implemented; we see them as critical and worthy of continued discussion.

This Report documents the discussions and recommendations developed during that two-day conference and a subsequent presentation on water banking.

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Why Resilience?

Resilience is the capacity to adapt to environmental and social conditions different from those that existed when existing laws and infrastructure were created. If a system can absorb disturbances and still maintain its functions and structure, it is resilient. If a system cannot adapt to changing conditions, it is not resilient.

Resilience can be enhanced through active anticipation, a willingness to change, and the ability to learn. Strengthening the capacity of people, communities and countries to anticipate disturbances enhances their ability to better prepare to endure shocks. The capacity of a system to absorb disturbance and keep functioning under new conditions depends largely on its ability to re-organize and change to accommodate new circumstances. Our resilience is also enhanced when we learn from our experiences. Our understanding of past experiences is what informs how we respond in the future.

Our water managers need the best law and policy tools to make New Mexico communities and economies resilient to a changing water supply. In the last few decades the water cycle has shifted in New Mexico. We receive less precipitation than we are accustomed to and when it does arrive, it falls at different times of the year and in different amounts than it has historically. The infrastructure we have constructed to manage historic precipitation events is no longer doing its job. The snow that falls is often lost through sublimation to warm, early spring winds; spring runoff is diminished; and torrential summer monsoons bring damaging floods. All of these factors contribute to reduced surface and groundwater supplies.

Increased temperatures aggravate these changes in our water cycle by enhancing evaporation and evapotranspiration. Higher temperatures make our forests more susceptible to fire, resulting in erosion, ash in runoff, and the inability of slopes to hold water. Critical watersheds, necessary for the health of our water supply, have suffered severe damage.

Resilience requires the ability to absorb and adapt to these types of changes. Our physical and legal infrastructure was designed for stable conditions and not adaptability, crafted during times of relatively predictable precipitation and temperature patterns. Changes in these patterns have resulted in uncertainty about New Mexico's water supply. New Mexico's economic and social well-being depends on our ability to adapt to future changes and disturbances in our water supply.

Our water managers need the best law and policy tools to make New Mexico communities and economies resilient to a changing water supply.

Evolving New Mexico Water Law and Policy

Established law creates certainty, but when laws cannot adapt to significant change, creative solutions must be crafted or laws must be changed. New Mexico water managers have a history of creatively adapting and interpreting New Mexico water law. Thus, the idea of adapting our water code and policies to current conditions need not be alarming: we have been doing it all along. Today, our growing understanding of the uncertainties we face requires that additional steps be taken.

For example, ways around the enforcement of the Priority Doctrine have been crafted within the confines of current law. On the Pecos River the State has purchased a significant quantity of senior water rights to reduce the potential for a priority call. On the Rio Jemez and in other basins, priority calls have been avoided with the institutionalization of water-sharing agreements. Currently, the development of the State Engineer's Active Water Resource Management Regulations is intended to make application of the Priority Doctrine expeditious. We continue to modify how we apply the principles of the Priority Doctrine.

Priority enforcement is not the only stricture in our water law. The complexity of the incomplete water rights adjudication process has limited other potential responses to change, such as the development of efficient water markets. Water markets and water banking allow for flexibility of water use but require an expeditious water right transfer process. Unadjudicated water rights impede the water transfer process.

Ambiguity in the application of the law also stymies New Mexico's resilience to water shortage. The uneven application of abandonment and the specter of forfeiture is thought to discourage conservation of water due to users' fears of losing or reducing their valuable water right. The slow development of policies for the administration of water harvesting and environmental flows has cast doubt on how to successfully implement these important water management tools.

Water markets and water banking allow for flexibility of water use but require an expeditious water right transfer process. Unadjudicated water rights impede the water transfer process.

To help overcome these challenges and advance the conversation about resilient water management in New Mexico, the Utton Center conference participants chose to focus on six areas:

- Funding sources for water management
- Water planning
- Water rights administration and water banking
- Water storage
- Preservation of agricultural uses
- Water availability for the environment, recreation and tourism

Funding Sources For Water Management

Almost every recommendation to make changes to water law, policy and management requires an expenditure of money. The list below is just a sampling of funding needed to make New Mexico more water resilient, as suggested later in this report.

- Effective water planning requires additional personnel to support regions, coordinate regional plans into a statewide plan, and keep plans up-to-date and relevant in changing situations.
- A primary roadblock to water rights administration is the slow and exacting nature of our current adjudication process, its cost, complexity, and duration. Increased funding of the Office of the State Engineer to handle adjudications is just a part of improving this situation.
- Responding to the need for water storage solutions that match changes in the timing and scale of precipitation events and do not waste water will require expensive studies, engineering, and construction, as well as changes in laws and regulations.
- Preservation of agricultural uses will require analysis of productivity of agricultural lands, potential short-term marketing of water rights for other uses, and a response to climate change that makes the best use of available water through crop changes and good soil management.

New Mexico voters also passed a constitutional amendment to make the Water Trust Fund a dedicated fund, meaning it cannot be raided for other uses.

Current Situation

The New Mexico's Water Trust Board and Water Trust Fund were created in 2001. The Water Trust Fund was to be funded at a $100 million level, but that has not yet occurred. In 2006, the Water Trust Fund received its major appropriation of $40 million. New Mexico voters also passed a constitutional amendment to make the Water Trust Fund a dedicated fund, meaning it cannot be raided for other uses. No less than $4 million a year is distributed from the Water Trust Fund into the Water Project Fund to fund water projects.

The Water Trust Board recommends projects for the Legislature to provide loans and grants out of the Water Project Fund, in accord with the State Water Plan. The Board's funding priorities include projects that address public health threats,

Safe Drinking Water Act compliance, dam safety, wildfire public safety, regional projects and projects that share services to achieve operating efficiencies, and projects that have greater contributions of local funding. The Water Trust Board has authorized projects for water storage or conveyance, restoration and management of watersheds, flood prevention, water conservation, recycling, treatment, and reuse. Projects with matching funds are favorably considered. Ten percent of the Water Project Fund is dedicated to the State Engineer for water adjudications. Since its inception, the Water Trust Board has awarded well over $300 million for water projects.

The State funding through the Water Project Fund has leveraged more than $50 million of local and federal funding. There are a variety of federal programs authorized to help states manage water resources. These programs almost invariably require that the state or another non-federal partner cover a share of the project costs. These obligations must be met using non-federal funds. The required cost share may be a fixed sum, a percentage of project costs, or a contribution of effort or other item of value. The term "cost matching" often refers to cost sharing where the amount required for cost share is equal to the amount received from the sponsor.

The Legislature has made direct appropriations to the Water Project Fund with capital outlay funding. The State appropriated $10 million in capital outlay funding to the Water Project Fund in 2002 and another $7.5 million in 2007. In 2003, the Legislature dedicated 10 percent of the Severance Tax Bond proceeds to the Water Project Fund. Capital outlay funding has been an important source of funding for local water projects. In 2014, the State appropriated $89 million for water projects. Capital outlay funding is derived from severance tax bonds, nonrecurring revenue in the general fund, and proceeds from general obligation bonds.

Of all the challenges identified in this report, developing adequate recurring funding sources for water management is the most difficult.

Need

Of all the challenges identified in this report, developing adequate recurring funding sources for water management is the most difficult. Many problems identified in this report can be ameliorated with the proper expenditure of money but there is always competition for available funding.

There is concern that funding for water resource management in New Mexico is too fragmented. There are at least seven separate funding programs for water projects, with little sharing of resources or coordination of funding. There is no one agency or unified process to coordinate and centralize water funding.

Potential Solutions

To make water resource management in New Mexico more secure, it seems most logical that funds designated for water management be generated from water use and related activities.

