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REGIONAL WATER PLANNING IN A MIXED URBAN, RIVERINE AND RURAL AREA — THE MIDDLE RIO GRANDE

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ABSTRACT

The Middle Rio Grande Region: Sandoval, Bernalillo, and Valencia counties. Three main watersheds. Two-fifths of the State's population. Predicted doubling in fifty years. Over 12 tribal entities. Over 18 local government entities. Over 130 public water supply providers. More than 30 acequias. Habitat for endangered species. Sixty percent of the State's economy. Substantial agricultural interests. Heavily studied hydrology. A seriously drawn down aquifer. A leaky transmission line for meeting downstream water obligations. And thirsty neighbors.

On average, we had about 15-18 percent more rainfall than in the last two millennia. On average we consumed 15-23 percent more water than was renewed. And we recognized that our aquifer sources of underground water were severely limited. All three of these occurred in the last quarter of the twentieth century.

"Balance Water Use with Renewable Supply." That's our adopted regional water planning Mission. Some say it's a mission impossible. We want to continue to have enough affordable, quality water to meet human and environmental needs while maintaining our desired New Mexican life styles - for generations to come.

The Water Assembly, a grass roots organization of diverse interests, entered a partnership in 1998 for regional water planning with the Mid Region Council of Governments, a voluntary association of local governments.

The controversial draft plan is now in its public review cycle. It is the result of an extensive public meeting and technical analysis process, touching nearly 3,000 members of the general public to guide the plan. In addition, it involved about 30,000 person-hours of Water Assembly volunteer labor and expertise, a contribution comparable to paid staff and funded consulting support.

This Region had both the blessing and the curse of extensive hydrological studies. These studies allowed us to understand our serious deficit spending situation, enabled endless debate on whose study was ever so slightly better, and obligated us to try to quantify our planned remedial actions.

The presentation discusses the steps and the logical flow from obtaining early-on public and technical input, through the ingestion of diverse stakeholder interests, identifying 44 candidate alternative actions, to having a documented plan with its family of recommendations.

In aggregate, we did not find the single silver bullet that will solve our shortfall situation. We see that nearly all of the candidate actions will have to be implemented, at least to some extent, so as to have a chance of achieving the Mission.

The overall resulting scenario is one of balancing interests. It describes a sharing of the impacts. It will take intense conservation on the part of all individuals, sectors, and jurisdictions. There will be incentive, regulatory, volunteer, engineering, and cost actions. It will take across-the-board moderation – moderation in our indoor uses, moderation in our lawn and garden uses, moderation in our land and water recreational facilities, moderation in our municipal and industrial uses, moderation in our agricultural activities/uses, moderation in our environmental needs/uses, and moderation in our new users/uses.

We see the difficult part as yet to come. The water plan is a set of recommendations to individuals, to businesses, to non-governmental organizations, to communities, to local governments, to state government, to tribes, and to federal agencies.

Now the challenge before the Region is building the support by these entities to follow through with actions to implement the recommendations. Each person, each entity will have to think cooperatively and broadly - beyond the boundaries of their individual jurisdiction, beyond the duration of their term of office, beyond traditional special interests, and beyond our current generation.

INTRODUCTION

The purpose of this article is to review the regional water planning issues and process in a mixed urban, riverine and rural region. This review can serve as a counterpoint to a similar discussion of a primarily rural region, Mora-San Miguel[2]. The Middle Rio Grande Regional Water Plan is scheduled for completion and delivery to the New Mexico Interstate Stream Commission in early 2004[3]. After establishing the setting for the planning, we will look at the major regional issues we have identified, discuss our publicly driven process, the results up to this point in time, and then note how we see the planning going in the near future.

OUR SETTING FOR THE PLAN

The following paragraphs briefly identify the region for water planning and the planning entities that are involved:

Middle Rio Grande Region

The Middle Rio Grande region is one of sixteen regions in the State of New Mexico (Figure 1). In the early 1990s, New Mexico was divided into these regions according to a combination of political and hydrological criteria - hydrological because that's the way the physical world acts and political because that's the way any regulatory and incentive implementation actions are likely to be taken. Our region is Sandoval, Bernalillo and Valencia counties, spanning much of the Rio Grande basin in the upper half of the Rio Grande Compact apportionment reach. The region is quite diverse including the Albuquerque/Rio Rancho urban area, farming areas, and very lightly populated desert areas. We have three main watersheds flowing generally from north to south - the Rio Puerco on the west, the Rio Jemez in the north central and the Rio Grande in the east (Figure 2). The people in the Rio Puerco and Rio Jemez watersheds chose to plan for water separately from the "mainstem" Rio Grande. This article will mainly address the mainstem, treating the Rio Puerco and Rio Jemez simply as tributaries to the Rio Grande.

