Aquifer Recharge, Storage & Recovery

Why Are We Here Today?

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April 9, 2011

Groundwater Levels in the Albuquerque region

Shows declines from 1960 to 2000
&
Direction of Flows away from the river

Conceptual Understanding and Groundwater Quality of the Basin-Fill Aquifer in the Middle Rio Grande Basin, New Mexico By Laura M. Bexfield
pubs.usgs.gov/pp/1781/pdf/pp1781_section1.pdf

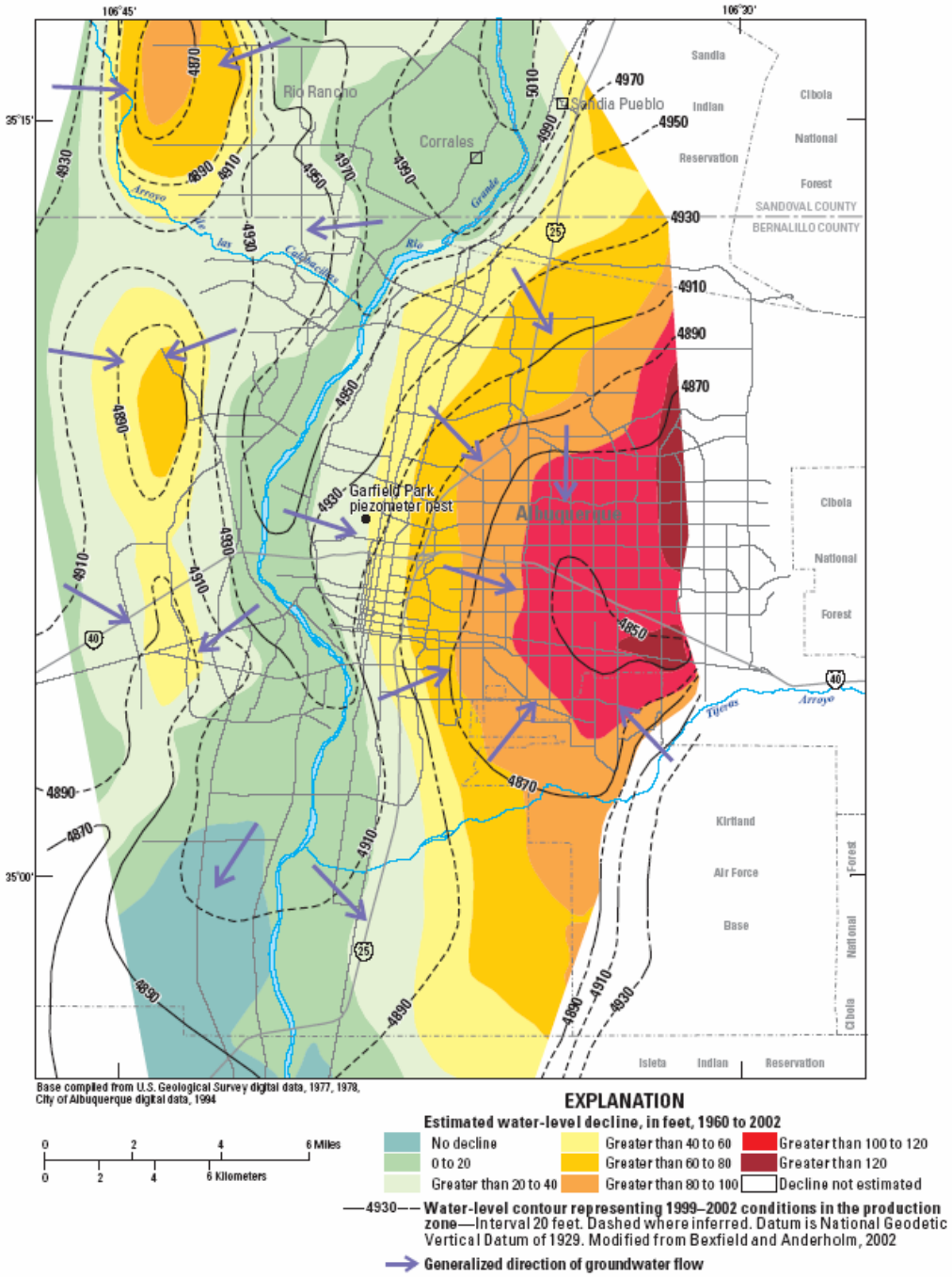
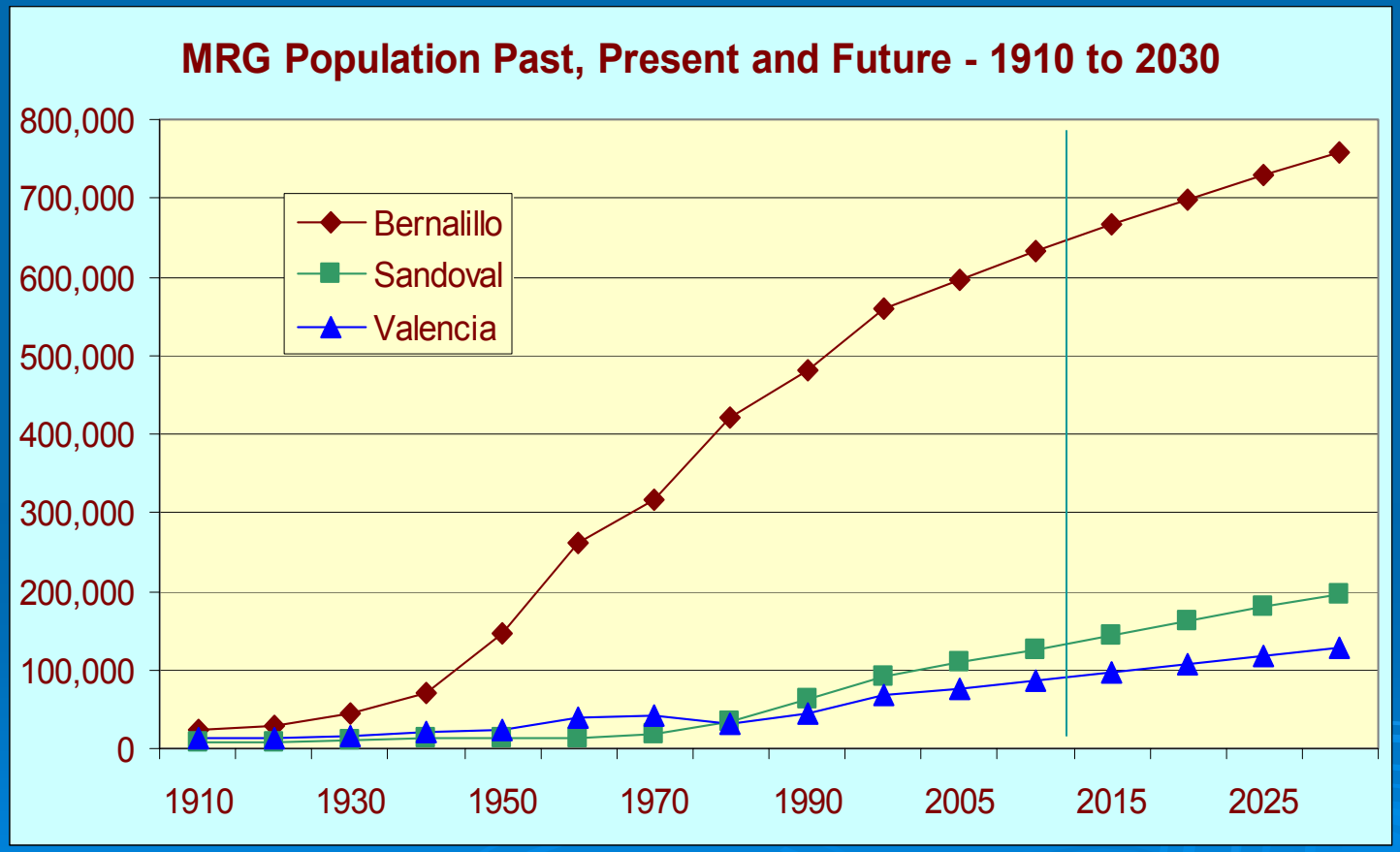


Figure 5. Water levels representing 1999–2002 conditions in the production zone, and estimated water-level declines, 1960 to 2002 , in the Albuquerque area, New Mexico.