Taxes and fees can be structured based on other resource taxes that have raised revenue for administration. For example, withdrawals from non-renewable supplies, primarily groundwater, could be subject to a severance tax. Withdrawals from renewable supplies such as streamflow, runoff, and flooding, could be subject to user fees. Notably, New Mexico's Air Quality Bureau is essentially self-funded. Air quality permits in New Mexico are subject to significant application fees, which cover the cost of staff that review and approve the permits. This model might be adapted for certain applications in the Office of the State Engineer that require time and personnel, particularly if a hearing is

required or other significant work is required by staff. A fee could be based on a sliding scale depending on the quantity of water at issue or the complexity of the application. Certain fees, such as those associated with water banking transactions, could be based on the value of the transaction.

Imposing a fee for water withdrawals would have to be implemented in a way that recognized water users' ability to pay but does not offend notions of basic equity. One approach may be to implement a sliding scale, allowing agricultural producers to pay a lower rate than urban users, and urban users a lower rate than industrial users of water. This has been suggested before.

Charging a tax or user fee on water withdrawals is obviously a politically fraught and unpopular notion among water users. Then Representative, now Senator Mimi Stewart, made such a proposal in 2004. The purpose of the bill was to create a water project fund by charging a fee to all water users, $2 per acre foot for agricultural uses and $20 acre foot for all other uses. This revenue would fund water management and water projects. This bill was met with criticism, opponents argued that such a broad tax would unfairly impact poorer areas and the benefits of the tax may not be proportionately disbursed. The bill did not pass. This approach may be worth revisiting.

In 2014, a bill was introduced that would have required all state agencies that fund or administer water projects to participate in a unified planning and coordinating process. In response to a 2013 Legislative Finance Committee evaluation of the Water Trust Board, the bill would have established a centralized funding process for water projects statewide. It would have also required the use of a single uniform funding application process to serve everyone requesting water-related funding.

Charging a tax or user fee on water withdrawals is obviously a politically fraught and unpopular notion among water users.

Importantly, it also would have required a statewide, comprehensive, multi-year capital plan for water projects. We recommend that this bill be reintroduced and that the sponsors attempt to address concerns that it would diminish the authority of certain agencies and create a cumbersome new level of bureaucracy.

Examples from Other States

The State of California has a large annual funding gap in five types of water programs: safe drinking water in rural areas, flood protection, storm water management and pollution runoff, restoration of aquatic ecosystems, and integrated water management support. There have been several alternative suggestions for funding this gap. One is an increase in the sales tax. Another suggestion is to place taxes on the sources of pollution or the beneficiaries of conserved water. A special tax on fertilizer, manure, or pesticide companies has also been suggested. A more familiar source of funding is a general obligation bond appropriation. The California Water Action Plan will provide $472.5 million in state general obligation bond funding for water projects.

The State of Colorado uses several different funding sources for water projects. The Colorado Water Conservation Board Water Project Loan Program pulls money from the Construction Fund and the Severance Tax Trust Fund, which come from principal and interest on existing loans and a portion of federal mineral lease revenues that are paid to the State. Five percent of the Severance Tax Trust Fund may be appropriated to the Colorado Water Conservation Board to provide grants and loans for a variety of water related purposes.

The Colorado Division of Water Resources is equivalent to New Mexico's Office of the State Engineer. It is funded through the Colorado General Fund, fees, and federal funds.

Colorado has a variety of grants available for improving the health of its rivers or for use in times of water emergencies, all administered by one central agency. The various grants include Water Efficiency Grants, Colorado Healthy Rivers Fund Grants, Colorado Watershed Restoration Grants, Agricultural Emergency Drought Response Program, Alternative Agricultural Water Transfer Methods Grants, Fish and Wildlife Resources Fund Grants, Weather Modification Grants, Non-Reimbursable Project Investment Grants, and Water Project Loan Programs. These programs are all administered by the Colorado Water Conservation Board, which serves as Colorado's centralized water planning and financing agency.

The Colorado Water Resources and Power and Development Authority has access to money from the State Revolving Fund. This fund is capitalized by state and federal funds whereby states contribute twenty cents for every dollar. This allows states to leverage other funds through the issuance of municipal or other bonds.

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Colorado has also suggested (but not yet enacted) future bond sales to fund projects such as a federal and state partnership similar to the Central Arizona Project; state facilitation of projects but with end users financing the project; public and private interests working together; water region taxation; statewide tax on internet based transactions; debt financing; and enactment of a water mil levy.

Water Planning

Current Situation

The Interstate Stream Commission (ISC), in collaboration with the State Engineer and Water Trust Board, is tasked with water planning in New Mexico. The State Water Plan Act of 2003 set a goal of integrating "regional water plans into the state water plan as appropriate and consistent with state water plan policies and strategies." The State Water Plan guides the funding recommendations of the Water Trust Board, which must prioritize its plans and financing in conformance with the Plan.

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In 2008, the ISC completed a detailed compilation of information from the sixteen regional water plans, but integration of the regional water plans remains a challenge. Full integration would mean that the sum of the parts equals the whole—that all of the regional plans when put together would result in a cohesive State Water Plan. Ideally, integrated regional water plans will be used as a basis for understanding water budgets, resources, and needs across the State.

Need

The compilation of the sixteen Regional Water Plans indicated that the high growth projections result in more than 700,000 acre-feet of new diversions in 2040 compared to 2000 diversions. This reinforces the need for the State to conduct long-range water planning activities.

The ISC's compilation of regional water plans identified inconsistencies and included the following recommendations for regional planning:

- Increased stakeholder involvement, especially from water providers
- Increased linkages to 40-year municipal plans and local land use plans
- Greater dialogue among neighboring regions
- Use of scenario planning to reflect uncertainty and variable conditions
- Greater emphasis on planning for drought
- Greater emphasis on constraints to water delivery
- Greater emphasis on potential environmental impacts
- Greater emphasis on energy considerations
- Increased focus on implementation of key programs and projects

- Regular updates
- Annual progress reports
- Need for ongoing funding for regional plans

In 2013 the ISC and Office of the State Engineer updated the Regional Water Planning Handbook. The purpose of the Handbook is to provide uniformity in how the regions report their current water status, needs, and plans. Water supply is defined as diversions for beneficial use. While there have been objections from some regions to this metric, the ISC defends it by stating that such uniformity will make it easier for the ISC to compute statewide supply and demand, facilitating the creation of a statewide water plan that allows for synergy instead of conflict between regions.

While the Handbook presents a conservative approach based on moderate funding, the ISC also makes a broad request for information from the regions. The regions are tasked with identifying strategies and alternatives, projects, programs and policies that they want to implement. This gives New Mexicans an opportunity to demonstrate that they are taking their water future seriously, creating confidence in those who consider investing in New Mexico.

Potential Solutions

The Utton Center conference participants added to the ISC's list of recommendations for improving water planning.

Regional water planning should be a consistent process with continuous support. First and foremost, there must be consistent funding for water planning. Water resource planning is an ongoing process that really should never end. We believe it very important that the State provide reliably consistent funding for water planning. This will allow for predictable progress, rather than the fits and starts of water planning that New Mexico has executed to date.

Consistently funding water planning, even at a moderate level, will help to control expectations about what New Mexico's water planning process can really achieve.

Consistently funding water planning, even at a moderate level, will help to control expectations about what New Mexico's water planning process can really achieve. There are many views on what constitutes good water planning and many stakeholders expect more than the State can accomplish. Regional water plans will only produce meaningful results if they have real stakeholder support. Providing consistent funding will help to level expectations and produce more community buy-in to the regional plans.

It is concerning that the State of New Mexico currently has only one employee dedicated to water planning. We recognize that what the State Water Planner has been able to achieve with limited resources and support is truly commendable. However, the failure of New Mexico to meaningfully staff and consistently fund water planning sends a strong signal about how serious we are about our water future.

