

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

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New Mexico Tech



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

Hydro-geology – Magdalena

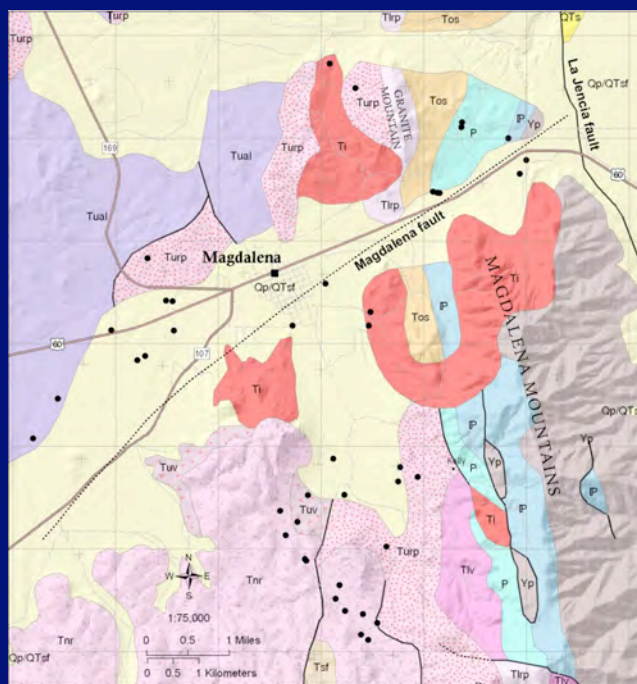
1. Fractured bedrock aquifers

- 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)



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History repeats itself?

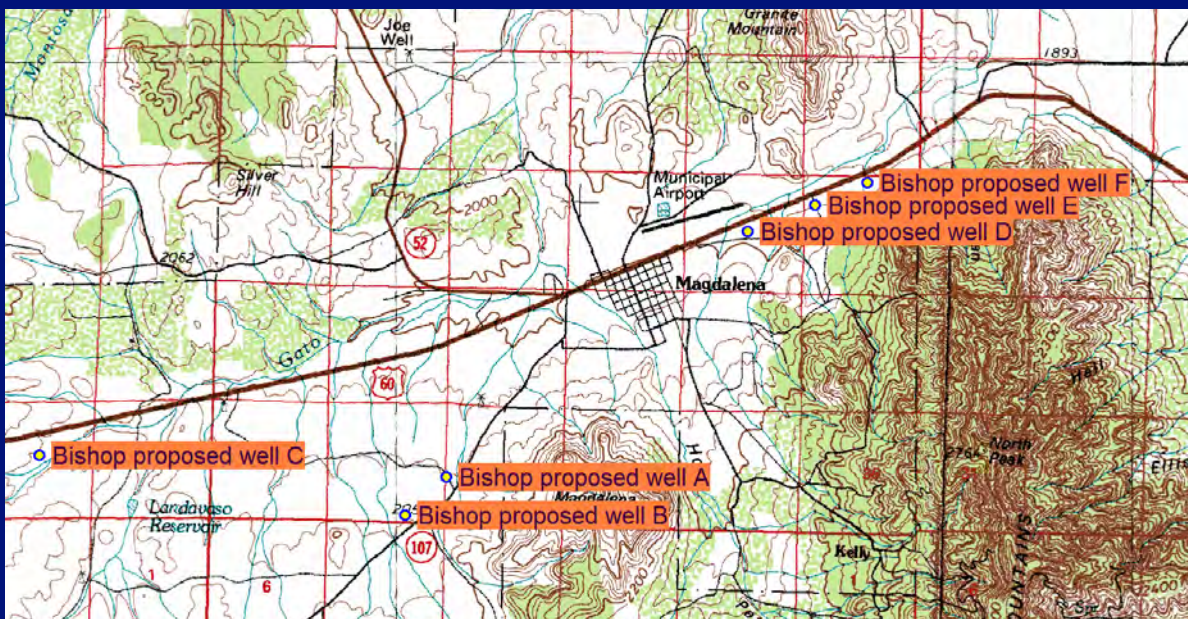
Philip H. Bishop (August, 1972) writes

- ▶ “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

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Proposed well locations – Bishop 1972