Population from 1910 to 2030

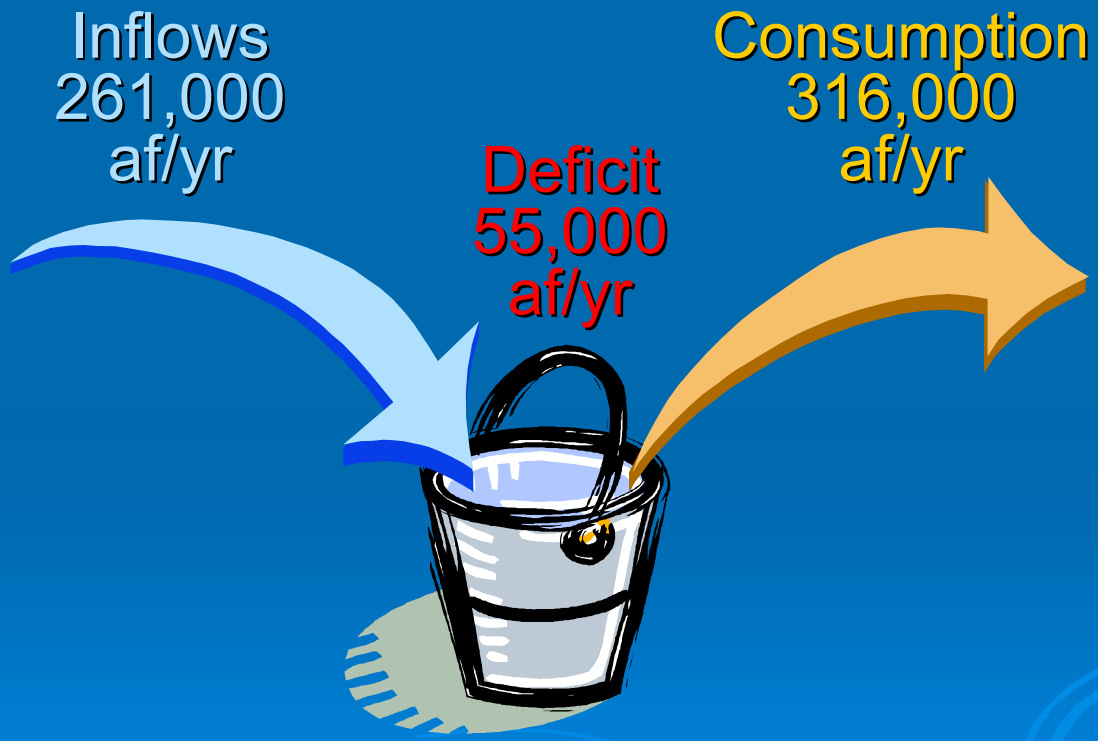
Our water usage increased as our population increased, helping to create those declines in the water levels.



Source: Bureau of Business and Economic Research, University of New Mexico.

The Regional Water Budget Bottom Line

Ongoing Deficit Spending of Water – 15-20%
Last Quarter of the 20th Century

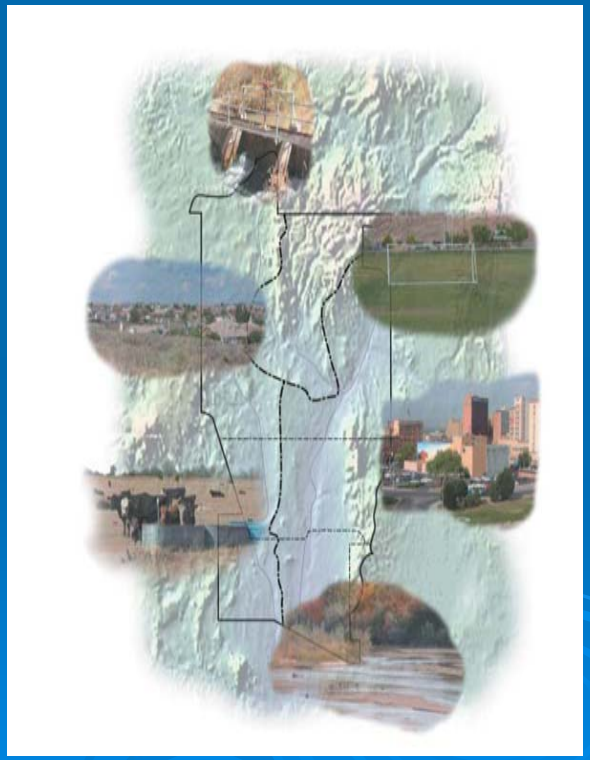


55,000 Acre Feet is 18 Billion Gallons
Enough to Fill a Football Field 7 Miles Deep, Every Year !