New Mexico regional and state water plans should be given some teeth. New Mexico's water plans are given no meaningful authority under current law. There is no enforcement authority associated with implementing the regional plans. The ISC has "accepted" the sixteen regional water plans, but it has not approved them or utilized them in any significant way. It is likely that community participation in the planning process would be more robust if the ISC were to indicate that it will genuinely embrace and promote implementation of the regional water plans.

The ISC should consider revising future regional planning efforts to take a basin-wide approach, based on hydrology and water accounting instead of political boundaries. The regions or water accounting areas could be based on

watersheds. That being said, regional water planning must include considerations of political and legal issues in addition to hydrologic ones.

Water planning should include considerations of non-diversionary uses of water for recreation, tourism, and the environment. Recreational and tourism uses should not be ignored as they provide great economic benefit. Providing for environmental uses deters federal intervention in local and State water management.

Examples from Other States

Colorado's recent water planning effort is an excellent example of planning for water resilience. Colorado's Draft Water Plan, promulgated in 2014, states Colorado's long-term goals and approaches for handling water scarcity in a time of growing demand and uncertainty.

Colorado has stated its water values are to "use water for a productive economy that supports vibrant and sustainable cities, agriculture, strong environments, and recreation and tourism." Efficient and effective infrastructure and investment planning will help achieve those values. Stating water values up front is an important step. It acts like a business's mission statement, in that when there is controversy or confusion about a course of action to take the values can be used to guide decision-making.

Colorado uses scenario planning, that is, planning for multiple needs given uncertainty and the need to easily redistribute water where it is needed most. This means uncertainties in the system must be identified and opportunities to adjust must be built into the system. This approach is opposed to using the most likely prediction and creating a single plan with the expectation that such a prediction will come true.

Colorado is setting both short and long term goals: Conservation, reuse, and completion of planned projects and development of alternative agricultural transfers are short-term goals for Colorado. Colorado is also looking at moving more water out of agriculture and possibly another large trans-mountain diversion in order to meet municipal and industrial needs. Plan drafters worked together to determine how to meet increasing water demands with uncertain supplies in the future and with the goal of balancing competing needs.

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Colorado is identifying its future need to move water. By measuring and predicting the supply and demand, it can identify water gaps or shortfalls. Identification of water gaps will allow Colorado to effectively plan and create a solution that either enables increased supply or reduces demand. This has to be well planned because moving water from one area to fill a water gap elsewhere can create a new water gap in a different area.

Colorado is exploring implementation of "Low or No Regret Plans," plans that come with little controversy or little cost and are preferable to costly, inflexible solutions. This type of solution could be as simple as developing a planning document, measuring supply and demand, or facilitating communication between groups. These are low or no regret plans because there is a lower cost and a smaller long-term effect. The low and no regret plans will ideally allow for future planning with good, up-to-date figures and adequate representation of all parties involved. The payoffs of these plans may not be as large as a big project but will have an accumulated positive effect on water usage.

Water Rights Administration

Current Situation

Many of New Mexico's waters rights are unadjudicated (the Legislative Council Service reports only 67% of the State's acreage has been adjudicated). The adjudication process is effectively impractical and interminable. The State Engineer has insufficient funding or staff to adjudicate water rights in a more timely fashion. Even if there were sufficient staff and funding, adjudications still would be long and difficult.

The adjudication process is so complex, expensive, and protracted that it is an obstacle to administration. New Mexico has made accommodations for the lack of completed adjudications, mostly on an ad hoc basis.

Need

The priority doctrine is alive in New Mexico, but it is more of a specter than an administrative tool. In basins without completed adjudications, priority enforcement has been subject to criticism. The development of water right settlements, shortage sharing agreements, and basin-specific Active Water Resource Management regulations are viable alternatives to strict priority administration, especially in unadjudicated basins.

Making ongoing adjudications faster and cheaper seems unlikely and attempts to do so have been criticized for threatening to compromise the integrity of the process. For example, the property-right nature of a water right and the requirements of due process, both key legal protections, make streamlining the process difficult. These issues must be taken into consideration.

Many think the adjudication process needs revamping. We are well aware that there have been previous attempts to do this. A 2007 memorandum from the New Mexico Administrative Office of the Courts on Water Rights Adjudications identified four areas to be addressed to reform the water rights adjudication process in New Mexico. They are "(i) reform of adjudication procedures, (ii) creation of a workable system for keeping track of changes in water rights ownership, (iii) prioritization and reallocation of resources at the Office of the State Engineer, and (iv) court restructuring and reform." These are not small undertakings and require sincere and meaningful collaboration and cooperation among many stakeholders.

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Our active adjudications are already being conducted by informed, intelligent judges with the input of experienced private and state attorneys.

In 2009 the New Mexico Legislature passed a Joint Memorial requesting that the Institute of Public Law and the Institute of Public Policy at the University of New Mexico School of Law design and conduct a study to acquire public input about the "procedures and process for adjudication of water rights." The study resulted in several suggestions, which have yet to be implemented: (i) completely separating the State Engineer's technical role from its legal work by placing technical assistance and evaluation in an independent agency or institution; (ii) not initiating the adjudication process "cold" with a lawsuit noticed by mail; (iii) designate a water court; and, (iv) create a settlement-based collaborative resolution system.

Our conference participants did not propose any revisions to ongoing adjudications. Our active adjudications are already being conducted by informed, intelligent judges with the input of experienced private and state attorneys. As managers of the process and as representatives of affected parties, they must drive reform in ongoing adjudications.

Potential Solutions

Our group focused on future determinations of water rights. Considering the inevitability of water rights litigation in the Middle Rio Grande, we developed several potential solutions that might relieve some of the pressure experienced in our current adjudications when the time comes to address Middle Rio Grande water rights.

We suggest that the initial scope of adjudications should be limited to large blocks of water rights, such as the water rights claims of the Pueblos and the water rights held by the municipalities and Middle Rio Grande Conservancy District. The resolution of the many smaller pre-1907 water right claims could then be addressed over time.

We considered the possibility of only adjudicating pre-1907 water rights and allowing the State Engineer to determine the validity of all permitted rights. We recognize that implementing a vigorous licensing program in the Middle Rio Grande would still likely result in litigation. However, it would be an opportunity for the State Engineer to develop a streamlined process for issuing licenses that could avoid many of the complex and time-consuming requirements of a full adjudication.

We also considered excluding or summarily adjudicating *de minimis* water right claims. This would certainly draw criticism no matter what the definition of a *de minimis* claim or whether *de minimis* claims were summarily approved or denied. Regardless, the real impact on the wet water budget should be insignificant by definition.

Examples from Other States

In its 2007 memorandum, the Administrative Office of the Courts cautioned that each state's adjudication processes are based on their unique history and circumstances, with New Mexico's currently utilizing a process largely developed while adjudicating the Pecos River in the 1950s (by which New Mexico adjudications are conducted under the general rules of civil procedure). This echoes the notorious sentiment expressed by New Mexico's territorial governor Lew Wallace, "All calculations based on our experiences elsewhere fail in New Mexico." We throw caution to the wind and reiterate here some of the findings of the Administrative Office of the Court's investigation into water right adjudication procedures, which relate to the role of the State Engineer, the creation of water courts, staffing, and notice.

New Mexico might reconsider the proper role of the Office of the State Engineer in adjudications, where it serves as both plaintiff and technical expert. Idaho's water management agency is no longer a party to water right adjudications. In 1994 Idaho changed the role of its water management agency from that of a party to the litigation to that of an expert technical witness. Like Idaho, Montana's water agency is not a party to water rights litigation, serving instead as an investigator and advisor to the water judges. In Colorado, the water agency likewise investigates water rights claims and makes recommendations to the water courts. These more limited roles might be considered in New Mexico, where the State Engineer's role as a both plaintiff and expert has raised concern about of conflicts-of-interest.

