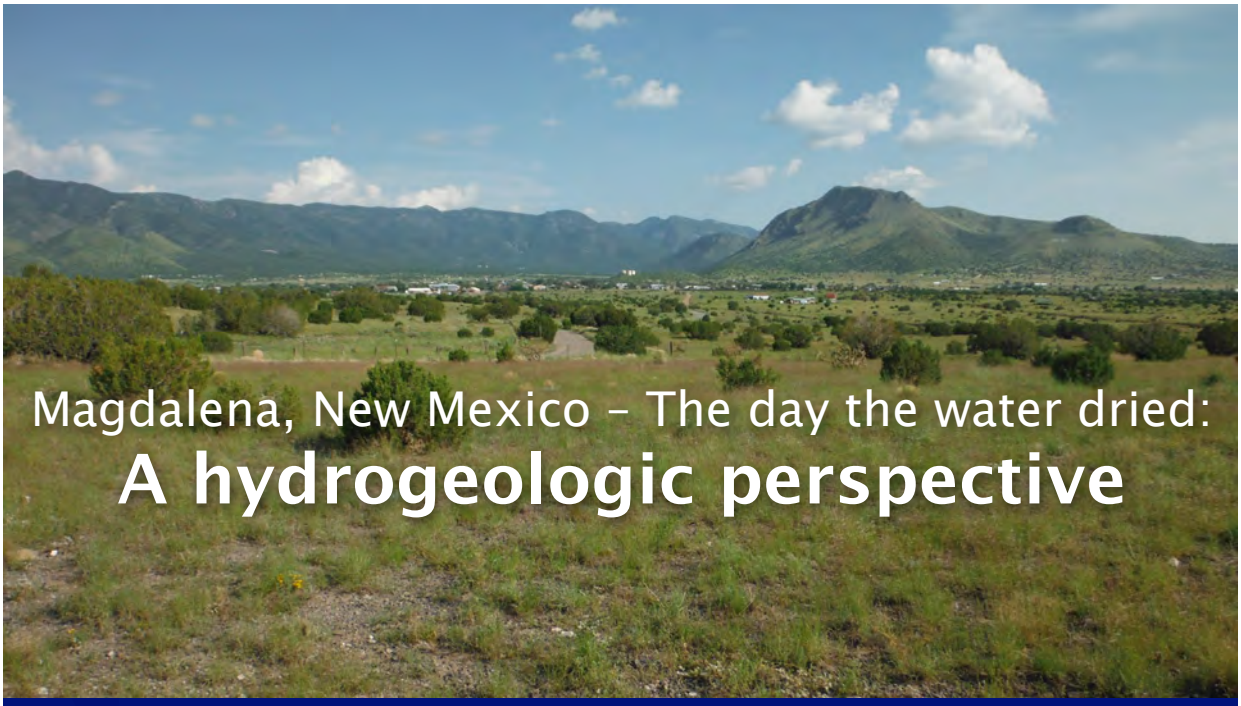

Magdalena, New Mexico – The day the water dried:
A hydrogeologic perspective

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April 2014

New Mexico Tech

New Mexico Bureau of Geology and Mineral Resources
Earth Science for the 21st Century

AQUIFER MAPPING PROGRAM

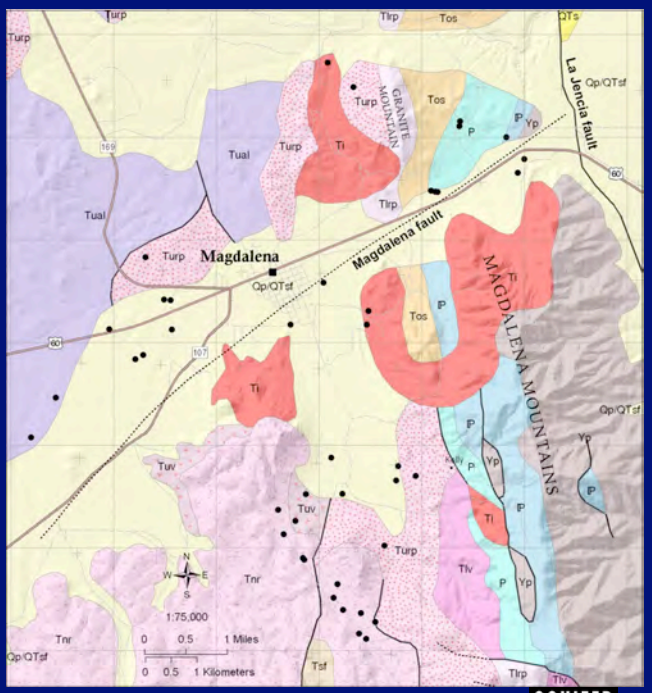
New Mexico Bureau of Geology & Mineral Resources, A Division of New Mexico Tech