Middle Rio Grande Regional Water Plan 2000-2050 Volume 1 – August 2004

Mission of the Plan:

"Balance Water Use with Renewable Supply"



The Regional Water Plan has 43 recommendations to close the gap

Increase Supply

- Restore the Bosque
- Manage the Watershed
- Re-Use Pumped Water
- Reduce Open Water Evaporation
- Harvest Rainwater
- Desalinate / Import Brackish Water
- Modify the Weather

Decrease Demand

- Implement Urban Conservation Plans
- Implement Rural Conservation Plans
- Adjust Water Pricing
- Meter Water Uses
- Limit New Domestic Wells
- Moderate Population Growth

Middle Rio Grande Regional Water Plan

10.2.7 Water Storage to Reduce Evaporative Losses

R7-1—Implement Upstream Surface Water Storage (A-45)

R7-2—Implement Upstream Aquifer Water Storage *(A-46)*

Pump surplus water into the aquifer so as to supplant the requirements to store large quantities in Elephant Butte Reservoir. Technology assessment and engineering feasibility for this recommendation should be started so as to determine whether the option is really practical within this region.

R7-3—Implement Aquifer Storage and Recovery for Drought *(A-46)*

Subject to water rights and environmental issues, in order to ameliorate the short term fluctuations is regional supply, it is recommended that surplus water be pumped into the depleted aquifers during wet years, and be retrieved for use during dry years. This system would be smaller than one used to supplant EBR evaporation. Technology assessment and engineering feasibility for these recommendations should be started so as to determine whether these options are really practical within this region.

What do we mean?

- **Aquifer** A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantifies of water to wells and springs.
- **Aquifer storage and recovery (ASR)** Injection of water into a well for storage and recovery from the same well.
- **Artificial recharge (AR)** Intentional banking and treatment of water in aquifers.

Aquifer Storage Options
http://leg.mt.gov/content/Committees/Interim/2009_2010/Water_Policy/Staff_Reports/aquifer-storage-options.pdf

Implementation

Various aquifer recharge and storage projects have been proposed and/or are underway … or could be.

Albuquerque Bernalillo County Water Utility Authority Bill No. R-08-25 (November 19, 2008)

Resolution Authorizing The Water Utility Authority To Submit An Application For Funding To The Water Trust Board For Large Scale Aquifer Storage And Recovery ($4,663,327)

Cost: The estimated costs for permitting, design and potential construction for Project are $3 to $5 million. The funding will be a combination of grants, loans and dedicated funding from the Water Authority Capital Implementation Program.

Project Justification: Aquifer Storage and Recovery is a policy and project called for in the adopted Water Resources Management Strategy. Large scale aquifer storage and recovery is a vital component of water resources management for the Authority as it provides artificial means of creating and maintaining the ground water drought reserve.

HB 143 was signed by the Governor and has an emergency clause. It includes a request to the Water Trust Board for Planning & Design assistance in the amount of $158,386. The design will begin when the funding is received. There is no current timeframe for starting construction.

FACT SHEET

Direct Injection Aquifer Recharge Demonstration

Starting in December 2009, the City of Rio Rancho will begin development of a facility to inject water into the aquifer underlying the City, a technique known as *artificial recharge,* in order to store the water for future municipal use.

http://www.ci.rio-rancho.nm.us/DocumentView.aspx?DID=7659

"Preserving currently irrigated acreage through various incentives is an obvious nonstructural and low-cost alternative which should receive immediate attention from city, county, and State government. **Agricultural-related recharge amounts** to about 31,000 acre-feet per year, and the consequence of losing this recharge source could be severe. Some specific segments of the canal and drain system can be identified as being particularly important for recharge."