New Mexico should consider having water right claimants share the cost of adjudications. Montana developed a new revenue source to accelerate its adjudications. Montana addressed the slow nature of its underfunded adjudication process by imposing a fee on water right claimants. Montana utilized this revenue to dramatically increase its number of water right claim examiners.

New Mexico could create a water court system. Colorado has a court system dedicate to resolving water right issues. Colorado revamped its adjudication process in 1969. It created seven water court divisions with jurisdictions based on the watersheds of Colorado's major river systems. It also brought groundwater into the adjudication process. Each water court is staffed with a judge, and engineer, a clerk, and a referee (who investigates water claims and makes recommendations to the judge). Colorado has now essentially completed adjudication of all its surface and groundwater.

New Mexico should provide more staff support for judges who oversee water right adjudications. In Idaho the court that oversees the Snake River Basin adjudication has three special masters, a staff attorney, two clerks and a reporter. In Montana the Chief Water Judge has a staff of twelve water masters, an administrator, and five clerks. New Mexico's adjudication judges have practically no administrative support.

It is difficult in water right adjudication to sufficiently and economically notify the tens of thousands of potential claimants that their rights are to be litigated. Montana deals with this issue by sending notice of adjudications out with property tax assessments. In Colorado, claimants must file their claims with the water courts. They are not personally served but can subscribe to a court published service that provides information about all water court proceedings. Both of these methods are easier than New Mexico's approach of conducting a full hydrographic survey and then contacting all the potential claimants identified in that process.

Idaho takes a somewhat draconian approach to notice of water right claimants. By law, Idaho water right claimants must file notice of their claim with the court, not the other way around. Failure to do so results in a loss of the unclaimed water right. Montana also required claimants to file notice of their claims and imposed a deadline to do so. Those water right claims that were not filed in Montana before July of 1996 were forfeited. Colorado set a deadline of July 1972 for the filing of water right claims, but did not forfeit those claims that were not filed. Rather, the late claimants forfeited just their priority dates and were deemed junior to all claims filed on time.

We reiterate that these suggestions are offered in consideration of future adjudications, which might benefit from a fresh approach.

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Water Banking

Current Situation

Water banking is becoming increasingly important across the West in minimizing losses to junior users whose rights are subject to curtailment. New Mexico has a long history of sales and leases of water. Given that water in the State has been fully appropriated, those in need of water must acquire existing water rights (the older the better). For the most part, sales and leases between private parties in the State consist of small transactions. In recent years the federal government has leased considerable amounts of water in the Rio Grande and Pecos to support flows and habitat for endangered fish. On the Pecos River, the State itself purchased large amounts of senior water rights to avoid enforcing priorities and the resultant economic hardship that would cause. However as the State is faced with more severe droughts and long term shortages, the option of buying up water rights to avoid priority calls may become, if it is not already, economically infeasible.

Water banking can help to provide funds to sectors to meet critical needs.

Needs

Water banking can help to provide funds to sectors to meet critical needs. For example, payments can be used to upgrade aging irrigation district infrastructure and to support new generations of farmers to keep them from being forced out because of water shortages. Water banking can help to provide reliable water for high value crops and improve municipal and industrial supply reliability. It can facilitate interstate compact compliance.

Potential Solutions

Facilitating water markets provides at least two potential solutions to support water resilience, moving water to higher value uses and encouraging conservation. Having a more robust water rights market will support both temporary and permanent transfers of water rights from low productivity uses to highly productive uses and mollify disruption to the economy due to a lack of water.

Water banking and temporary transfers have other multiple benefits. Water banking can allow water users to avert costly crises and help manage the risks of shortage. Banking can reduce the economic losses that result whenever there is drought by facilitating transfers to uses that cannot be interrupted. For example,

A diversity of water users is needed in a water bank to ensure interest from both buyers and sellers.

pecan farmers can lease water to keep their trees alive, while the cotton and alfalfa growers fallow fields and profit by leasing water to the pecan farmer.

Effective water banks allow users to anticipate how to meet their needs for water and control the timing of their water acquisitions. The benefits of water can then be spread across participating sectors through water bank transfers, so that the needs of the sectors (e.g., agriculture, urban, industrial, environmental, recreation) can be met flexibly.

In order to succeed, a water bank must operate in a timely and cost-effective manner. Water banks succeed when they reduce costs and delays in meeting intermittent water needs. It is essential that the water right transfer process facilitate banking. Where law and policy allow, water banks can provide real-time flexibility through a menu of pre-approved transfers. If a water bank has procedures that provide certainty and reduce costs of transfer, it will have a greater chance of success.

A primary concern with water banking is the risk of increasing net depletions. Monitoring of net depletions within water banks is challenging and often cannot be done on a case-by-case method because it would take too much time for an effective market. Remote sensing technologies such as satellite imagery are now being used across the West to estimate evapotranspiration, which gives greater accuracy to the consumptive use figures. Also, more accurate water accounting can be accomplished with regional, watershed-based banks, rather than state-wide water banks.

Controlling net depletions also requires that acceptable methods of producing banked water be followed. Clear regulatory definitions of the transferable quantities and acceptable non-injurious methods of producing the replacement water should be employed. For example, water rights that have not been quantified or have not been put to use for an extended period should not be included in a water bank.

A diversity of water users is needed in a water bank to ensure interest from both buyers and sellers. This is especially true in availability of seasonal and short-term water. Permanently buying and drying up farmland to create water is falling out of favor, so other ways must be used. Effective ways of creating short-term exchange of water between diverse users include full-season and partial-season cropland fallowing, change in overall crop mix to alter consumptive use, change in irrigation techniques and practices, and regulated deficit irrigation.

We highlight three types of water bank transfer arrangements here:

1. Contingent transfer agreements are multi-year contracts negotiated in advance of need. They provide the ability for a pre-planned rapid response at the time water becomes needed. In addition, such contracts can limit the frequency of agricultural land idling by incorporating an on-and-off fallowing schedule. For example, the contract can provide the cessation of pasture irrigation during hot summer weeks that could be triggered by low river flows or high water temperatures that negatively impact important fish. Such contracts can be used to augment interstate compact deliveries in dry periods, triggered by low reservoir levels.
2. Banking "conserved" water is a popular notion that is difficult to implement in the real world. Allowing for the marketing of conserved water can provide a good incentive for stretching a State's supplies through water conservation. However, it is challenging to define, measure, and monitor exactly

how much water is conserved. Creating wet usable conserved water is complicated because of the interdependency of water users in New Mexico. Nevertheless, typical methods for conserving water include land fallowing, changes in crop pattern, changes in irrigation technology and practices coupled with restrictions on expanded production, and regulated deficit irrigation.

3. Seasonal leases are reliable standing agreements that allow for water to move back and forth between uses. The short-term nature of these leases requires that the market or water bank operate with transactional efficiency. Where this has been achieved, the benefits have been considerable.

Effective water bank design principles include 1) using federal funding opportunities to improve irrigation technologies and practices; 2) paying per unit of reduced consumptive use and not per acre idled or per acre foot reduced over diversions; and 3) specifying protocols for quantifying reduced consumptive use, including advanced remote sensing tools and accepted regional crop consumptive use coefficients.

Legislative actions that can support water banking include providing budgets for pilot projects; focusing on advantages to communities and the State economy; and providing legislation that provides flexibility for temporary, intermittent, seasonal transfers with low transaction costs.

Examples from Other States

The Nebraska Platte Basin Natural Resource Districts operate a water bank that allows the Districts to meet streamflow targets for compact and Endangered Species Act compliance.