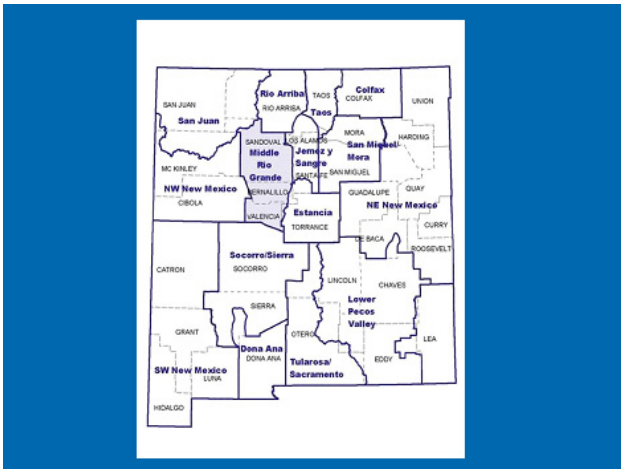

Figure 1. In the early 1990s, New Mexico was divided into sixteen political/hydrological regions for purposes of Water Planning.

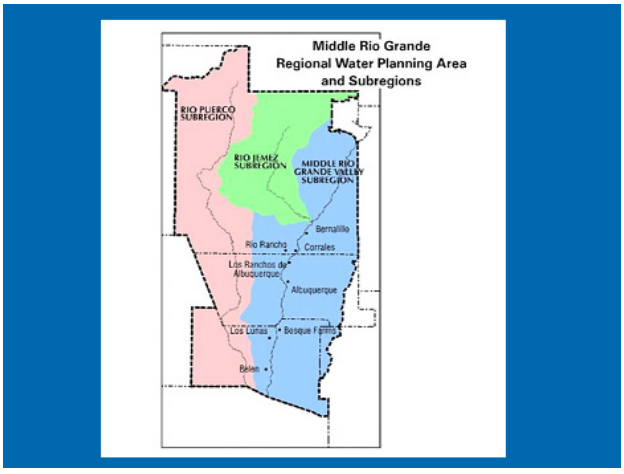

Figure 2. The Middle Rio Grande Region consists of Sandoval, Bernalillo and Valencia Counties. It contains portions of the Rio Puerco, Rio Jemez and Rio Grande watersheds.

Water Planning Partnership

The co-equal partnership between the Water Assembly and the Mid-Region Council of Governments was established in late 1998 to accomplish the regional water planning. While there was and is substantial overlap of roles, the Water Assembly has been mainly responsible for the plan development. The Mid-Region Council of Governments' Water Resources Board has been responsible for establishing plan implementation.

The Water Assembly failed to obtain more than superficial participation from the pueblos on the Rio Grande, despite efforts and desires to involve them actively.

The Water Assembly is an independent, all volunteer, grass roots, not for profit organization that was established in 1997[4], following up on a request from the State Engineer to the University of New Mexico to set up an independent water planning process for the region.

The Water Assembly is made up of five internally diverse constituency or advocacy groups so as to balance and draw in the expertise and various viewpoints about water:

- Agricultural, Cultural and Historic Water Use Advocates
- Urban Users and Economic Development Advocates
- Environmental Advocates
- Water Managers – utilities and cooperatives
- Specialists – hydrologists, lawyers, engineers, etc.

Then, to accomplish the needed planning activities there are six working teams, all coordinated by an Action Committee and its supporting Executive Committee.

The Mid-Region Council of Governments is a voluntary association of local government entities in a four county area[5]. It was established in 1967 for the purpose of regional transportation planning and coordinating federal funding for transportation projects.

The Council of Governments established a Water Resources Board with representation from governments within the water planning region in 1998 to deal with water issues:

- Municipalities
- Counties
- Special Districts
- Other Governmental Entities

Supporting this Board and its Water Providers Council, the Council of Governments staff included an Executive Director, a Water Planning Coordinator and all important Office Staff.

OUR REGIONAL ISSUES

The Region has physical/hydrological, human, and institutional issues, all of which bear on the water planning process:

Regional Water Budget

The regional water budget shows an ongoing deficit spending of water during the last quarter of the twentieth century. With data drawn from the twenty-six year period 1972 through 1997, we see an average

of 261 thousand acre feet per year[6] (kafpy) of renewable supply balanced against an average 316 kafpy of consumptive use (Figure 3). That reflects an annual deficit spending of 55 kafpy, enough water to fill a football field to a depth of about eleven miles.