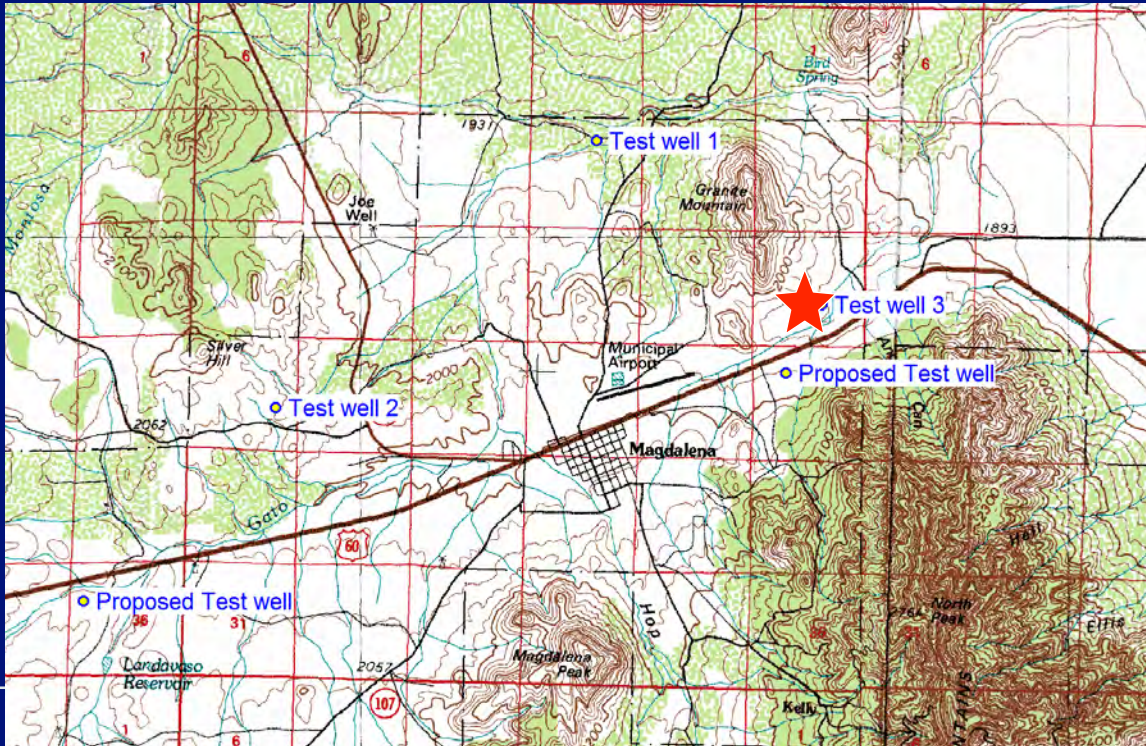


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More history

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



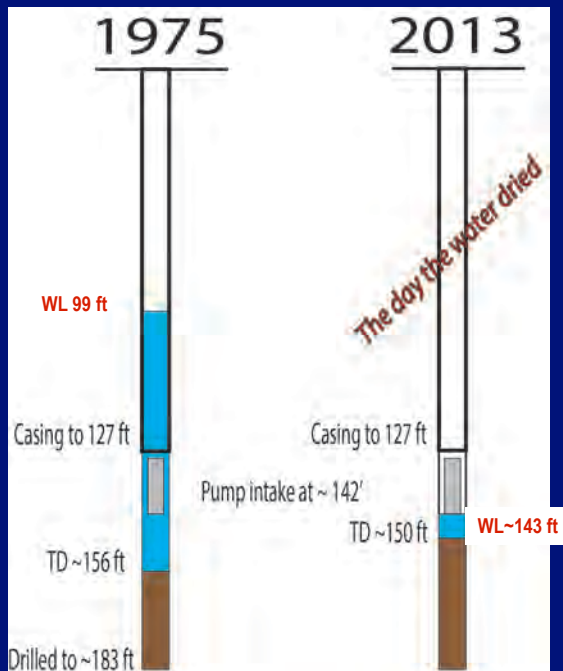
The "Trujillo" well – Drillers notes from 1975



- 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

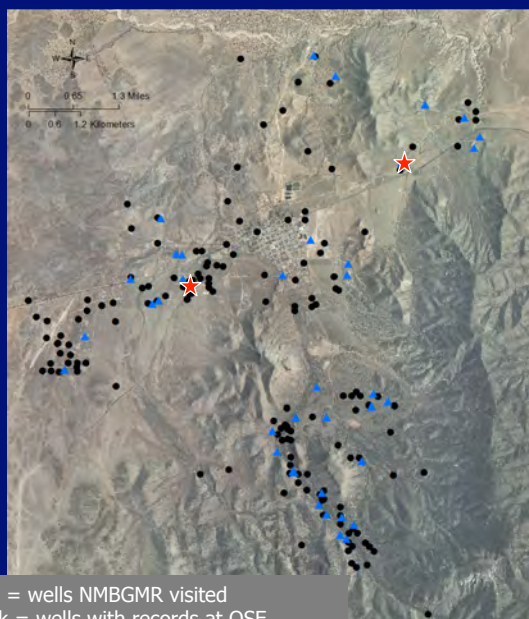


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Watershed-scale hydrogeologic assessment