In north central Oregon water banking has been motivated by urban growth and diminished river flows for salmon. It banks produced water through canal lining, ditches-to-pipe improvements, improved on-farm technology and precision irrigation scheduling.

In Idaho's Snake River Basin water banking was enacted to meet salmon recovery and hydropower needs. Remote sensing is used to monitor changes in agricultural consumptive use.

In 2003, the Metropolitan Water District (MWD) of Southern California faced the sort of shock that tests water management resilience. MWD, the nation's largest municipal water wholesaler, at the time served twenty-six member agencies, primarily municipalities, that delivered water to eighteen million people across six southern California counties. In January 2003, a complex dispute among the states that share the Colorado River and water agencies within California led to a forty-five percent cutback in MWD's Colorado River water, one of its two primary sources of supply. One of the keys to its response, which allowed MWD to continue to delivering reliable supplies to the communities it served was a series of previously established agreements, primarily with agricultural water agencies. These agreements allowed the agency to bank more than 660,000 acre feet of surplus water available in previous years in aquifers outside its service territory. The stored water, and the underlying agreements, left MWD with a diversified supply base that provided a measure of resilience (the ability for the agency to maintain its basic water delivery functions) when the agency faced a major and shock to one of its primary sources of supply.

In north central Oregon water banking has been motivated by urban growth and diminished river flows for salmon.

Water Storage

Current Situation

Significant legal, political, and technological constraints hamper changes to the current way stored water is managed. Nevertheless, continuing to manage water storage as New Mexico and the federal government have in the past is wasteful. It is widely acknowledged that reservoir evaporation is a major component of losses in New Mexico's water budget. Both federal and state water managers are painfully aware of the obstacles to change. For example, evaporative losses at Elephant Butte reservoir are significant and could be alleviated by moving storage to upstream reservoirs or underground where there is less or no evaporation loss. This, of course, would implicate the Rio Grande Compact and require negotiations among Colorado, New Mexico and Texas.

New Mexico lags behind other western states that have implemented large-scale aquifer storage and recovery within the framework of interstate stream compacts.

Need

New Mexico cannot afford to waste or lose any available water. Water demand is projected to increase and water supply is predicted to decrease due to increased temperatures. We cannot change the amount of precipitation that will fall, its variability, or the rise in temperature, but we can change the laws and agreements that we have made. Solutions that affect the Rio Grande Compact or the operation of our reservoirs may be difficult to implement, but they are not impossible. New Mexico lags behind other western states that have implemented large-scale aquifer storage and recovery within the framework of interstate stream compacts.

The Albuquerque Bernalillo County Water Utility Authority's pilot project for aquifer storage and recovery is now operational. This pilot project will give us good information as to how aquifer storage and recovery works. In addition, the Authority is planning a larger aquifer injection project as well as additional small projects. The City of Rio Rancho is also considering aquifer storage and recovery projects.

Albuquerque's Bear Canyon Pilot Program was the first recipient of an underground storage and recovery permit in New Mexico. The New Mexico State Engineer's Office recognized an initial storage account of 1,073 acre feet. The project takes imported San Juan-Chama water that goes unused and is stored in the Arroyo del Oso Reservoir. It sends this water down Albuquerque's Bear Canyon arroyo, the natural geology of which allows the water that flows

In 2008, California's Orange County Water District's Replenishment System (OCWDRS) began to send purified sewer water from the District's facility in Fountain Valley into one of two recharge basins located in Anaheim California.

through the arroyo to soak into the ground and infiltrate down into the aquifer, in order to build a drought reserve.

Potential Solutions

Authorizing increased flexibility for management of upstream reservoirs to allow for increased storage of different types of water could minimize evaporative losses. This solution implicates federal reservoir authorizations and the Rio Grande Compact. The State should institute informal negotiations with Texas, accompanied by a study to identify legal, institutional, and physical barriers and model potential water savings from increasing upstream storage of water.

Authorize and implement large-scale aquifer storage and recovery. Issues include identification of geologically appropriate locations; energy costs; regulatory revisions (e.g. current rules limit aquifer storage to four years before the stored water becomes local groundwater); and Compact considerations. Because of the Compact, this solution would be easier to implement with San Juan-Chama water than with native water. This proposal also requires informal negotiations with Texas and studies to identify institutional and physical barriers.

Authorize and implement shallow aquifer storage and recovery for agriculture. Issues include the historic and cultural reliance on ditch systems for water delivery; hydrogeologic feasibility, which will vary by region; and, water quality implications. This may best be done with small pilot projects to study feasibility and work out legal and hydrologic issues.

Authorize and implement small-scale local surface storage and reregulation for agriculture. The large dams of the past may no longer be the answer to water storage given the lack of certainty about precipitation and ecological protection challenges associated with large projects. Increasing small local storage capacity can greatly enhance operation flexibility and limit losses due to water that is ordered but not needed when delivered. We suggest exploring the feasibility of this proposal with small pilot projects.

Examples from Other States

Arizona actively utilizes aquifer storage and recovery. The City of Scottsdale stores excess surface water and stormwater runoff, treated Central Arizona Project water, and reclaimed water in an alluvial basin via direct injection wells. The Salt River Project stores excess Central Arizona Project water, Salt and Verde River water, and reclaimed water. Tucson treats and stores surface water, reclaimed water, and imported Central Arizona Project water. The Vidler Recharge Facility stores Central Arizona Project water in alluvial basin basins.

In 2008, California's Orange County Water District's Replenishment System (OCWDRS) began to send purified sewer water from the District's facility in Fountain Valley into one of two recharge basins located in Anaheim California. This is a form of recharge that does not rely on Colorado River project water or California State Water Project water. This project helps to highlight the costs of a well-run recharge program. The OCWDRS required rubber dams, multiple pumping stations, miles of pipelines, flow meters, water level sensors, and a computerized system that allowed for remote control of the project. The OCWDRS has also invented a method for cleaning recharge basins that does not

require the traditional drain, dry, and clean process. This new technology cleans the recharge basins while water still remains inside the basin. The process removes the clogging layers within the basin in order for new water to infiltrate.

In the Coachella Valley there are four aquifer replenishment facilities. Beginning in 2004, replenishment assessment charges were levied on cities, farmers, golf courses and others that annually pump more than twenty-five acre-feet of groundwater in the area of the replenishment projects.

In Colorado the Centennial Water & Sanitation District stores excess surface water from the South Platte River using direct injection wells. Colorado Springs Utilities store excess Colorado River water through direct injection wells.

In Texas, the City of El Paso recharges aquifers with store reclaimed water in an alluvial basin via direct injection wells. The Wintergarden Groundwater Conservation District enhances recharge to the Carrizo aquifer with stormwater runoff via sandstone impoundments

Interstate Example

In December 2004, the Southern Nevada Water Authority (SNWA) and the Colorado River Commission of Nevada (CRCN) created an interstate water banking agreement with the Arizona Water Bank Authority (AWBA). This agreement allows Arizona to store Central Arizona Project water underground and credit Nevada with the balance. Essentially, Nevada is paying Arizona to store excess water in its aquifers and in return Nevada receives the unused water credit that it can request at anytime. Dubbed Intentionally Created Unused Apportionment (ICUA), it is unused CAP project water that is accounted for by the AWBA and the Bureau of Reclamation and credited to Nevada in an equal amount. The ICUA entitlement is made available to Nevada from Lake Mead and the ICUA is stored underground in Arizona aquifers. Whenever Nevada requests ICUA, water is drawn down from Lake Mead and Arizona must rely on its aquifer for replacement water. The Secretary of the Interior is required to release this ICUA for the benefit of SNWA in accordance with a Storage and Interstate Release Agreement under regulations adopted by the Secretary. As of December 2013, the AWBA had created 600,651 acre feet of storage credits in exchange for $122,738,945 paid by the SNWA.