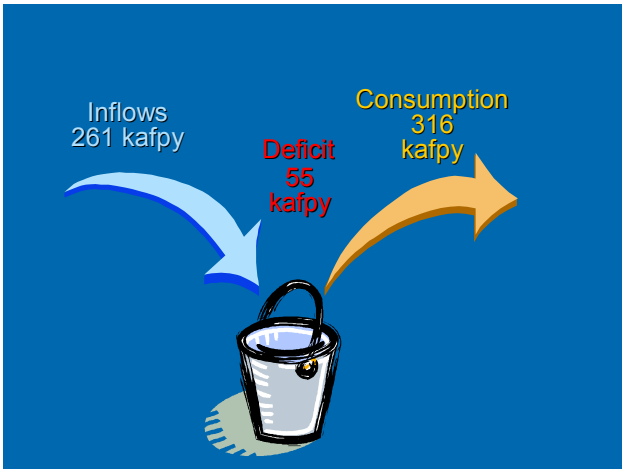

Figure 3. Summary of the Regional Water Budget. During the last quarter of the twentieth century, the region had an ongoing annual deficit spending of water. The planning mission is to eliminate the deficit.

These numbers were calculated primarily from The Water Budget 1999[7]. As with all hydrological data and reports, qualifiers are important. Key qualifiers include:

- All of the numbers we deal with are estimates and are coarse approximations (As examples, other studies show deficits 41 kafpy[8], 60 kafpy[9], and more[10]).
- Average delivery water southward has been excluded from inflows and outflows (Socorro/ Sierra uses, Elephant Butte evaporation, and Rio Grande Compact deliveries).
- Heron Reservoir was being filled with regional inflows during the data period.
- Changes in Elephant Butte Reservoir content were not incorporated.

A breakdown of this budget appears in Figure 4. The data in that figure include the 169 kafpy average consumptive use of water by the downstream Socorro/ Sierra Region, embedded among the inflows and explicitly identified as a downstream outflow.

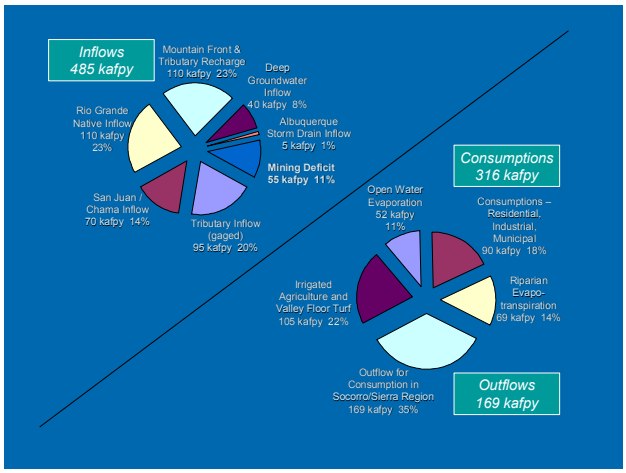

Figure 4. Breakdown of the Regional Water Budget. In this heavily urbanized region, residential/industrial/municipal consumption, irrigatied agriculture consumption, and riparian/open water consumption each represent about a third of the total regional consumption.

A USGS Report[11] corroborates the indications of significant deficit spending over the period through a chart showing the drawdown of the aquifers in the Albuquerque area (Figure 5).

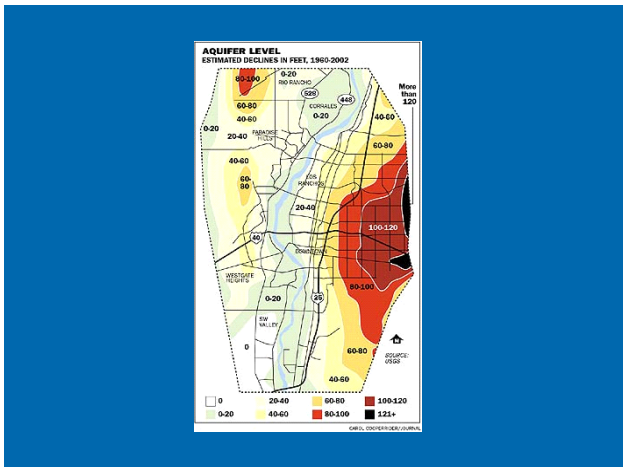

Figure 5. Cones of depression show a lowering of water table levels in excess of 120 feet on the east side of Albuquerque since 1960.