- 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



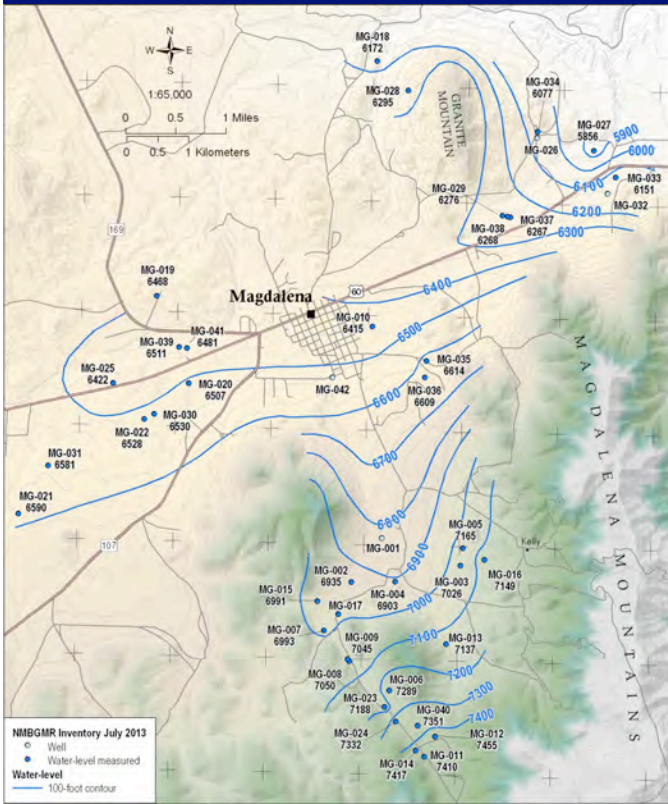
Blue = wells NMBGMR visited
 Black = wells with records at OSE
 Red stars = continuous monitoring sites