Hydro-geology – Magdalena

1. **Fractured bedrock aquifers**
   - Mostly igneous, some limestone, some metamorphic
   - Can move water quickly
   - Often compartmentalized
   - Limited water in storage
2. **Alluvial aquifers**
   - More groundwater storage
   - Water may move more slowly

Highest water production along fault zones and fractures

(many more than shown on map)

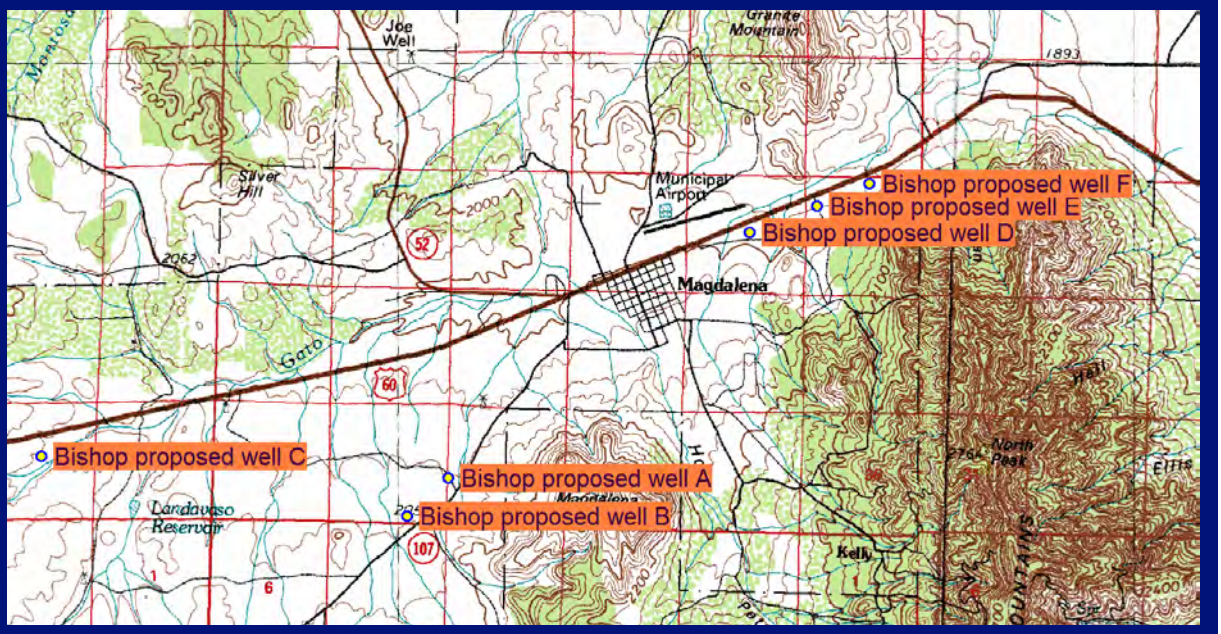


History repeats itself?

