

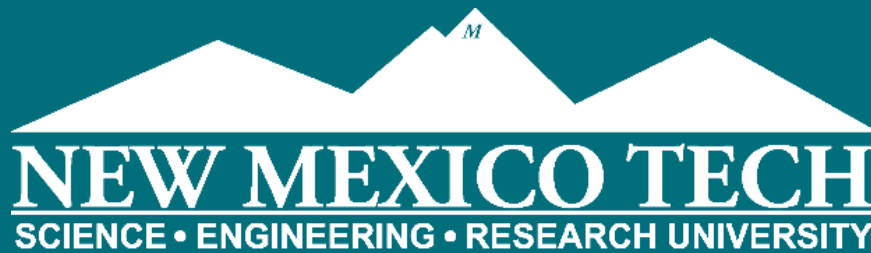
AQUIFER MAPPING AND MONITORING: UNDERSTANDING NEW MEXICO'S GROUNDWATER

NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES

A RESEARCH AND SERVICE DIVISION OF NEW MEXICO TECH



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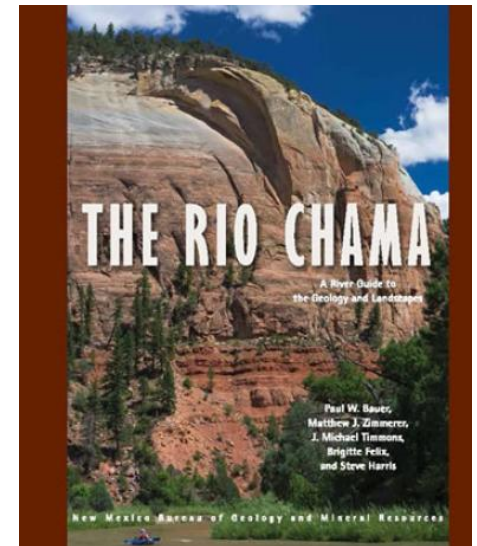


NM BUREAU OF GEOLOGY A RESEARCH DIVISION OF NM TECH



Non-regulatory, state geologic survey, providing science and service to NM since 1927!

- Geologic Mapping and Hazards
- Energy
 - Oil/gas and geothermal
- Mineral Resources
- Laboratories
- Outreach and Education
- Hydrogeology / Water Programs



WATER PROGRAMS AT NM BUREAU OF GEOLOGY



Aquifer Mapping and Monitoring Program

Characterize the quantity, quality, and distribution of groundwater in aquifers using geology, geophysics, hydrology, and chemistry information

Groundwater level monitoring (currently funded by philanthropic funds from Healy Foundation)



Water Data Initiative

Began in 2019, after the Water Data Act

Convening the work with multiple state agencies

Working to make NM water data more accessible and usable



Water Education Program

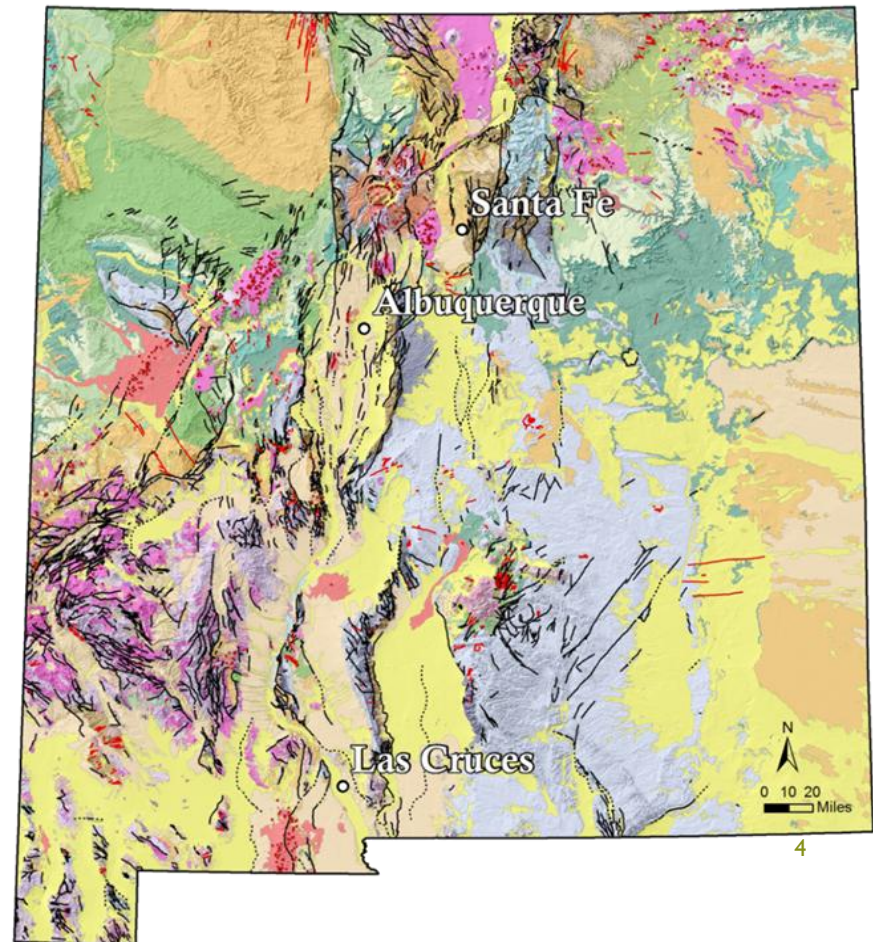
For legislators, staff and state water leaders