Now that we have noted the deficit spending during the last quarter of the twentieth century, we can take a bit longer term view. Figure 6 shows tree-ring precipitation data at El Malpais (about 75 miles west of Albuquerque) across a 2000 year period[12]. The figure depicts a 100 year running average of single year data. We should take caution from the indication that the last quarter of the twentieth century shows as the wettest quarter century in 2000 years.

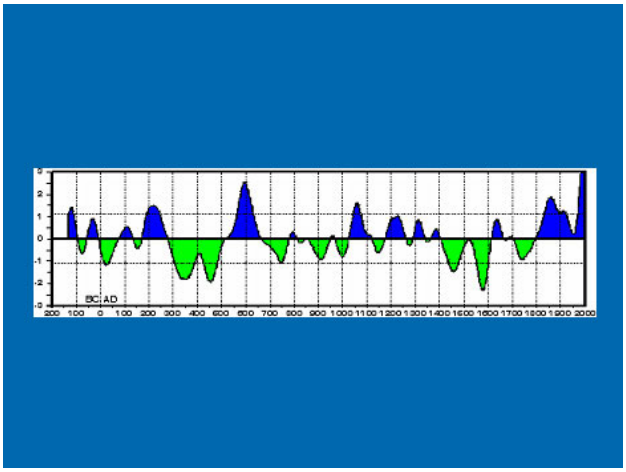

Figure 6. Reconstruction of 2000 years of Precipitation at El Malpais from Tree Ring Study (inches of precipitation relative to the 14.5 inch average). The last quarter of the twentieth century, the period of devicit spending, was relatively wet.

As a qualifier, it should be noted that the 100 year running average gives a slanted picture of the infamous 1950s drought. The annual data shows that the drought was quite intense, dipping well below the chart bounds, but was relatively short lived at that level. The 100 year averaging makes the 1950s appear to have occurred during just-above-average rainfall.

Our demand for wet water relative to renewable supply essentially places us in a perpetual state of drought, characterized by intermittent periods of newsworthy drought intensity increases. This entire plan for water management is effectively a drought management plan.

Selected Regional Attributes

Characteristics of this region had and continue to have great influence on the planning process:

- Over 12 Tribes – possessors of unquantified prior and paramount water rights
- Over 18 Local Government Entities – each with its own issues and goals
- Over 30 Acequias – ancient traditions and governmental authorities
- Over 130 Public Water Supply Providers - each with its own rules and procedures
- 40% of the State's Population, Predicted Doubling – within about 50 years
- 60% of the State's Economy – industrial/urban job center
- Substantial Agricultural Interests – major water user under market pressures
- Habitat for Endangered Species – newly enforced demands with implicit water rights
- Heavily Studied Hydrology – provides both knowledge and debates
- A Seriously Drawn Down Aquifer – dwindling asset base having risks for our future
- A Leaky Transmission Line for Downstream Uses – impacting compact obligations
- Thirsty Neighbors – no one is offering the Region new fresh water

However, as with the hydrology, we need to remember that there is negligible return on trying to make the above quantities overly accurate or precise. Measurement quality is often not there. The choice of study assumptions make for disparities. And regulatory/incentive tools to influence the situation are blunt instruments. All we really need are numbers that are close enough to convey their respective messages.

Water Planning Focus

A water planning focus is needed because the problem is too complex to tackle all at once. We have chosen four key foci:

- We should recognize the region's role in **broader issues** than just within our boundaries. For example, meeting the Rio Grande Compact obligations is rigorously the State's responsibility. However, since we are the major consumer of the State's allocation, we believe we really need to consider this obligation in our planning. Further, it's really an arbitrary choice of semantics. Either we consider the amount of impending shortfalls in meeting the Compact, or we consider the amount we need to reduce our consumption within the Region when the State preempts enough supply to meet the Compact - same problem, same numbers, different words.
- We chose to deal with **wet water**, the kind you can pour and drink. This is as distinguised from paper water or water rights. Paper water is essentially a license to use wet water if you can find it, and we appear to have three or four times as much paper water as we have wet water. Without denigrating the importance of water rights and associated ownership prerogatives, we felt it to be of first importance to assure our collective ability to find enough water.

- We also decided to focus on **averages**.The Region's water supply is highly variable. It can vary as much as by factors of three from year to year. We wished to concentrate on the multi-decade term, rather than transient remedies for this year's lower than normal precipitation or next year's higher than normal snowmelt.
- We chose to concentrate on **consumption or depletion** of water. That is the water that evaporates out of the system or is combined into plant life. Once it has evaporated, it is really gone. We get no credits when the vapor drifts out across state lines. We make this choice instead of counting diversions (or rerouting) of water and return flows, where the same drop of water can be diverted and counted multiple times as it flows from Colorado to Texas.