Philip H. Bishop (August, 1972) writes

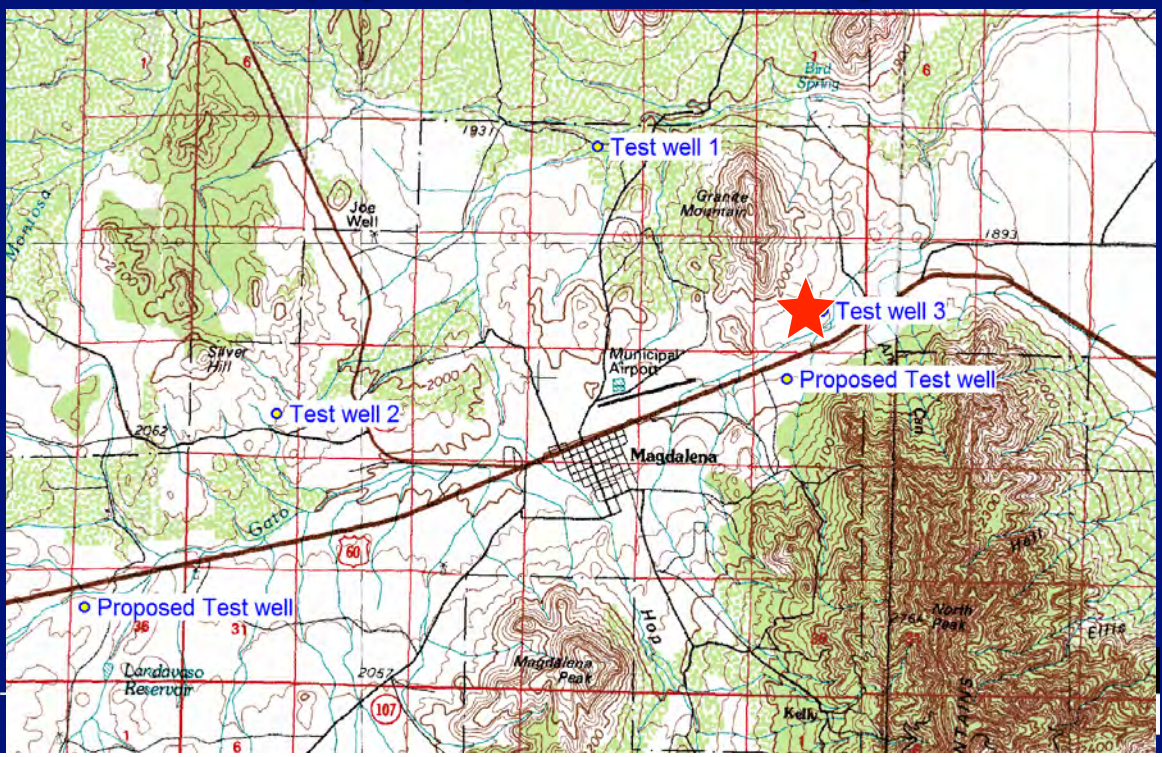
- "At present, the Magdalena municipal water system is overworked. Only two wells (Park well and Benjamin well) are producing..."
- 135,000 gallons per day for 1200 residents, 3 motels, 3 cafes and 4 gas stations. (112 gpc/day)
- Wells were producing less water and pumps were at the bottoms of the wells.
- Other wells (near Benjamin well, in Hop Canyon) had gone dry, including the Pino well.
- Over-pumping on the Benjamin and Park well had partially de-watered the aquifer

Proposed well locations – Bishop 1972



More history

W.K. Summers (May 1975) writes about test drilling in Feb 1975

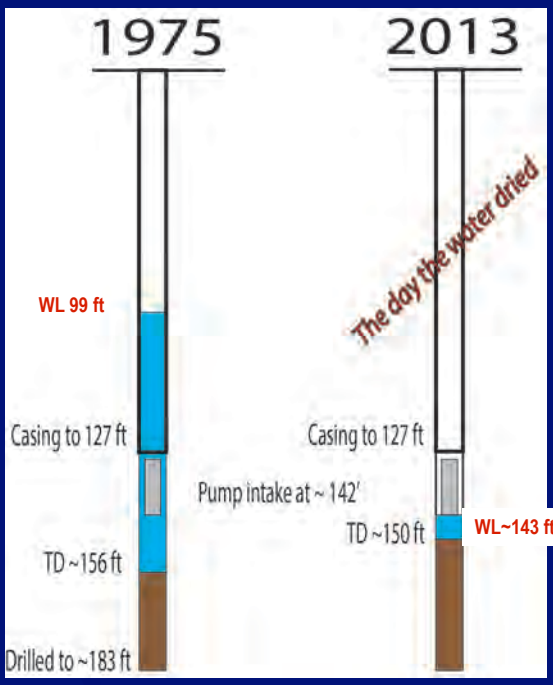


The "Trujillo" well – Drillers notes from 1975

- 0-133 ft Alluvium
- 133-158 ft No returns
- 158-183 ft Limestone - highly altered, mineralized fault zone