Focusing on increasing awareness and education on critical water issues in NM

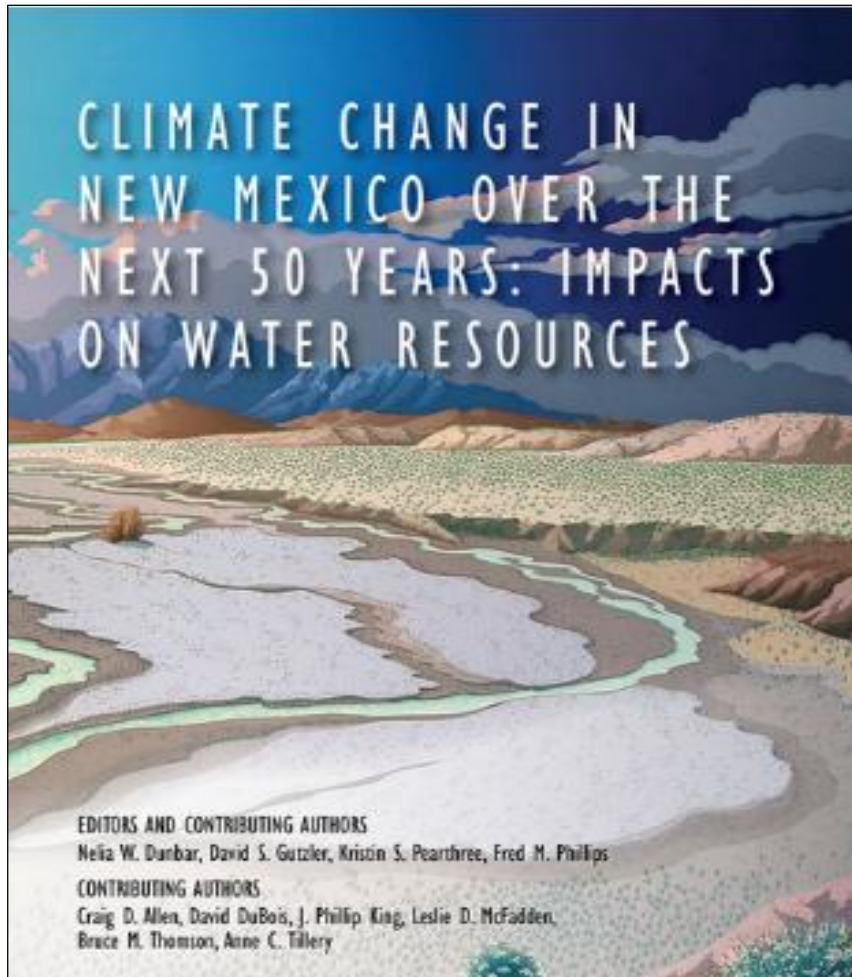
Growing program to include tribal water issues and increasing public education

GROUNDWATER BASICS

- Aquifers are rocks that can contain or transmit groundwater
- Unlike rivers and lakes, groundwater is hidden from direct observation making quantification more difficult
- Changes and impacts to groundwater take time to observe
- Recharge to groundwater is typically MUCH slower than the it is extracted by pumping
- Deeper formations are typically tighter (poor production) and may have higher mineral content (brackish/saline, or contaminants)



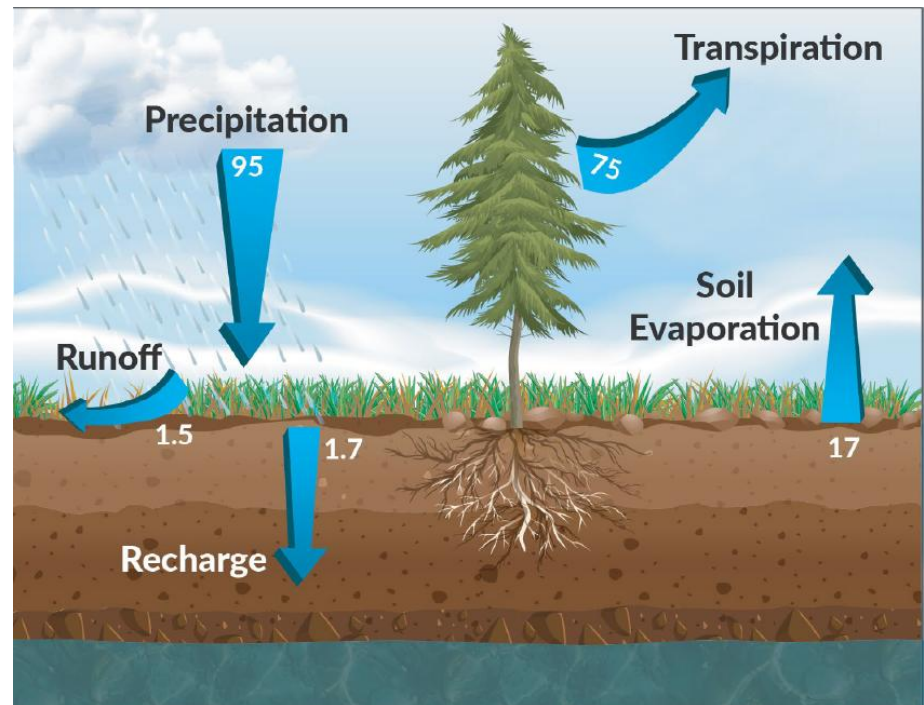
OUR WATER SUPPLY IS LIMITED AND FURTHER REDUCED DUE TO CLIMATE CHANGE



- Average temperatures warming 5-7°F over next 50 years
- Increasing aridity
- 25-30% reduction in surface water
- Increasing demand on groundwater
- Increasing wildfire