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Water table

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

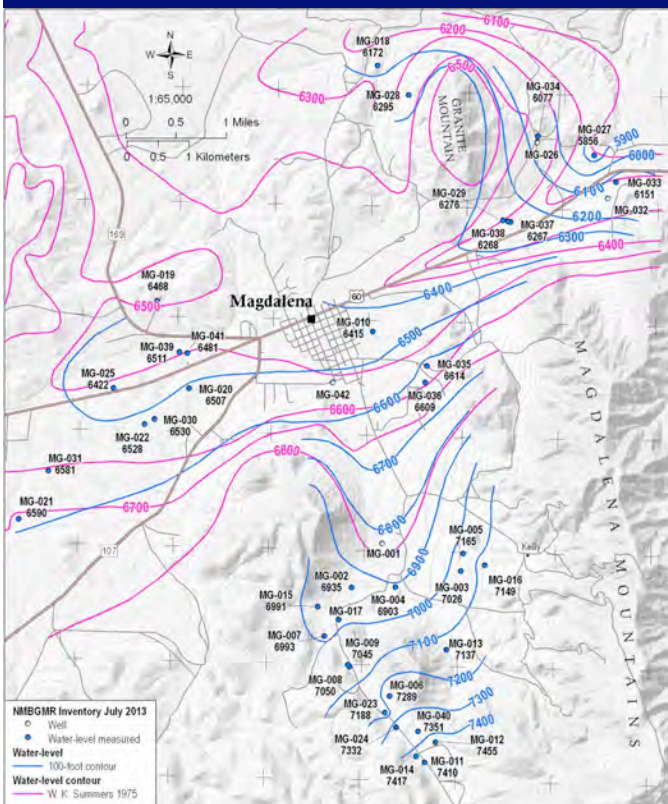


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1975 to 2013 water table

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

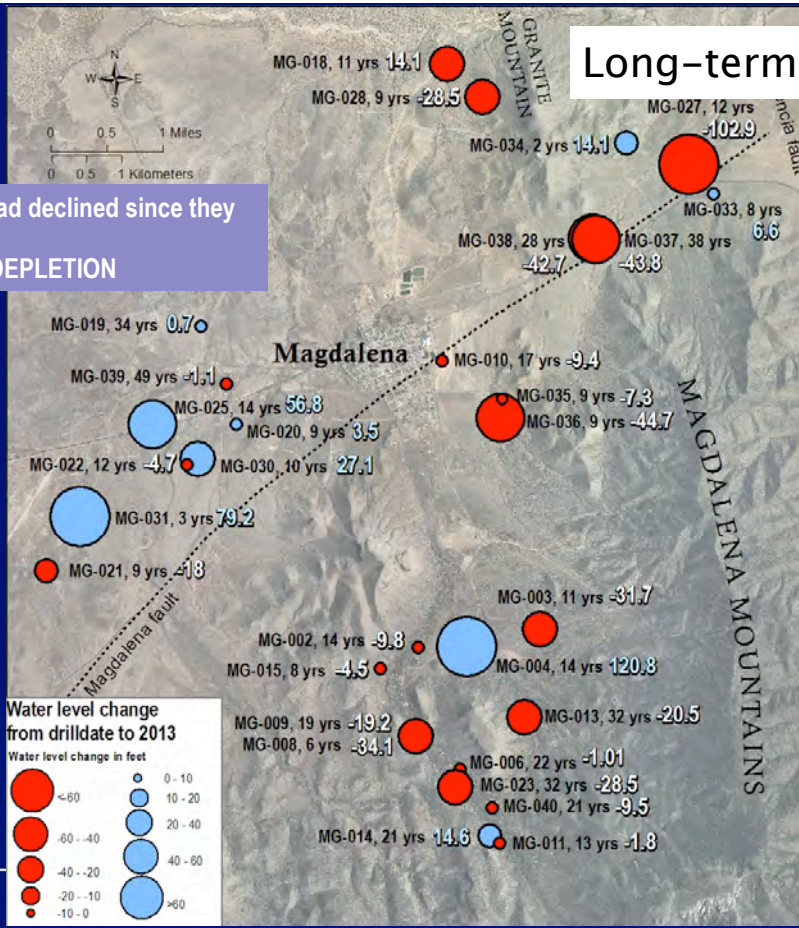


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Long-term change

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



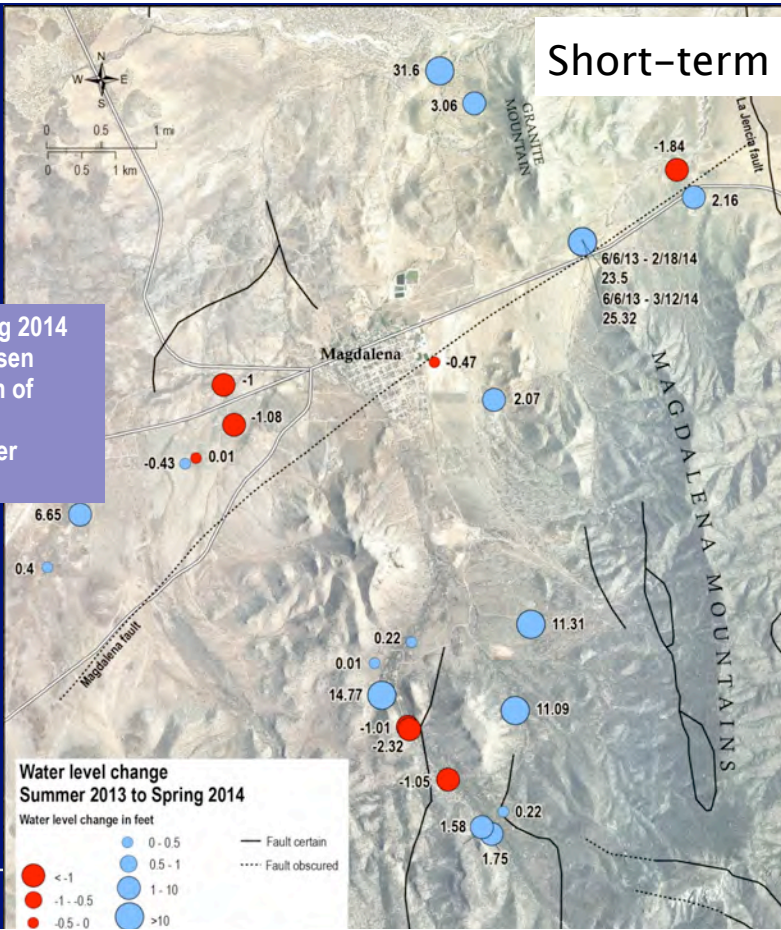
Short-term change

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

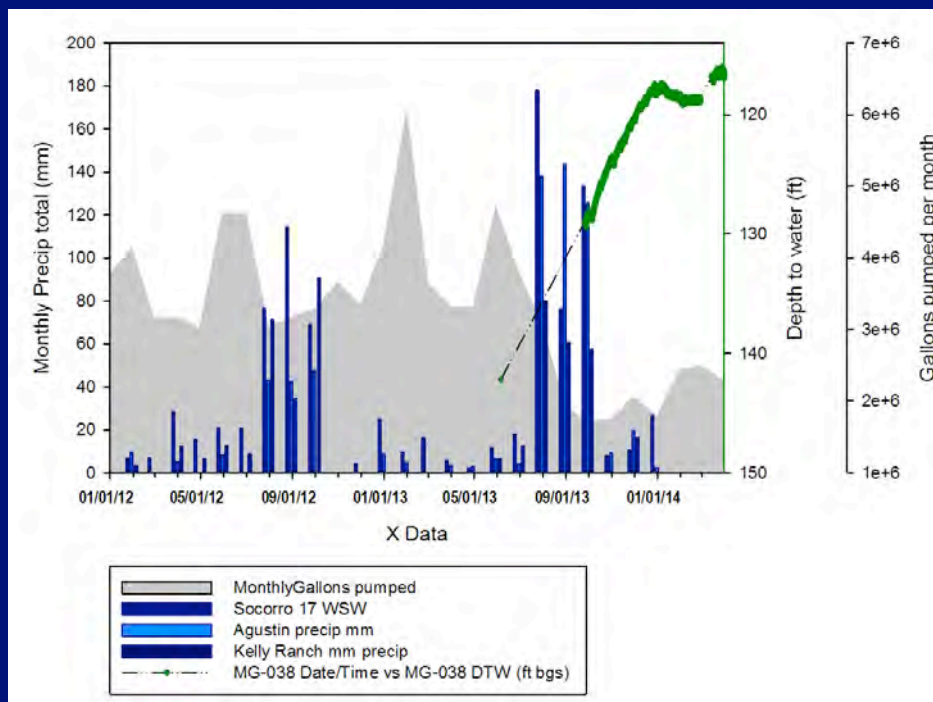


Short-term change

- 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)