- Well repeatedly collapsed
- Set casing to 127 ft
- Total depth at ~156 ft
- Well pumped ~350 gpm
- Recommended to keep at 100 gpm, and re-evaluate

The "Trujillo" well – Notes from 2013

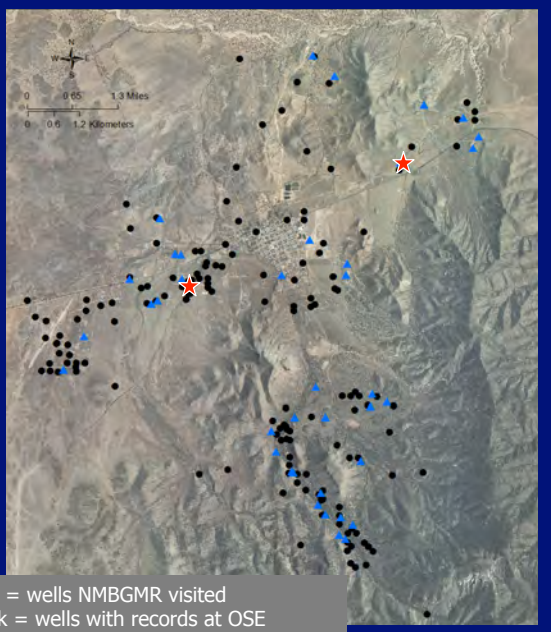


- Well continues to collapse
- Pump is near bottom
- Pumping rates ~150-200 gpm

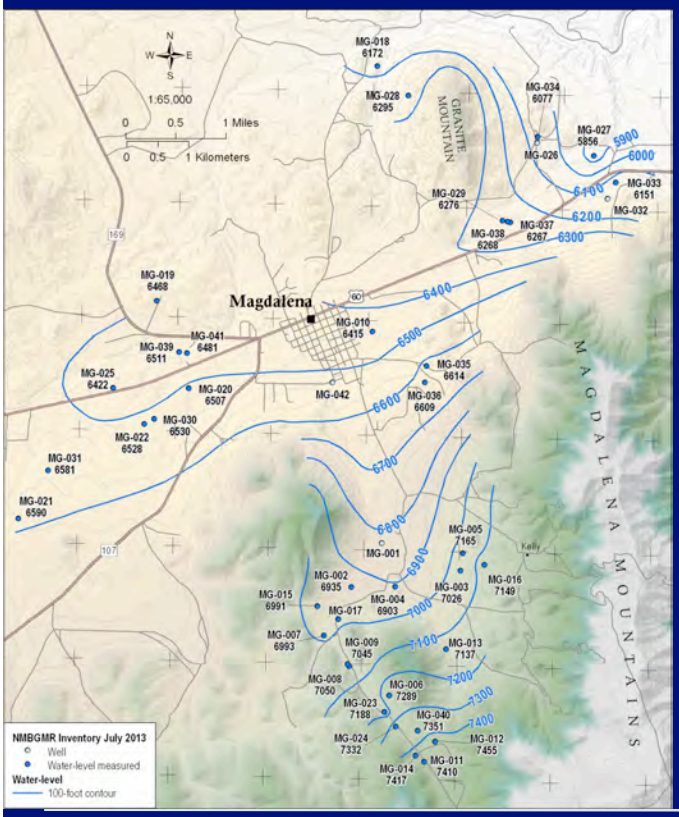
- Biggest problem: single source of water was this well
- Well returned to production in late June
- Older wells were rehabilitated