CLIMATE CHANGE IS IMPACTING NEW MEXICO'S WATER RESOURCES IN MULTIPLE WAYS

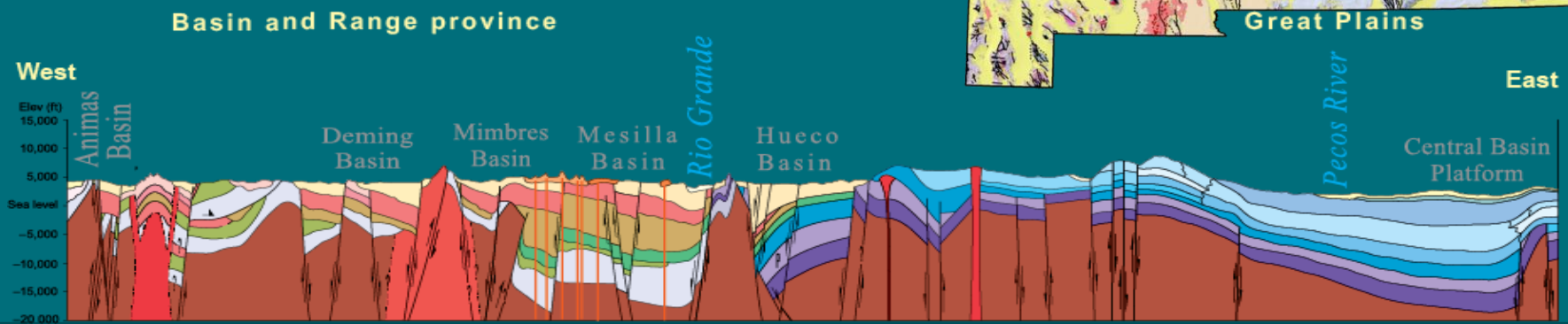
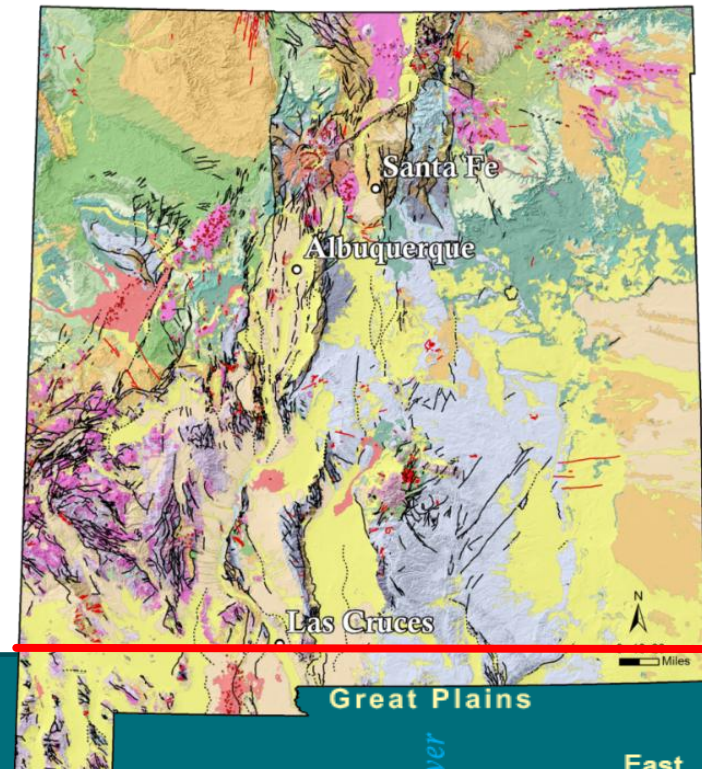
- Lower streamflow because of increased aridity
- Variability in precipitation
- Hotter, more severe droughts
- More extreme precipitation and flooding events
- Decreasing snowpack → earlier and diminishing snowmelt runoff
- Greater demands on groundwater, with less recharge to groundwater
- Vegetation stress
- Increasing catastrophic forest fires
- Increasing sedimentation in rivers / reservoirs
- Irreversible damage to soils through loss of vegetation and erosion
- Degraded quality of surface waters



Numbers represent millions of acre-feet/yr

AQUIFER MAPPING PROGRAM WORKING TO SERVE NEW MEXICO

- Serving as the only non-regulatory state agency engaged in this specialized, multidisciplinary water science and research
- The Aquifer Mapping Program was officially created in 2006
- Funding has been a combination of state, regional, local, and philanthropic sources
- New Mexico's geology is complex, and so are the aquifers



NM BUREAU OF GEOLOGY WORK FROM THE 50-YEAR WATER ACTION PLAN

Upon fulfillment of funding:

1. Characterize all major and minor aquifers in the state (fresh and brackish)
2. Characterize all major aquifers by 2032
3. Build a statewide groundwater monitoring network with 100 new dedicated wells by 2037

50-YEAR WATER ACTION PLAN

Office of the Governor
MICHELLE LUJAN GRISHAM

WHAT WE ARE DOING TO INCREASE WATER SECURITY:
50-Year Water Action Plan.
The Water Plan actions will help address the reality of a reduced supply in the future.

Water Conservation EST. IMPACT: 660,000 AF PER YEAR	A1 Develop a public education campaign A2 Incentivise agricultural water conservation	A3 Reduce leaks in drinking water infrastructure and increase municipal conservation A4 Improve water storage and delivery systems
New Water Supplies EST. IMPACT: 150,000 AF PER YEAR	B1 Establish a \$500M strategic water supply to spur investments in desalination and wastewater treatment	B2 Adopt policies to expand potable and nonpotable water reuse B3 Improve groundwater mapping and monitoring
Water and Watershed Protection	C1 Cleanup contaminated groundwater sites C2 Protect surface water by controlling pollution through a discharge permitting program	C3 Modernize wastewater treatment plants and stormwater infrastructure C4 Protect and restore watersheds

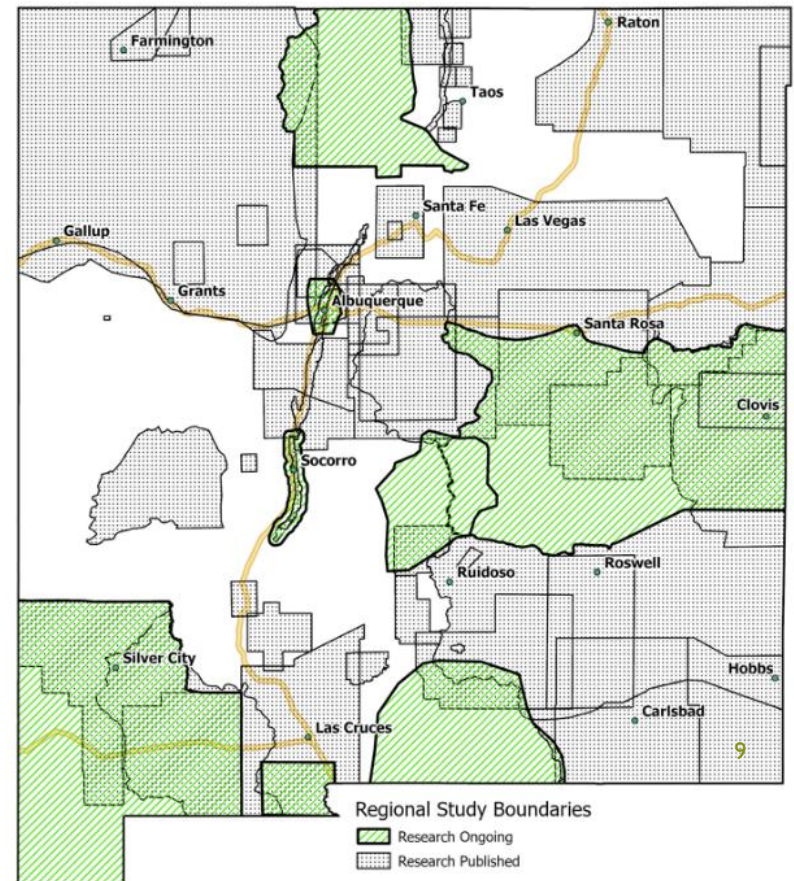
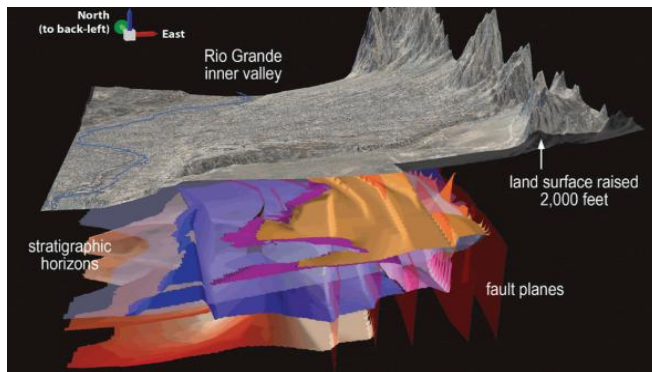
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50-YEAR WATER ACTION PLAN HIGHLIGHTS OUR TWO BIGGEST CHALLENGES ON GROUNDWATER