In Texas, the City of El Paso recharges aquifers with store reclaimed water in an alluvial basin via direct injection wells.

Preservation of Agricultural Uses

Current Situation

With periodic severe droughts of long duration, the unpredictability of climate patterns, and increasing competition between sectors for water, many farmers are concerned that they will not have enough water to produce their crops in the future. Agriculture has been a way of life in New Mexico for centuries. Even though it no longer dominates the economy of the State, it contributes in important ways to the State's well being. Agriculture is often interwoven with our river ecosystems and it provides food for our residents and livestock.

With reduced water supplies and increasing population growth, the threat of drying up farmland for future municipal use looms large.

Need

Historically New Mexico was self-sufficient when it came to food production. As the interstate highway system developed and crop production in California increased, food importation became a viable option for New Mexicans. Today agricultural use is the largest user of water in New Mexico.

Irrigators fear losing even a portion of their water right. With reduced water supplies and increasing population growth, the threat of drying up farmland for future municipal use looms large. To ease this concern, the New Mexico legislature passed a law that limits a municipality's ability to condemn water rights owned by an acequia or irrigation district.

Options to limit the buying and during of farms should be explored fully. Improvements in water efficiency and agricultural practices may provide a more palatable solution for all. Our regulations and incentives should be examined to identify if the State is needlessly subsidizing or penalizing some water uses in favor of, or at the expense, of other users.

Potential Solutions

Many of the ideas identified for preserving agriculture have been discussed above. Encouraging a more robust short-term market in water rights will support the transfer of water to more economically productive uses during times of drought. Identifying likely climate patterns can help farmers adjust cropping patterns and adapt their conservation practices.

Some suggest reviewing how beneficial use policies may have resulted in non-productive uses of water. There is much speculation that the fear of abandonment of forfeiture motivates unnecessary use of water. It is commonly thought that water users will take water even when they do not need it simply to defend against claim that they may have forfeited or abandoned their water right. This may be an unwarranted concern but it should be investigated to resolve such fear.

Allowing irrigators to hold, bank, or sell water rights saved due to conservation may provide more incentives for conservation. Targeting low productivity agricultural lands with above average water use for fallowing in water bank programs is recommended to reduce competition for water among highly productive agricultural lands.

Encouraging collaboration among sectors based on sharing in times of shortage could help stave off the enforcement of priorities and preserve farms that would be lost without the short-term protection afforded by water sharing agreements. An agreement on the Rio Jemez provides and excellent case study of such cooperation.

The Rio Jemez Water Sharing Agreement: The Value of Collaboration

Collaboration is at the heart of effectively managing shared water. It is true that water users themselves often can create a more realistic and durable agreement than courts can. An example of effective water sharing collaboration is the 1996 irrigation agreement between Jemez Pueblo, Zia Pueblo, and neighboring non-Pueblo water users. Even though this agreement is almost twenty years old, it is still an excellent New Mexico example of a water sharing agreement worked out in times of drought.

In an extremely water short year, the Pueblos were not receiving sufficient water for essential irrigation use. The Jemez River Stream System adjudication was ongoing. The Pueblos' water rights had not yet been quantified. Zia tribal representatives had begun negotiations with the village of San Ysidro. The negotiations were expanded to include all users on that stretch of the river. Representatives of the water users toured each other's irrigations works, where they met with local officials. They realized that many of the people who were in positions of leadership along the stream were people they knew from high school. As negotiations continued and the drought intensified, the attorneys for the Pueblos of Jemez and Zia sought to exercise their yet unquantified but priority water rights by requesting the federal district court to issue a temporary restraining order and preliminary injunction to cut off non-Indian irrigation uses above the Pueblos. The Pueblos supported their motion for injunctive relief by claiming diminished surface water supply for Pueblo agricultural activities.

A hearing was held on the request. During the hearing, Pueblo leaders and acequia spokespersons asked the judge for a recess to talk among themselves. As frequently pointed out, they met without their lawyers and quickly crafted an agreement. The fact that they had already been negotiating and they had a shared history helped expedite their meeting. They were able to present a joint agreement to the court. Ultimately, the Federal District Court did not grant either a temporary restraining order or preliminary injunction against non-Pueblo water users. Instead, as requested by the parties, the District Court adopted a "stipulation" order, generally referred to as the "Irrigation Agreement."

A decree as to all of the non-Indians water rights was entered on January 1, 2000. Litigation to quantify the Pueblo rights is

ongoing. Because a final decree has not been entered in the adjudication, the 1996 Irrigation Agreement continues as a living document to control the annual, seasonal and daily use surface waters for irrigation purposes from the Jemez River and upstream tributaries. The process followed in implementation of the Agreement protects each Pueblo's senior rights; yet non-Pueblo users are afforded access to water, except in times of severe shortage.

The Agreement itself is written in plain language and is a reflection on the spirit of cooperation and deep sense of mutual respect the parties to the Agreement hold for one another as common users of the waters of the Rio Jemez.

The Irrigation Efficiency Paradox

Agriculture is currently the largest consumer of water in the drought-ridden West and New Mexico. In order to make more water available, farmers and administrative agencies have looked to improve the efficiency of irrigation techniques. Drip irrigation has increased in popularity as it can allow the user to decrease evaporative and run-off losses; essentially, to deliver a more precise amount of water directly to the root zones of crops, avoiding losses associated with flood irrigation. However, switching from flood to drip irrigation technology does not prove to be a stand-alone method for water conservation by agriculture.

A recent study by New Mexico State University's Frank Ward and Manuel Pulido-Velasquez of the Polytechnical Institute of Valencia evaluated how increases in subsidies for drip irrigation affect net water depletions in stream systems. According to the authors, increasing subsidies on drip irrigation can lead to more total acres being put into production. Ward and Pulido-Velasquez investigated the affect of these subsidies on productive acreage, net stream depletions, plant transpiration, return flows, and overall water supply in the Upper Rio Grande basin. Crop yields, stream depletions, and productive acreage were all seen to increase when drip irrigation was encouraged.

How could technology that provides for less water waste in agriculture lead to an increase in total water consumed? One reason for the increase in net depletions from the Rio Grande came from the rise of evapotranspiration (ET) promoted by drip irrigation. By delivering water directly to the root zones of plants, drip irrigation can increase plant size with certain crops, and as plant size increases, ET also rises. ET, from a river-management perspective, is water that does not return directly to the system.

There are also aspects of the water rights law in New Mexico that contribute to this conservation effort going astray. This is the *natural resources efficiency paradox:* sometimes, increasing efficiency in an effort to conserve water does not necessarily lead to net water savings for the community.

The basic underlying principles of the prior-appropriation regime in New Mexico generally encourage individual water users to continue to consume as much water as they have in the past. First, water rights can be forfeited or considered abandoned if users do not put the entirety of their consumptive right to a specific recognized beneficial use on a consistent basis. New Mexico forfeiture statutes have a five-year non-use period of limitation. If water is not put to beneficial use within that limitation, the state will consider such unused water as unappropriated public water and the ownership will revert to the public. This encourages users to continue to irrigate, for example, lands that aren't in production, out of fear that they might lose their ability to irrigate at all.

However, there is another New Mexico law that helps promote conservation of agricultural water by putting the control of conserved water in the users' hands. New Mexico's water allowance statute allows water rights owners to keep using the water they have conserved from improved irrigation methods, provided that such practices do not result in impairment or diminishment of other water rights. Under this law, if an irrigator installs a drip irrigation system and requires less water to irrigate his land, the irrigator will still be entitled to the full appropriation of water that they had before the drip system was installed. The benefit of this is that it allows for a change in the use, point of diversion, place, purpose, or quantity of the conserved water. Farmers that install drip irrigation could, therefore, use the water saved from their original water right to open more acres and grow more produce, or, treat the conserved water as a commodity and sell or lease it to other users. This kind of flexibility enhances water resilience.