Watershed-scale hydrogeologic assessment

- **Community concern about water supplies**
- **June 2013: NMBGMR & Aquifer Mapping Program initiate small study**
  - **June/July 2013**
    - NMBGMR measured water levels in area
    - Water samples collected (NMED/ NMBGMR)
  - **September 2013**
    - NMBGMR measured water levels after exceptional rainfalls
  - **Fall 2013**
    - Installation of monitoring devices (1 adjacent to Trujillo well)
  - **March 2014**
    - NMBGMR measured water levels

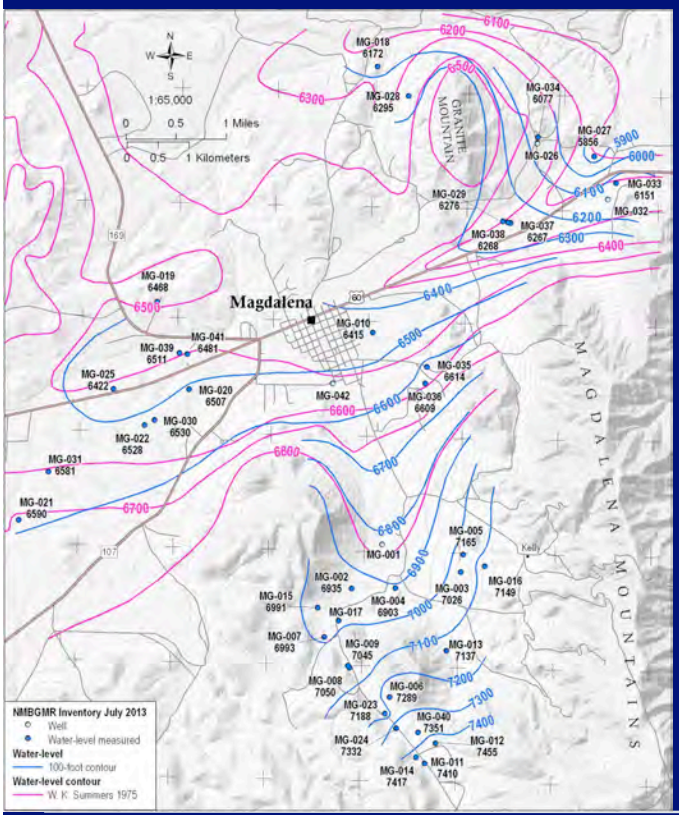


Blue = wells NMBGMR visited
Black = wells with records at OSE
Red stars = continuous monitoring sites



Water table

- Groundwater generally flows from the mountains down to the east
- Groundwater gets deeper east of the La Jencia Fault