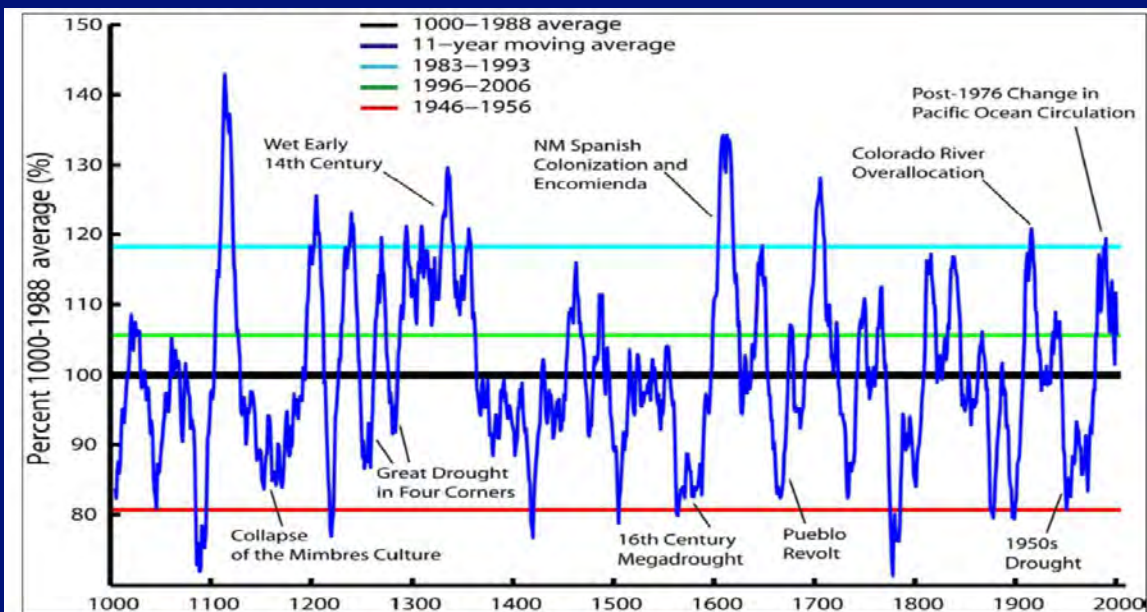
- ▶ Santa Fe: 105 gpcd
- ▶ Albuquerque in 1994: 250 gpcd
- ▶ Albuquerque Now :136 gpcd
- ▶ Magdalena in 1972: 112 gpcd
- ▶ Magdalena average from 1995-2013 (950 residents): 141 gpcd
- ▶ Magdalena since June 2013: 75 gpcd!!

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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

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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 help relieve pressure on single well

Keep a long-term perspective!

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

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