Through an extensive public process (see below) we chose "Balance Water Use with Renewable Supply" as the mission for the Regional Water Plan. The key figures of merit relative to this mission became the aquifer depletion implications and implications for compliance with the Rio Grande Compact obligations. In the process of dealing with these implications, however, the important and most intensely debated issue was how to maintain a strong balance among side effects in areas such as the environment and species, water rights prerogatives, decision making authorities, deep traditions and ancient cultures.

OUR PUBLIC-DRIVEN PROCESSES

The Interstate Stream Commission's Regional Water Planning Handbook[13] declares that besides a sound technical basis, public involvement in the regional water planning process is important. We took that guidance very seriously. Rather than develop a plan through a consultant and then bring the plan to the public for ratification, we chose the reverse - to involve the general public from the very beginning.

Overall Objective

The overall objective was to find a broadly acceptable solution to a difficult and complex problem, via an open, inclusive and participatory process. We identified the planning problem to be continuing to have sufficient affordable clean water to meet human and environmental needs while maintaining all of our desired New Mexican lifestyles.

These are very stringent constraints. If we were willing to remove any of the above requirements, the problem would become substantially easier. For instance, at $169.9 per gallon, we could have all of the highly purified water we could ever want. However, for example, in Albuquerque we are accustomed to paying somewhere between one and two tenths of a cent per gallon for tap water. Nearby municipalities are somewhat more, and irrigation water is less. In all cases, the charges are for delivery systems, not for water. How high a price is "affordable" and is politically acceptable without having a debilitating impact to the economy?

Key Components

The key componments in the planning process were public involvement, technical integrity, governmental involvement, and the planning infrastructure. Throughout the planning period, there were ongoing and iterative information exchanges among the components.

The public involvement component included the Water Assembly as well as the general public at large. Technical integrity was aided through understanding of the Region's hydrology, analyses of alternative actions, and computer modeling. We involved the local governments directly and through the Council of Government's Water Resources Board, and conducted dialogue with acequia, state, federal and some tribal entities. For the process of developing a deliverable plan, we had the need to maintain administrative and documentary infrastructure.

The public ingredients in the planning process are illustrated in Figure 7. Over the seven-year period and through far more than 100 general public meetings throughout the region, we gathered and ingested public input on topics. This is indicated in the upper row of boxes, from visions and values through goals, action suggestions and building scenarios. The lower row of boxes identifies the kinds of events that were conducted along the way, annual assemblies, community conversations, telephone surveys, and briefings.

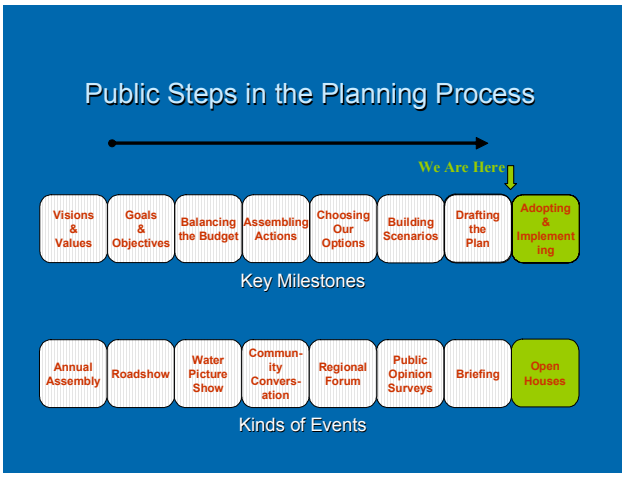

Figure 7. Involving the General Public in the Process from the Very Beginning. Key milestones reflecting topic discussions and the events in which the discussions took place.

The technical ingredients were developed interactively across the same time period and are similarly shown in Figure 8. The upper row indicates the technical products that we obtained from water budgets to future predictions to action analyses and the lower row indicates the sources that were used to develop those products, both volunteer expertise and funded consultants.