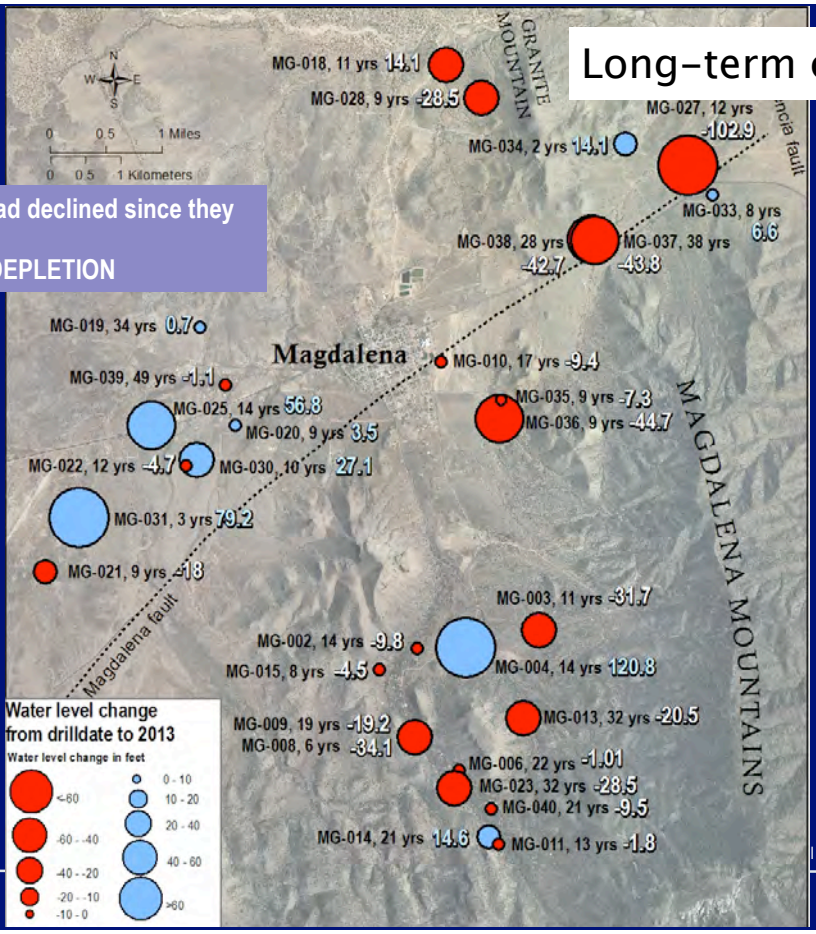


1975 to 2013 water table

- Comparison of water table maps from Summers 1975 report
- Largest decline ~ 200 ft