In practice, the problem for many farmers is that in order to reap a reward from conserving, they must accrue other costs associated with accounting for the water, such as hiring a hydrologist to do the farm's water budget accounting. Some farmers may find it more economical to instead keep flood acreage in production or drip irrigate for more productive fields with their same water right.

If the goal of efficiency programs for agriculture is to increase the availability of water for the benefit of all users, there are other ways this can be accomplished. In contrast with New Mexico law, Oregon law allocates at least 25% of any individual's conserved water to the state with a later priority date. In New Mexico, improving the management of conserved agricultural water may provide a more palatable solution than either drying up farmland for municipal use or taking some cut of conserved water for the state. Providing cheaper, publicly accessible tools for agricultural water budget accounting may help New Mexico's farmers, as well as other potential users, benefit directly from efficiency irrigation.

Water for the Environment, Recreation and Tourism

We focus largely here on water for the environment, as it in turn supports recreation and tourism. More importantly, how we manage water for the environment is a contentious issue in New Mexico that needs improvement. We do recognize that recreation and tourism have unique water management requirements that are not addressed when looking only at water for the environment.

Current Situation

Healthy flowing rivers are important to New Mexicans. The Rio Grande, the Pecos, the Gila, the San Juan, the Canadian are synonymous with the State's cultural and natural heritage. Rivers, wetlands, and riparian areas comprise a very small part of our landscape, a mere one percent. This one percent plays an essential role in renewing the state's water supply for its two million residents; for sustaining tourism (the State's second largest industry); for producing food and fiber; and, for sustaining New Mexico's diverse web of life. For many New Mexicans, our rivers are considered sacred arteries that feed deep cultural connections to the land. For others, our rivers provide significant amenity and recreational values.

New Mexicans recognize the benefits of flowing rivers. In 2005, the State Legislature enacted the Strategic Water Reserve, authorizing the ISC to acquire water rights and use them to maintain river flows, recognizing that leaving water in-stream for fish and wildlife can be a beneficial use under New Mexico law. That same year, the State Engineer amended the regulatory definition of "beneficial use" to include "fish and wildlife." In 2009, the State Engineer authorized federal and private water rights holders to leave water in the Mimbres River for the benefit of the federally protected Chihuahua chub under a "water conservation program," an obscure but increasingly used legal water conservation tool in New Mexico. New Mexico's water forfeiture statutes recognize that water right owners may enroll in a State Engineer approved water conservation program, allowing them to fallow acreage and not divert from a stream or well. This strategy protects the owners from forfeiture or abandonment of their water rights and can result in increased river flows.

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Unhealthy rivers don't just jeopardize New Mexico's fish and wildlife; they make all New Mexicans more vulnerable.

New Mexicans know that investments in healthy rivers produce broad returns. In 2007, the State began a program to restore its rivers. In its first two years, the River Ecosystem Restoration Initiative awarded 27 grants. These projects restored 2,394 riparian acres and 33 river miles within 17 counties in New Mexico. State funds were matched by other agencies, in many cases doubling or tripling funding for the projects. At the same time, the River Ecosystem Restoration Initiative created over 222 permanent, seasonal, and part-time restoration-related jobs in the private sector. Between 2007 and 2010 the State invested $7.2 million to restore our rivers. The program was revived in 2014 with a $2.3 million appropriation to the New Mexico Environment Department for what is now called the New Mexico River Stewardship Program.

The Watershed Protection Section, also in the New Mexico Environment Department, is responsible for helping New Mexicans reduce the amount of non-point source pollutants that get into our waters. It's staff help to implement best management practices such as watershed association development, riparian ecosystem restoration, spill response, and abandoned mine reclamation. They administer federal grants provided under the Clean Water Act that enable New Mexico communities to develop watershed based solutions for their water quality problems.

New Mexicans are united in support of healthy watersheds. A bill entitled the New Mexico Forest and Watershed Restoration Act was proposed in 2015 that received broad public support and passed both the State House and Senate unanimously. The bill was intended to enable a much greater scale of restoration work in New Mexico watersheds than is currently occurring. The Governor vetoed the bill due to her concerns that it would create additional bureaucracy and dilute the ability of Executive agencies to fund watershed restoration projects. The New Mexico State Forestry Division is responsible for forest fire suppression in New Mexico but has treated only 78,043 acres in the last seven years.

The federal government has been investing heavily in water leases for years that are used to create flows for endangered fish in the Rio Grande and Pecos River Basins. The Bureau of Reclamation's 2015 budget included $1 million for leasing water to leave in stream in the Middle Rio Grande.

Need

Unhealthy rivers don't just jeopardize New Mexico's fish and wildlife; they make all New Mexicans more vulnerable. Healthy rivers are the original "green infrastructure," providing free services that would take billions of our tax dollars to replace. For example, healthy river systems store and release flood peaks, recharge groundwater, maintain channel capacity for water deliveries and flood flows, transport sediment through the system, and retain and remove pollutants protecting our drinking water supply.

New Mexico's rivers suffer quality impairments. Under the New Mexico Water Quality Act, the New Mexico Water Quality Control Commission (WQCC) is tasked with adopting water quality standards in the state. The New Mexico Environment Department's Surface Water Quality Bureau monitors New Mexico's surface water quality. According to the 2014-2016 New Mexico Water Quality Assessment Report, 54% of the 7,170 stream miles in New Mexico have identified impairments and 65% of publicly owned lake, reservoir, or playa acres also have identified impairments. New Mexico has issued fish consumption advisories in 26 lakes and three rivers due to

high contaminant levels, including mercury. The three most common causes of water quality impairments are temperature, siltation, and turbidity. Non-point sources of water pollution, such as loss of riparian land and rangeland grazing have a large impact. The Report stated that the largest non-point sources of ground water pollution came from household septic tanks or cesspools.

The hydrology of New Mexico's rivers has been altered. This means that rivers in New Mexico no longer flow as the did naturally, impaired with reduced magnitudes and frequencies of high flows, reduced flow duration, increased frequency and duration of low flows, and increased river drying at sites downstream of water diversions, groundwater wells, or major dams. It is difficult to find a river in New Mexico that doesn't have significant changes to its natural flow patterns. Some human uses actually sustain flows, such as downstream deliveries for municipal use and to satisfy Compact obligations or return flows from farm fields and municipal wastewater. Still, human uses on the whole have dramatically changed the pattern of flows in our rivers.

Potential Solutions

Our native plant and animal life do best when the rivers they rely upon are managed to maintain or mimic natural flow patterns. Each component of a river's natural hydrograph (base flows, monsoon pulses, snowmelt surges, high flows, and large floods) is key to sustaining the integrity of a river's processes and functions. It is not possible to return to pre-development conditions but managing our rivers to recreate important components of their unique natural flow patterns can exert a very positive influence on the health of New Mexico's rivers. Mimicking a river's natural hydrograph is now recognized as an efficient way to improve river health.

The Strategic Water Reserve was initially very well funded; it was appropriated $5.3 million in its first three years. Funding dried up as the economy went into recession. On a positive note, the Strategic Water Reserve is breathing new life due to a new appropriation of $2 million. Continued funding and more aggressive implementation of the Strategic Water Reserve are recommended.

The burden to offset environmental water use has largely been put on those who attempt to implement environmental restoration projects. The Strategic Water Reserve should be utilized to allow the state to support private restoration and recovery efforts.