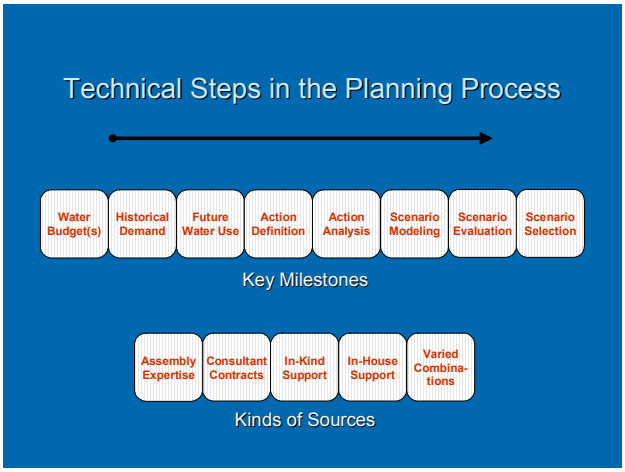

Figure 8. Ensuring the Technical Integrity of the Process. Milestones showing the technical products that were used to keep the public process on track. These were developed from various sources of expertise.

The governmental involvement took place through numerous briefings to local, state, tribal and federal staffs as well as to local elected officials. In addition, the members of the Water Resources Board served to some extent as a two-way communication link between the represented local governments and the detailed water planning process.

The documentary infrastructure was characterized by a thirty page "Annotated Table of Contents" that was developed relatively early on in the planning process. Being tailored from the Regional Water Planning Handbook, it identified about 100 chapters, sections, and paragraphs to be placed in the plan, along with a textual description of the intended content of each. Water Assembly working teams, per their respective expertises, populated those paragraphs as the indicated information became sufficiently developed.

A flow for organizing the public input and technical data, and for making decisions is depicted in Figure 9. As we proceeded in developing the plan in an attempt to meet the developed mission, goals and objectives, we gathered some 270 suggestions from the public and from the experts about possible actions. These were massaged into 44 "alternative actions" whose separate implications were analyzed. These alternative actions were gathered into five planning "scenarios" based upon advocacy emphases and later merged into a single "preferred scenario." The preferred scenario was then mapped into a set of 43 recommendations in the plan document.

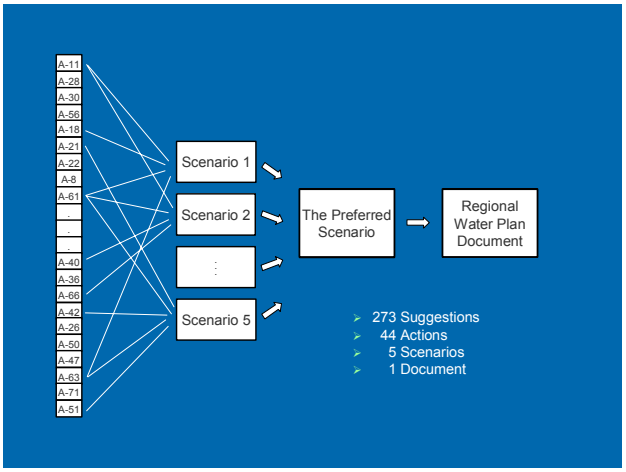

Figure 9. Converging Public Suggestions into a Plan. Suggestions led to Alternative Actions. Analyses, Modeling, and Viewpoints led to Scenarios. A blended "preferred" scenario became the basis for the plan's recommendations.

Computer modeling supported the selection and evaluation of scenarios. Scenario development teams used the model as partial guidance in setting and re-setting scenario parameters. The model was also effective as a demonstration and education tool during general public meetings.

The Water Assembly and Sandia National Laboratories cooperatively developed the computer model to help in the planning process. The intent was to allow the model user to adjust numeric parameters regarding alternative actions, and then to observe the water and cost implications of a collection of such adjusted alternative actions. Some of the key attributes that went into and/or came out of the modeling were:

- The use of a multi-constituency management team to help with model credibility
- Identification of model adjustables and water figures of merit near the outset
- Use of the model as a public education tool
- Being able to see the model results in real time
- Having the model usable for evaluation during scenario building
- Performing figure of merit sufficiency checks on a collection of actions
- The necessity to recognize that the model has limitations
- The importance of applying model results with good judgment

Figures 10, 11, and 12 are annotated images of model screens. The left side of Figure 10 indicates the categories of adjustments that the user can make (Bosque, agriculture, residential, etc.). Figure 11 is a typical adjustment screen showing parameter adjustment slider bars whose positioning the user can control with a mouse. And Figure 12 depicts figure of merit plotted from 1960 through 2050. For each graph, one curve is the "no-action" data and the second curve shows the results with the full collection of slider bar adjustments.