(*Middle Rio Grande Water Assessment Final Report – 1997,* by Steve Hansen & Chris Gorbach, U.S. Bureau of Reclamation, Albuquerque Area Office)

Urbanization has resulted in agricultural land being replaced with homes, businesses and parks. Urbanization has also resulted in a change in how **stormwater runoff** is routed through the valley to the Rio Grande. Many arroyos have been improved and lined to increase their hydraulic efficiency, and there has been a significant increase of less pervious materials, such as roofs and pavements, replacing more pervious land. These same improvements **reduce the amount of ground water recharge** that can occur because they move the storm water through the valley faster and across impervious material.

(*Middle Rio Grande Water Assessment*, Supporting Document No. 15, 1995)

Green Infrastructure (GI) and Low Impact Development (LDI) Methods for Stormwater Management in Arid Environments

The terms LID and GI are often used interchangeably. Green Infrastructure (GI) refers to a class of stormwater control measures or practices that slow, capture, treat, infiltrate and/or store runoff at its source, and includes both structural and non-structural approaches. GI can be applied at the site (green roofs, porous pavement and cisterns), neighborhood (streets and green detention facilities) or regional scale (urban forestry and open space preservation).

Low Impact Development (LID) approaches and principles include: minimizing land disturbance during development, incorporating and preserving natural features in the development, decentralizing stormwater management and treating it at the source through the use of GI and other techniques, reducing and disconnecting impervious surfaces in the development, and understanding and mimicking pre-development hydrology.

http://www.aridlid.org

Yet as a 2008 National Research Council (NRC) report reveals, little quantifiable, reliable information is available regarding total amounts of water stored underground, subsurface storage locations, or available storage. Nor are there widely accepted metrics for assessing storage suitability, economic and financial costs and benefits of ASR, or ways to compare and combine surface and subsurface storage alternatives for conjunctive (joint groundwater and surface-water) management. This lack of information, along with inconsistent regulatory guidance, creates challenges for individual providers considering ASR, but is also a problem for planners considering the bigger picture: How can we apply and integrate ASR into conjunctive water management to address regional and national or federal priorities?

ASR and the "Big Picture", *Cat Shrier – Watercat Consulting LLC,* May/June 2008 • Southwest Hydrology

Initial Questions

- what is ASR and recharge
- what is being proposed by Rio Rancho and ABCWUA
- what are the plusses and minuses quality- and quantity-wise
- what has been the experience elsewhere
- how much energy does it take to clean, inject and extract the water
- what are the other costs and benefits
- what if the aim were to *recharge* as opposed to *store and recover?*

Not knowing the answers, we thought it appropriate to ask – boon or boondoggle?

Today's Forum

- We value everyone's time so this event is scheduled for 4 hours.
- It's designed to provide a place to learn about various ways to recharge, store water and recover water, how such projects are permitted and some of the issues such projects engender.
- It is not a complete evaluation. Everyone is welcome to continue the conversation afterwards in the forum.
- We'd also like you to answer two questions on the pad of paper near the door:
- What additional information would you like to have on aquifer storage, recharge and recovery?
- What topics would you like future symposiums to cover?

Alternatives Analyses can be found in the archive material on the Water Assembly's web site. For Aquifer Storage, see:

http://waterassembly.org/archives/MRG-Plan/H-Rio%20Grande%20Supporting%20Documents/SE%201-7%20Alternatives/SE-6%20Alt%20Feas%20Hndbk.pdf

Feasibility of Candidate Alternative Actions
p 14
Aquifer Storage (A-46)
(2 page summary with some costs)

http://waterassembly.org/archives/MRG-Plan/H-Rio%20Grande%20Supporting%20Documents/SG%201-4%20DBStephens%20Feasibility%20Fact%20Sheets/SG-2%20DBS%20Legal.pdf

Middle Rio Grande Regional Water Plan
Evaluation of Alternatives for Legal Implications
p 18
A46—Aquifer Storage

http://waterassembly.org/archives/MRG-Plan/H-Rio%20Grande%20Supporting%20Documents/SG%201-4%20DBStephens%20Feasibility%20Fact%20Sheets/SG-4%20DBS%20Tech.pdf
p 293
Evaluation of Alternatives for the Middle Rio Grande Regional Water Plan
A46—Aquifer Storage