I. MANY AQUIFERS HAVE NOT BEEN FULLY CHARACTERIZED

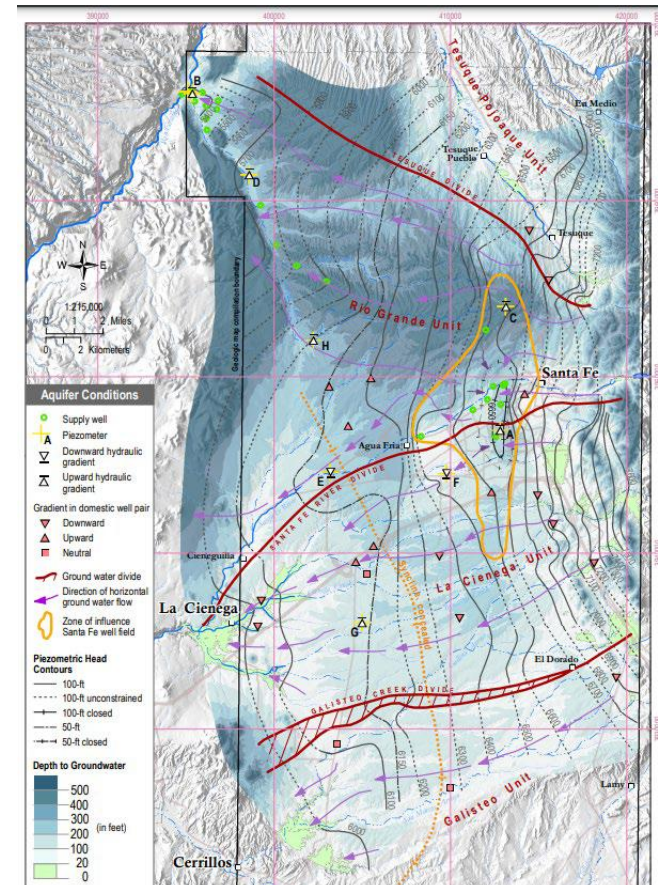
Complete aquifer maps include:

1. Geologic units and hydrogeologic unit(s) characteristics
2. Depth to water/ groundwater elevations
3. Boundaries of aquifer(s), impactful geologic structures, and recharge areas
4. Water quality characteristics



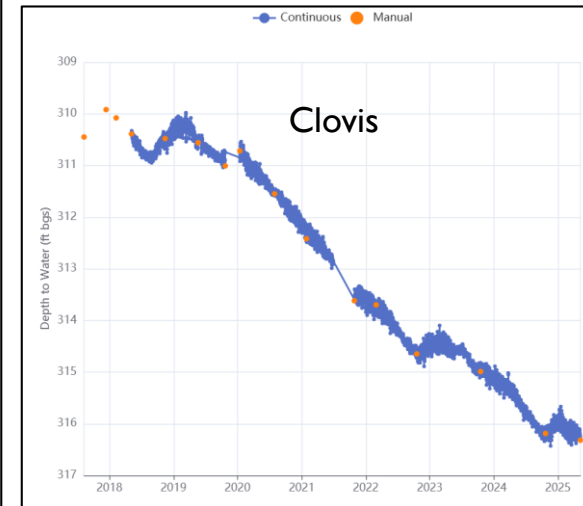
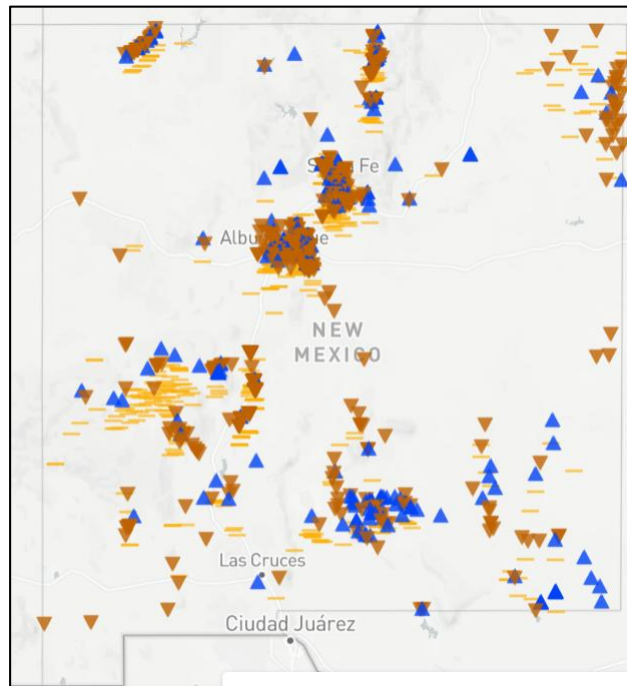
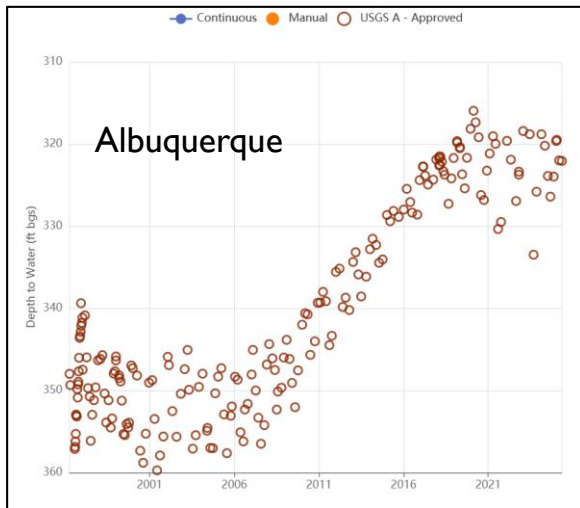
WHAT CAN WE GAIN FROM IMPROVED AQUIFER MAPPING AND MONITORING?