RESULTS TO DATE

The plan is close to completion. The draft plan was built to closely track the attributes identified in the Regional Water Planning Handbook. However, we did make some adjustments to meet the needs of the Region, to consider some broader implications, and to acknowledge our limited resource situation. Key content items in the draft plan include:

- Technical Background and History
- Actions and Analyses
- Future Budgeting
- Preferred Scenario
- Recommended Actions
- List of Projects
- Public Welfare Statement

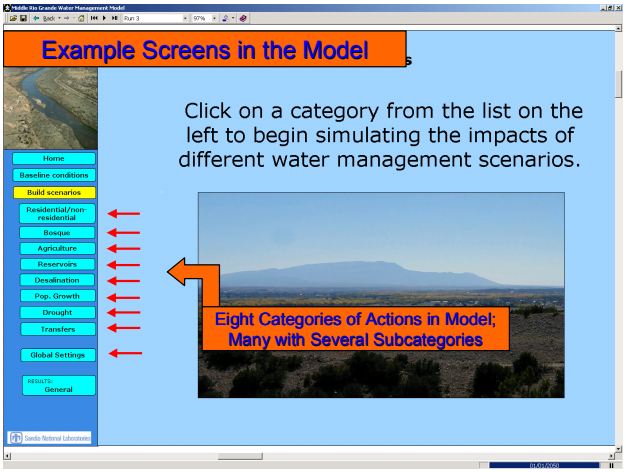

Figure 10. A Human-Usable Computer Model allowed the scenario builders to explore the quantitative implications of collections actions, using some 60 adjustable parameters.

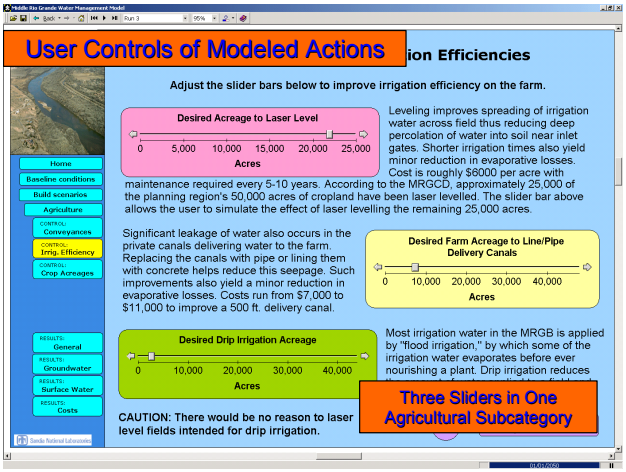

Figure 11. In building/evaluating their scenarios, users set and re-set parameters of multiple selected actions, by using a mouse to move a pointer along the calibrated slider bar.

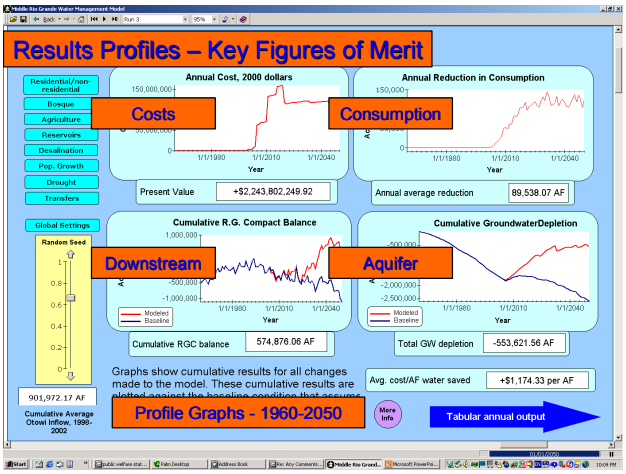

Figure 12. The main model results appeared in real time as graphs depicting surplus/deficit on obligations and aquifer impacts, along with the associated costs to implement/maintain and water savings.

- Implementation Strategies
- Shopping List of Tools for Implementation

The intent of the preferred scenario was to balance the water budget. We had to select from among the candidate alternative actions. Our conclusion was simply that we have too many "needs" and too little water. We need to adopt/recommend nearly all of the alternative actions. The real question was how much of each? The considerations here included:

- Current Overspending
- Population Doubling
- Environmental Obligations
- Downstream Obligations
- Lifestyle Considerations
- Economy Needs for Cheap Water
- Minimal New Water Sources

It became clear that there would be no single "silver bullet" to solve our problems. There would have to be many actions in many spheres to even come close. Further, we found for the diverse region, there was no "one size fits all." Each locale (e.g., local government) would have to determine which and how much of the recommendations to actually implement. And because of the time needed to implement change, the modeling suggests that we may see compact shortfalls lasting many years, and the resultant need for additional urgent action. Regularly, the underlying political issue, topic after topic, was the dichotomy between individual rights/desires and community rights/desires, which drove an ongoing balancing act.