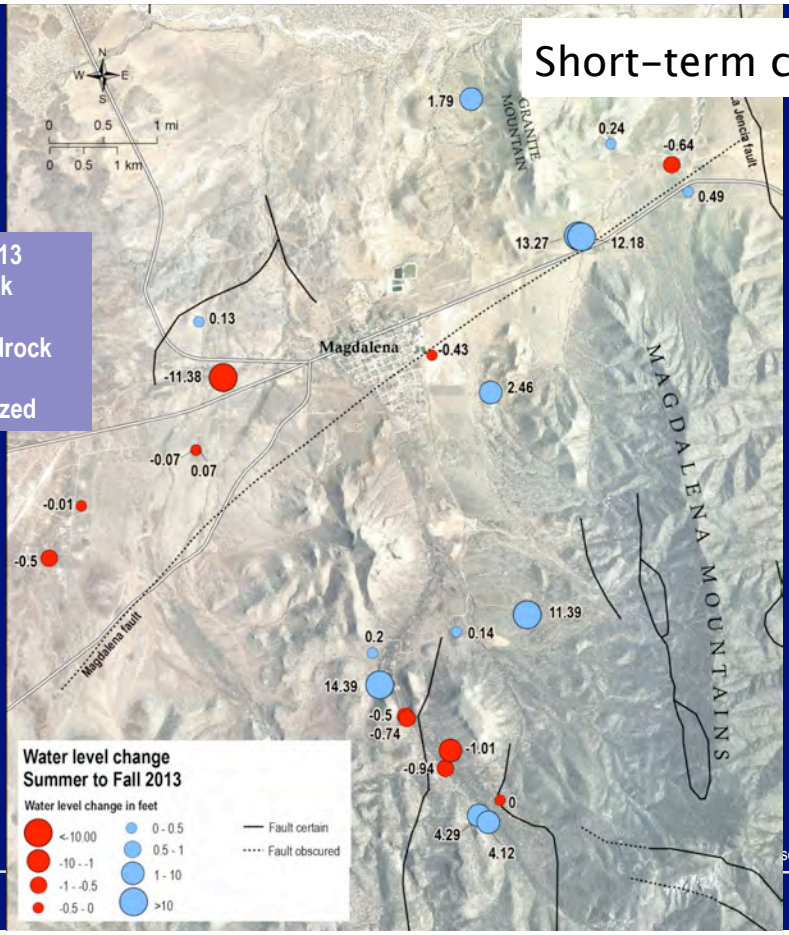
Long-term change

- 70% of wells had declined since they were drilled
- Groundwater DEPLETION



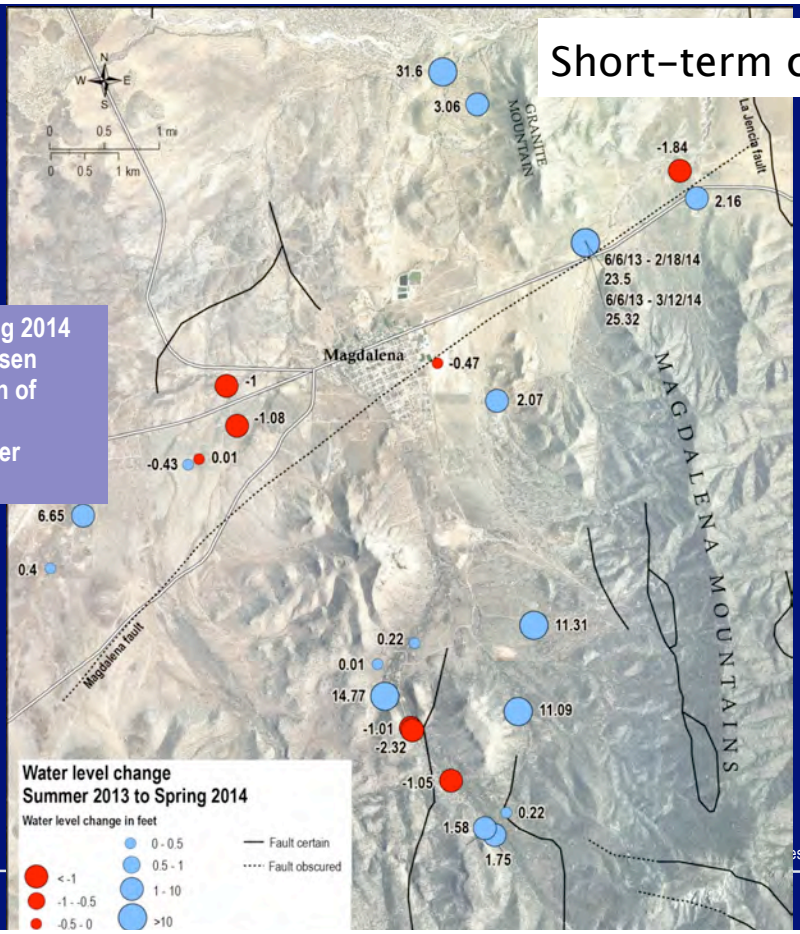
Short-term change

Summer 2013 to Fall 2013
•After monsoons – quick response due to limited storage in fractured bedrock aquifers
•Highly compartmentalized