- Regional knowledge of depth to water, flow directions, water quality, and basic aquifer properties
- Real-time data tracking of how groundwater is changing
- Better understanding of distribution and properties of fresh and brackish water aquifers
- Identification of ideal managed aquifer recharge locations
- Improved decision-making for long-term investments in water infrastructure
- Proactive water management and improved water planning based on science and data



50-YEAR WATER ACTION PLAN HIGHLIGHTS OUR TWO BIGGEST CHALLENGES ON GROUNDWATER

2. GROUNDWATER LEVEL MONITORING COVERAGE IS INSUFFICIENT



- Stable
- ▲ Increasing (less depth to water) ↑
- ▼ Decreasing (more depth to water) ↓

GROUNDWATER LEVEL MONITORING

Why measure groundwater levels?

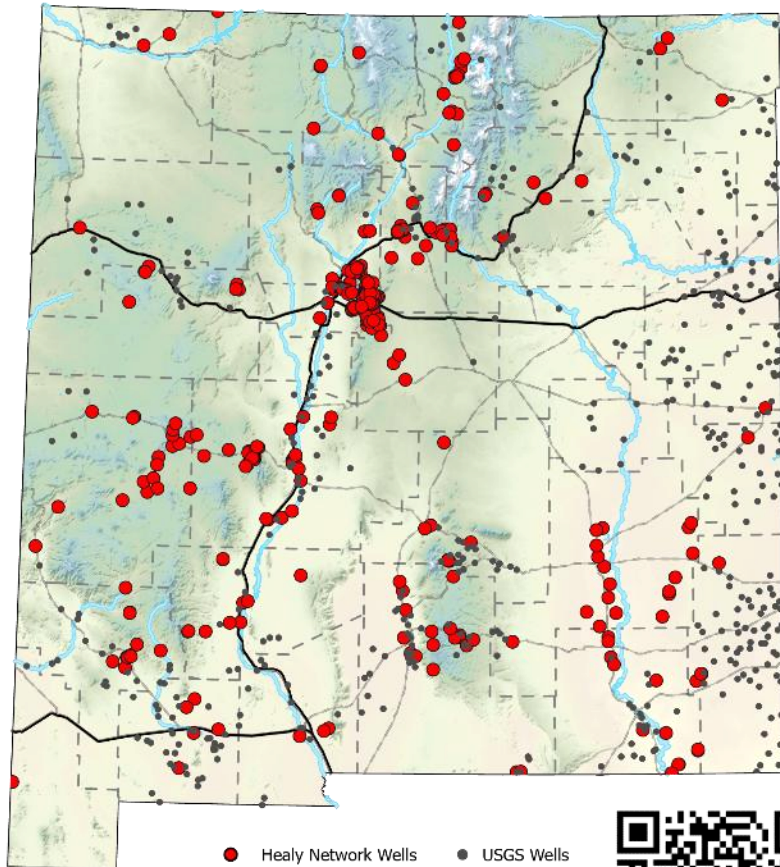
- Maps and models of aquifers in NM are driven by data
 - Funding
 - Decision making
 - Water rights administration
- With geologically complex state facing climate change impacts, we need even more data

What does monitoring tell us?

- Trend in groundwater level – going up or down?
- Is pumping more than the recharge?
- Avoid water outages



WITH INCREASING ARIDITY, WE NEED GREATER MONITORING OF GROUNDWATER



- NMBGMR maintains a network of about 600 wells (funded by Healy Foundation) that **is free to well owners**
- USGS has a cooperative agreement with NMOSE to measure about 600 wells annually
- Significant spatial gaps across the state
- Many sites are not measured frequently enough
- Most sites are “reused” wells – not drilled with monitoring purpose



OUR VISION FOR THE FUTURE: AQUIFER CHARACTERIZATION AND MONITORING

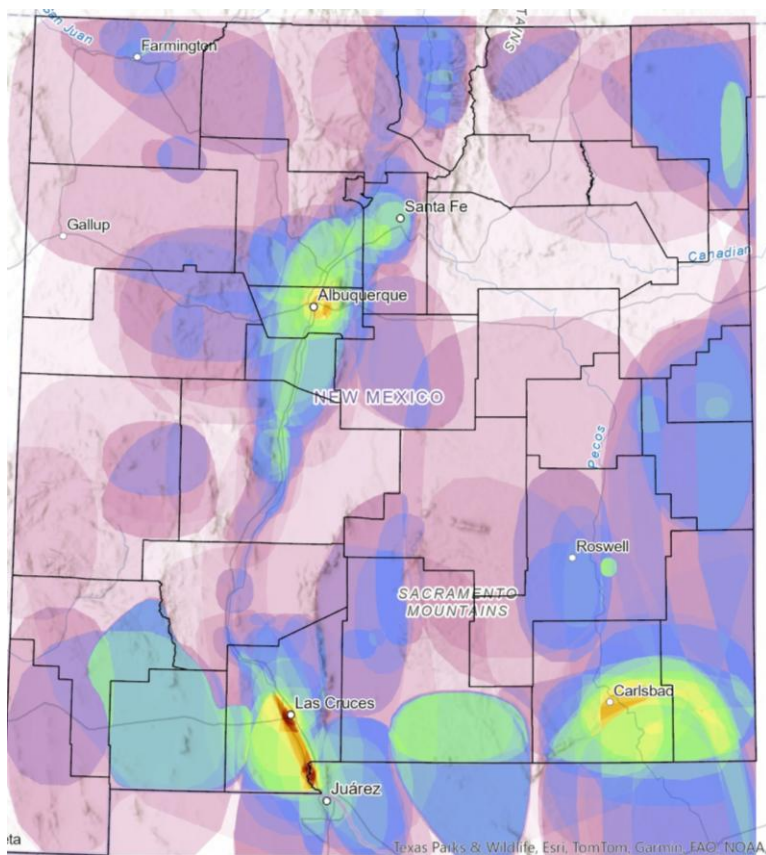
Complete regional aquifer characterization