OUR COMING ATTRACTIONS

The controversial draft plan is now in its public review cycle. It is the result of an extensive public meeting and technical analysis process, touching nearly 3,000 members of the general public to guide the plan. In addition it involved about 30,000 person-hours of Water Assembly volunteer labor and expertise, which contribution was comparable to about $1.2 million of paid staff and funded consulting support.

Where do we go from here? In the short term, we have acceptance of the draft plan yet to accomplish – open house reviews with the general public, draft review and critique by the Interstate Stream Commission, and acceptance by the local governing bodies in the Region.

However, the difficult issue is the longer term one - implementation or how do we keep the plan from gathering dust on a shelf? The Regional Water Plan has no authority. It contains only recommendations. Various types of action on the specific recommendations must be taken. These include:

- Incentives/Exchanges
- Regulatory/Enforcement
- Volunteer/Social
- Education/Media
- Engineering/Construction
- Substantial Funding

The work is just beginning. We need to encourage the decision makers at various levels to take action (individual, local, state, tribal, and federal). We see a serious challenge for each person and for each entity. The very difficult challenge is to think wisely:

- Think Cooperatively
- Think Broadly
- Think Water

And that challenge means doing things many of us are not accustomed to. We need to think and act for our grandchildren and their grandchildren:

- Beyond the Boundaries of Our Jurisdiction
- Beyond the Duration of Our Term of Office
- Beyond Our Own Special Interests
- Beyond Our Current Generation

If we choose to address the problem together (Figure 13), we in the Region and the State can meet the challenge.

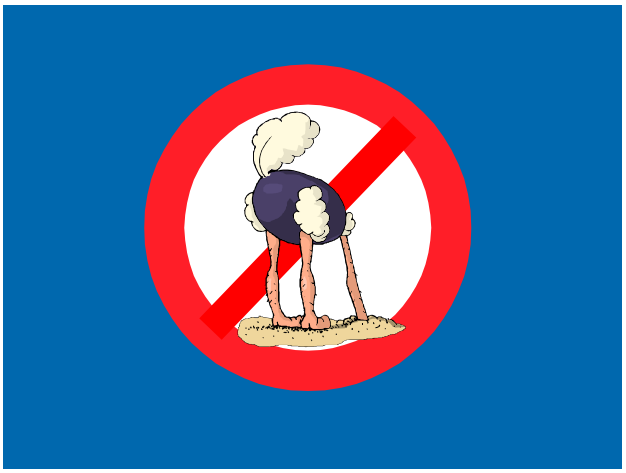

Figure 13. Two of the biggest obstacles to a healthy water future are long term apathy and denial.

ENDNOTES

[1]Contact the author via Wessely@sciso.com or (505) 259-7842.

[2]Tracy Seidman Hephner and Joanne Hilton, *A Rural Perspective on Regional Water Planning from the Mora-San Miguel Water Planning Region*, NMSU Water Resources Research Institute, 48th Annual New Mexico Water Conference, November 6, 2003.

[3]The Regional Water Plan as well as other planning data appears on the website WaterAssembly.org.

[4]Contact the Water Assembly via WaterAssembly.org or (505) 867-3889.

[5]Contact Mid-Region Council of Governments via www.mrcog-nm.gov or (505) 247-1750.

[6]One acre foot of water is approximately 326,000 gallons.

[7]Action Committee of the Middle Rio Grande Water Assembly. *Middle Rio Grande Water Budget: Where Water Comes From, & Goes, & How Much – Averages for 1972-1997*. Middle Rio Grande Water Assembly, October 1999.

[8]S.S. Papadopulos & Associates, Inc. *Middle Rio Grande Basin Water Supply Study*. Prepared for the New Mexico Interstate Stream Commission and the U.S. Army Corps of Engineers, Albuquerque District, under contract no. DACW47-99-C-0012. Boulder, Colorado, August 2000.

[9]Bartolino, James R. and James C. Cole. *Ground-Water Resources of the Middle Rio Grande Basin, New Mexico*. U.S. Geological Survey Circular 1222. 2002.

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[11]Bexfield, Laura M. and Scott K. Anderholm, *Estimated Water-level Declines in the Santa Fe Group Aquifer System in the Albuquerque Area, Central New Mexico, Predevelopment to 2002*. US Geological Survey Water-Resources Investigations Report 02-4233, December 2002.

[12]Grissino-Mayer, Henri D. "Climate Reconstructions."Last updated June 1, 1999. http://www.valdosta.edu/~grissino/geog1112/henri.html. December 15, 2003.

[13] New Mexico Interstate Stream Commission, Regional Water Planning Handbook, December 1994.