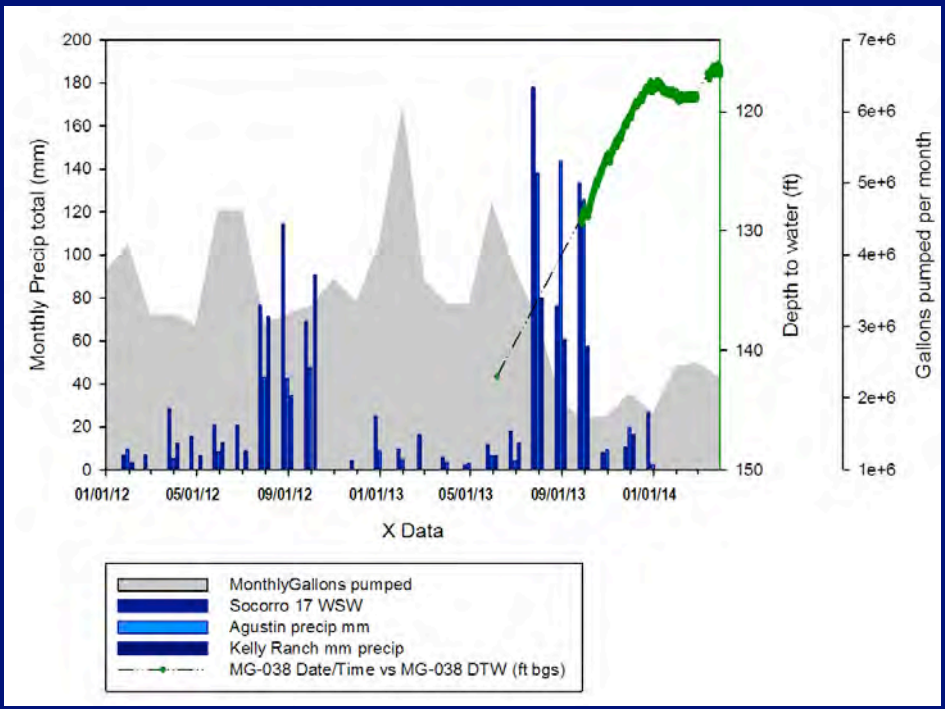


Short-term change

Summer 2013 to Spring 2014
- ~70% of wells have risen
- Compartmentalization of aquifers
- Still show groundwater depletion



Monitoring change near the Trujillo well

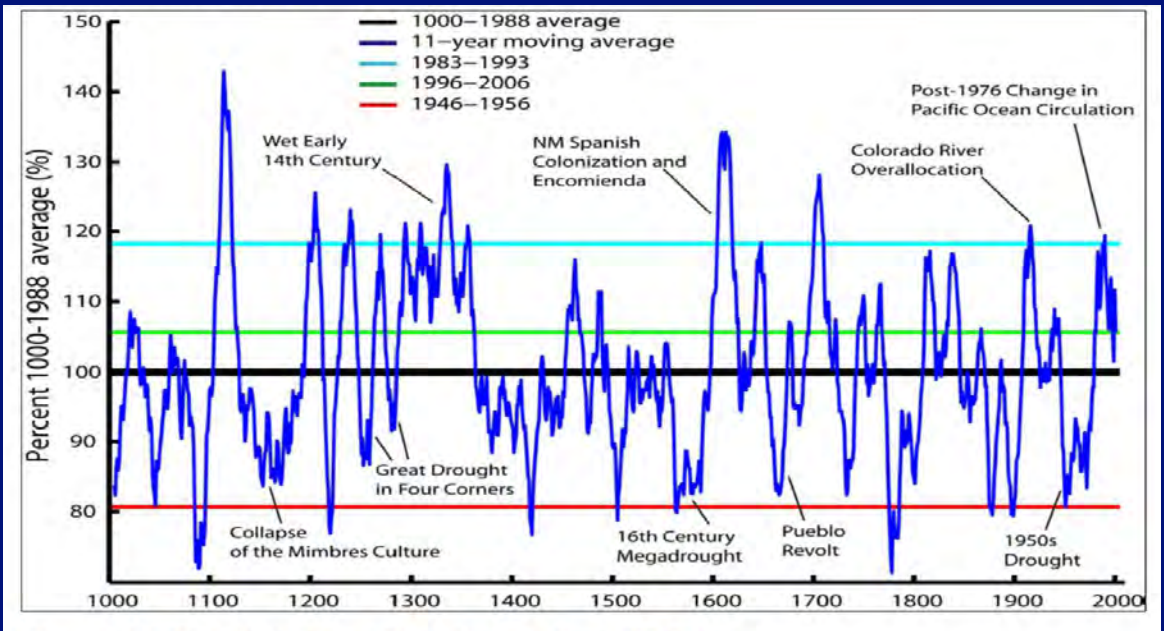


Gallons per capita per day (gpcd)

- Santa Fe: 105 gpcd
- Albuquerque in 1994: 250 gpcd
- Albuquerque Now :136 gpcd
- Magdalena in 1972: 112 gpcd
- Magdalena average from 1995-2013 (950 residents): 141 gcpd
- Magdalena since June 2013: 75 gcpd!!

Precipitation historically

Percent of average precipitation from 1000 to 1988, based on tree ring data



Background Report, 2014, Town Hall on Water Planning, Development, and Use

Conclusions

- **Over last 40+ years: Valid concerns with groundwater depletion**
  - Declining water levels
  - Diminished pumping
- **Over the last 1 year: Small villages can make big changes!**
  - Keep conserving water
  - Pray for rain; Rain helps
  - Rotate pumping wells to helps relieve pressure on single well

Keep a long-term perspective!

More info at: geoinfo.nmt.edu
Open-file report 556

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