- Regional approach
- Compile existing data, reports and models
- Address data gaps (water chemistry, water levels, geophysical studies, etc.)
- Build improved conceptual and functional models
- Full characterization of groundwater basins, including brackish and freshwater resources

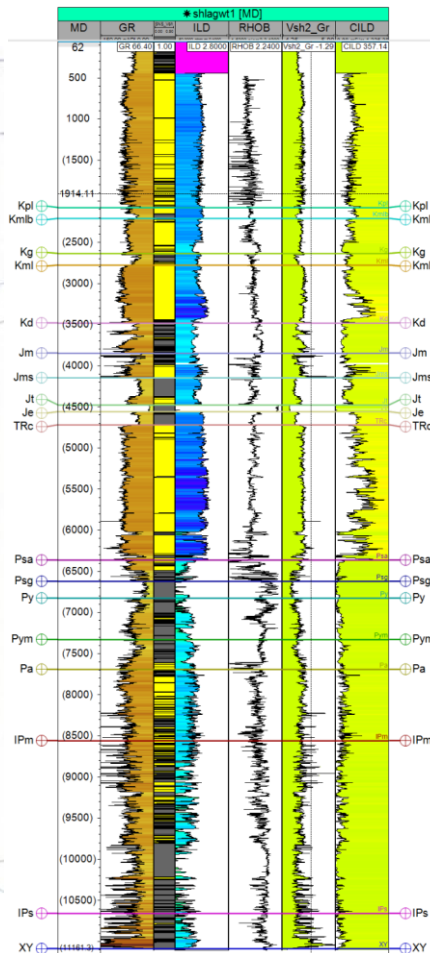
Build long-term groundwater monitoring

- Regional selection based on priority, land access, depths, and costs
- Drill wells to fill data gaps; utilize high quality existing wells
- Collect abundant data on each drilled well (geophysics, chemistry, age data)
- Set wells for long-term monitoring with telemetry for aquifer levels, possibly water quality
- Maintain O&M; reporting updates

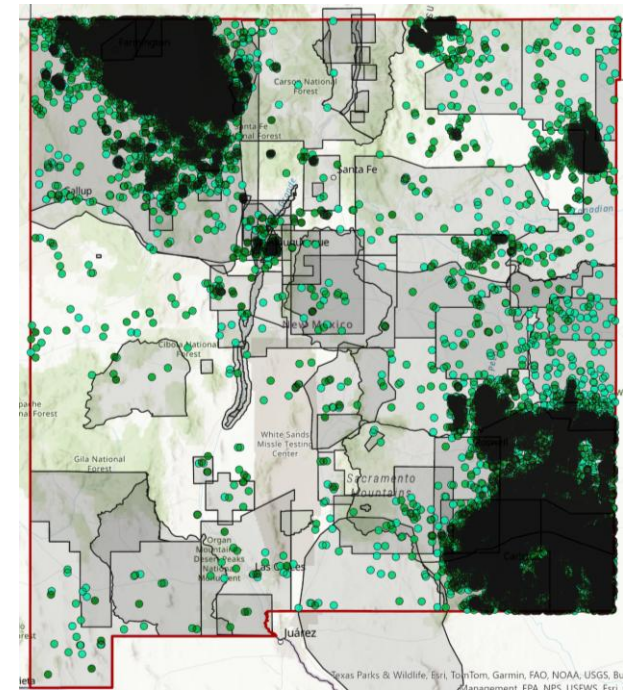
USING ANY / ALL EXISTING DATA



Regions with hydrogeologic studies (darker red – more studies to faint pink – few studies)