Local governments may be missing economic development opportunities associated with flowing rivers. A solution is to incentivize local governments to acquire water for instream uses including wildlife habitat, watershed protection, and recreation.

We must move beyond Endangered Species Act driven environmental flows for single species management and develop holistic environmental flow prescriptions for impaired New Mexico rivers. Failure to manage rivers as complete systems results in unforeseen detriment such as wildlife die-off, habitat destruction, and loss of greenbelt.

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Addendum

Operating Principles for Water Resilient Governanace

Our group of forty water managers, lawyers, scientists, engineers, and academics began the discussion of how to make New Mexico more water resilient not by immediately delving into the important details of hydrology or law. Our preliminary discussions touched upon issues of governance and human nature. We present them here because we believe they can facilitate achieving water resilience in New Mexico.

Polycentric Governance

We recognized that all water governance in New Mexico is polycentric governance. Not only do current governmental jurisdictions overlap, there are remainders of ancient authorities that still exert influence across the State. If these entities cannot work collaboratively, decision-making becomes time consuming and conflict-ridden.

For example, in the Middle Rio Grande there are a variety of levels of governance over irrigated agriculture. The Middle Rio Grande Conservancy District's water delivery system was formed by linking together approximately seventy separate acequia systems. At the local level, acequias maintain their vitality. These acequia communities and other community managed ditches are responsible for the distribution and maintenance of the works within their control. Also within the Middle Rio Grande Conservancy District are six sovereign Native American Pueblos. The Middle Rio Grande Conservancy District delivers irrigation water in coordination with all these communities.

The Middle Rio Grande Conservancy District itself is within a federal water project, the United States Bureau of Reclamation's Rio Grande Project. The Army Corps of Engineers shares flood control responsibilities in the Middle Rio Grande and the Fish and Wildlife Service oversees endangered species conservation; both require collaborative partnerships with the Middle Rio

At the local level, acequias maintain their vitality. These acequia communities and other community managed ditches are responsible for the distribution and maintenance of the works within their control.

Recognizing the interdependence of our multiple levels of water governance and identifying effective means of communication and collaboration amongst them will make New Mexico more prepared to deal with our uncertain water future.

Grande Conservancy District. An additional layer of governance requires coordination with the State, as it is both the administrator of the public's water and bears responsibility for complying with the Rio Grande Compact.

Optimally, the community ditches, acequias, Pueblos, the Middle Rio Grande Conservancy District, the State, and the federal agencies would all be working in relative harmony. Instead, there are significant unresolved legal disputes among all these parties. These uncertainties and lack of integrated polycentric governance create administrative conflicts, and irrigators miss out on the potential benefits of better-coordinated management.

Nobel Prize winning economist Eleanor Orstrom pointed out that nesting levels of organization within one another actually can provide advantages to water users and managers. Localized management encourages local monitoring, while large-scale system managers can pursue more complex funding opportunities and take advantage of economies of scale. Local communities may be able to respond more quickly to changed circumstances due to their comparative lack of bureaucracy, but larger governance systems can influence responses on a larger landscape.

Recognizing the interdependence of our multiple levels of water governance and identifying effective means of communication and collaboration amongst them will make New Mexico more prepared to deal with our uncertain water future.

Institutional Integrity & Flexibility

Our conference participants also emphasized the need for water governance entities to earn and keep the public's trust and confidence in their actions. To operate most effectively, our water management agencies must have the support of an engaged public. To acquire the support of the public, an agency must be perceived as working in an equitable manner and not being subject to improper influence by any particular interests. Acquiring the trust of the public can only be done if an agency is transparent in its decision-making process. Acquiring the confidence of the public requires an agency to be accountable for all its actions.

Institutional integrity is bolstered by public participation in agency decision-making processes. Our conference participants agreed that agency responsiveness to public input is critical. Public participation should be an interactive experience for both the public and water management agency. Meaningful public participation is not achieved by the traditional practice of the "three I's" - to invite, inform and ignore the public. While seemingly self-evident to members of the public, the importance of public participation in water management decisions is often overlooked given that gathering, analyzing and responding to public concerns is a slow and cumbersome chore. Nonetheless, it should be a critical component in making New Mexico water management more resilient in the long-term.

Our conference participants also discussed the need for water management agencies to be flexible. As described in this report, New Mexico water managers have historically shown great imagination while working

within tight legal constraints. Changing water supply conditions will require imaginative and timely actions from our water managers. However, there is a balance to be struck between the need for opportune responses to crises and the need for operational certainty among water users. We must consider how our water managers can respond quickly but with sufficient deliberateness to create confidence among users.

Courage

Making New Mexico water management more resilient in the future will require change. Making any type of change to New Mexico water management, law and policy can be a daunting task. Any such proposal is first met with the challenge "Whose ox are you going to gore?"

During a 2014 water conference, a team led by Sandia National Laboratories posited that transformational solutions are required in New Mexico water management and policy. Many of the concepts they discussed are embraced in this report. However, they caution that these changes can be disruptive to the social, political, and economic status quo. Therefore they will be opposed. We commend the team from Sandia Labs for proposing to disrupt the status quo, especially as they point out that what seems impossible today will be possible tomorrow.

Social Capital

Relationships have value. New Mexico will be more resilient in times of water crises if we establish and maintain wide and deep social networks among political leaders, water managers, and water users. Changing and adapting water management in times of drought or other stress can be greatly facilitated by existing positive working relationships. As a small state with accessible public servants, New Mexico could easily have an advantage in this regard.

Effective change in water management often arises from collaborative relationships, as seen across the West. When Colorado changed its water laws in the middle of the last century to include the regulation of groundwater and require adjudication of rights, it did so using panels of water lawyers that reflected the diversity of users as well as a broad knowledge base. Recent drought sharing agreements, changes in reservoir management, and environmental flow projects in the Lower Colorado Basin were born of friendships among both American and Mexican water managers and stakeholders.

System-wide Thinking

The effectiveness of the ideas and recommendations in this report depends on the ability of state water planners and policy gurus to think of effects on the whole system. These recommendations support each other. For example, implementation of coordinated state and regional water plans should take into consideration the development of a robust and defensible water budget that addresses the preservation of agriculture while promoting healthy ecosystems, recreation and tourism. We believe this to be true for each of the ideas presented in this report - the more fully they are implemented, the more resilient the state's water management will become.

New Mexico will be more resilient in times of water crises if we establish and maintain wide and deep social networks among political leaders, water managers, and water users.

Preventive Diplomacy

The ideas described above are embraced in the doctrine of preventative diplomacy. The Utton Center supports the practice of preventive diplomacy through collaboration among water users, managers, and experts to better manage water supplies. The Utton Center's namesake, Albert Utton, promoted preventive diplomacy and other concepts presented in this report over twenty years ago:

> "Key concepts in the rational use of resources which are divided by political boundaries have to include future orientation, international cooperation, coordination, and preventive diplomacy. In a time of increasing populations and advancing economic growth, it is becoming urgently important to address the issues of the prudent and cooperative use of shared resources before reaching a state of contention. Preventive diplomacy is a necessity to minimize debilitating disputes."

Over forty people generated this collection of ideas during two days. It only represents one conversation in the perpetual discourse about how to best manage our water resources. We strongly encourage broad input and collaboration as a part of the development and implementation of all the ideas and recommendations in this report. In that spirit, we invite you to contribute your voice. Please feel free to let us know your thoughts on the ideas presented here via: uttoncenter@law.unm.edu.

We strongly encourage broad input and collaboration as a part of the development and implementation of all the ideas and recommendations in this report. In that spirit, we invite you to contribute your voice.

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For the conference report highlighting the Rio Jemez Agreement see: **http://uttoncenter.unm.edu/pdfs/crossing_boundaries.pdf**.

Attachment A

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