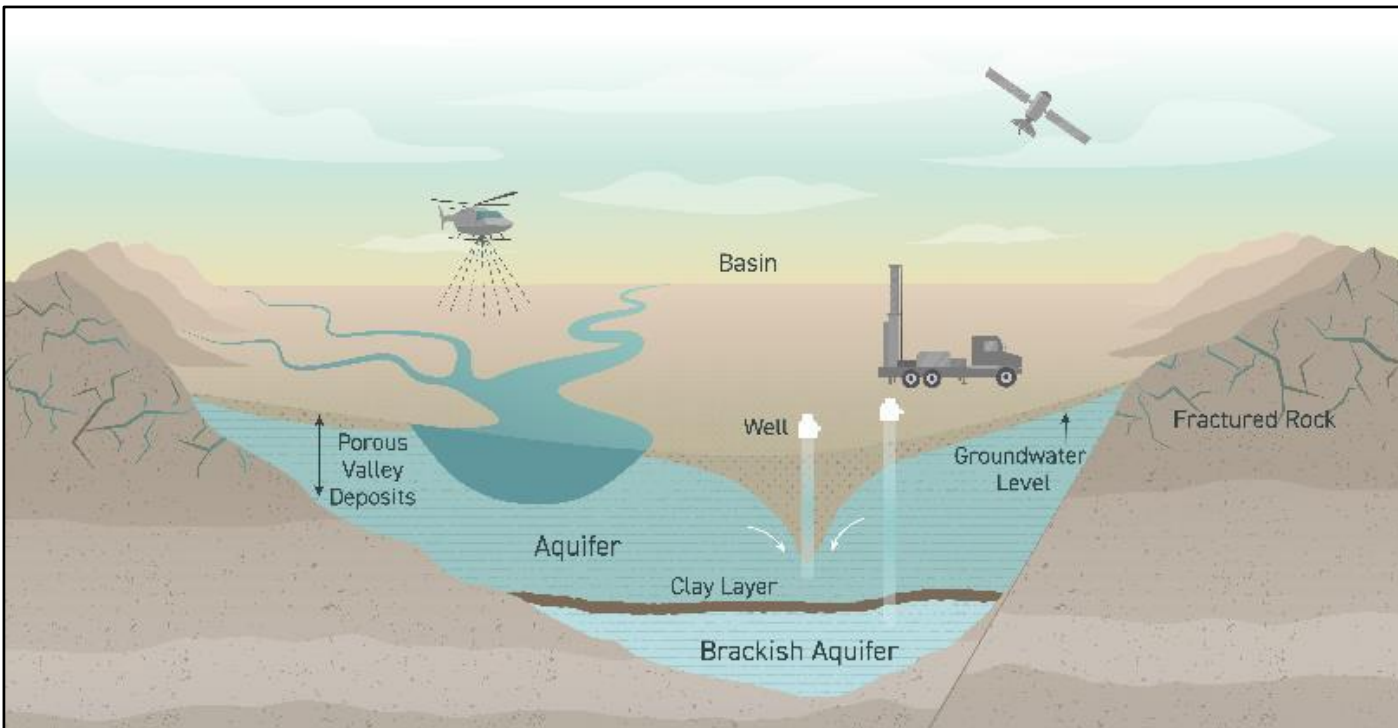
Example well log with geology



Wells with logs

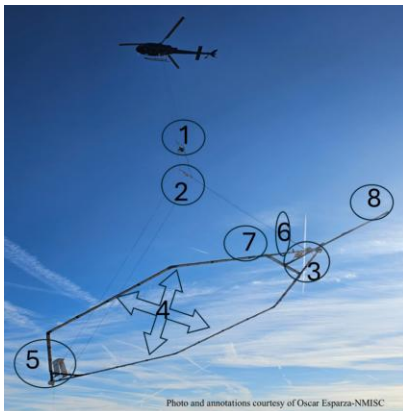
NEW DATA COLLECTION

- Collect geophysics (i.e. aerial electromagnetic surveys)
- Geologic mapping
- Drill wells
- Measure groundwater depths / changes
- Geochemical sampling



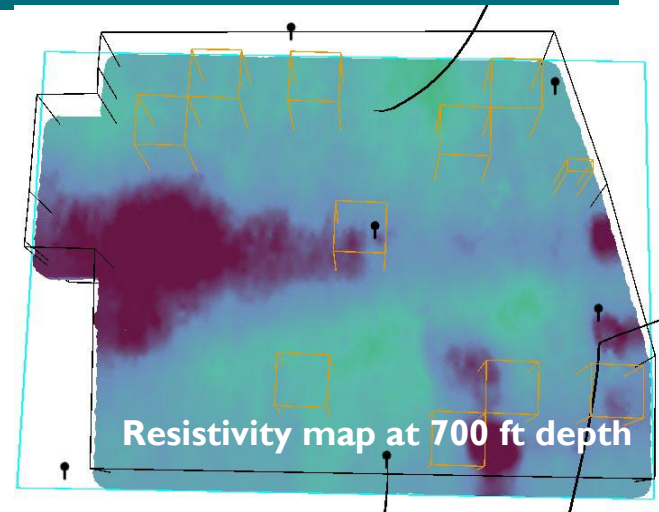
EXAMPLE AERIAL ELECTROMAGNETIC SURVEY: SANTA TERESA STUDY BY NM ISC

Acquisition set up

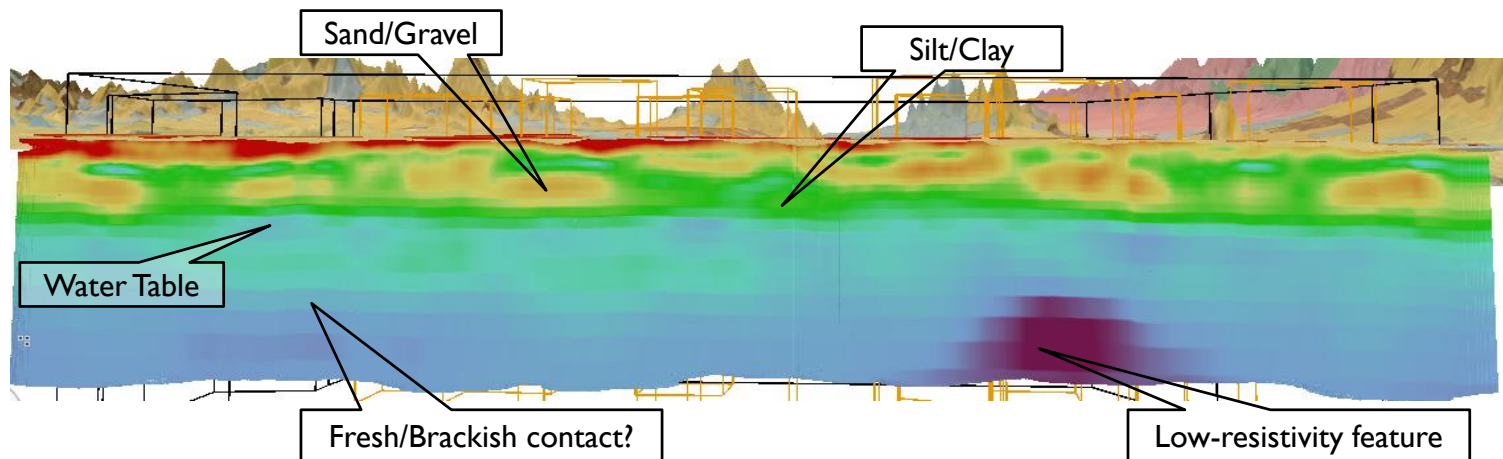


Aerial ElectroMagnetic (AEM)

1. Generator
2. Sequencer
3. Capacitor, computer, transmitter, & cooling system
4. Transmitter loop (x12)
5. Receiver coils (vert & horiz)
6. Laser altimeter
7. GPS
8. Magnetometer



Resistivity cross section: Preliminary Results



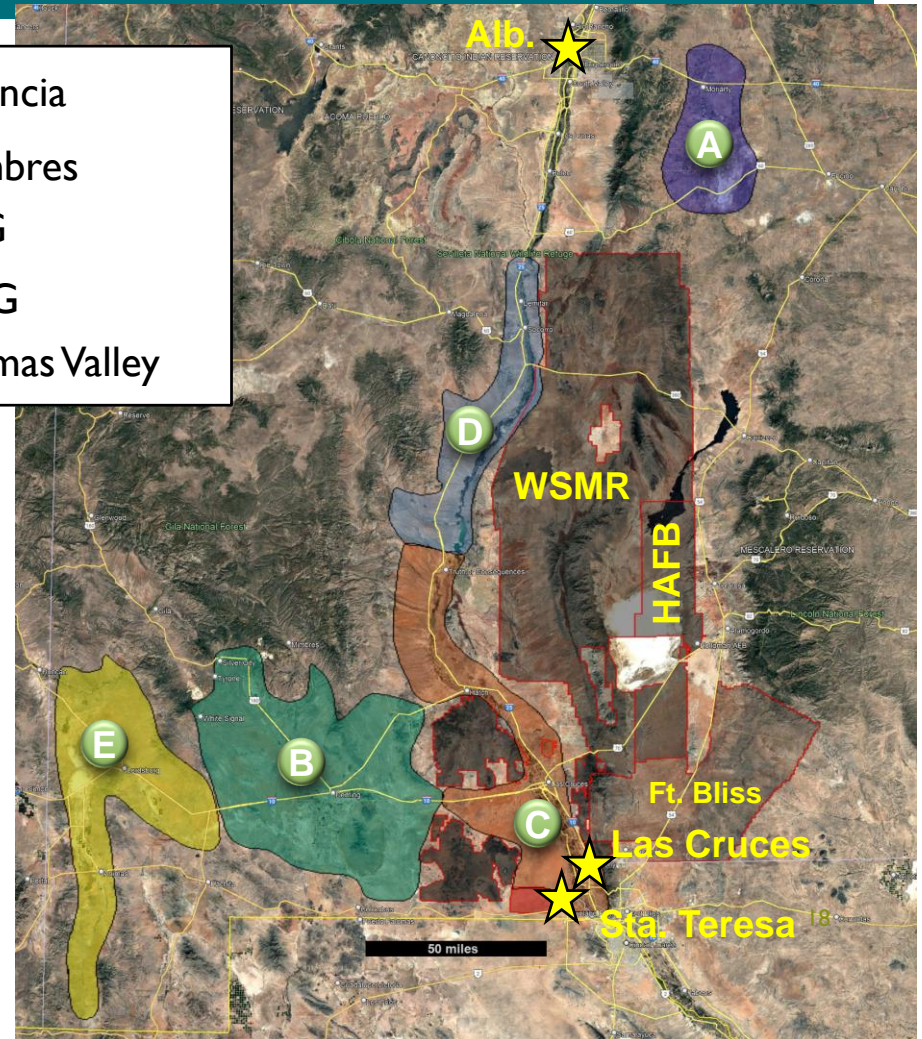
PLANNED PROJECT AREAS THIS YEAR

CONSIDERATIONS

1. Highly studied areas with many reports / data vs. less studied areas with few previous reports / data
2. Regions most dependent on groundwater
3. Cooperation, interest, and capacity to participate
4. Declining groundwater levels
5. Areas of current research or recent projects with Aquifer Mapping Program

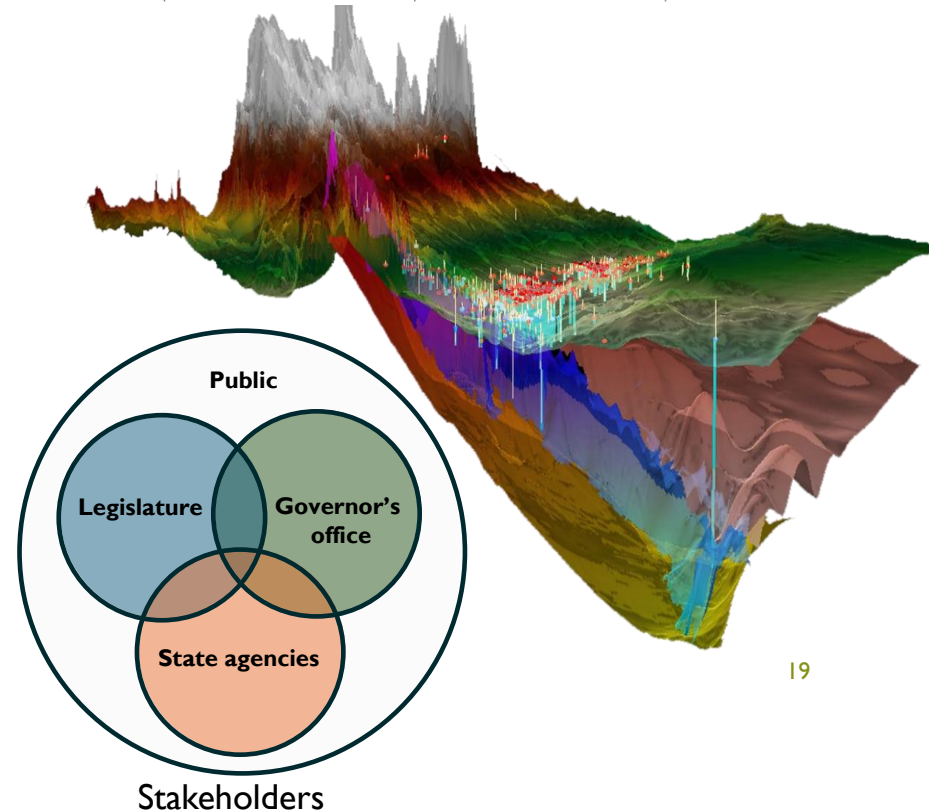
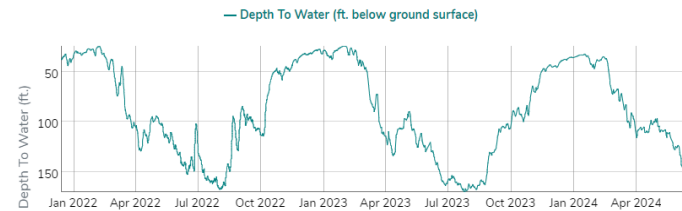
- A Estancia
- B Mimbres
- C LRG
- D MRG
- E Animas Valley

Collect and interpret new AEM data to refine existing framework models, estimate volumes of fresh & brackish water, and identify well locations

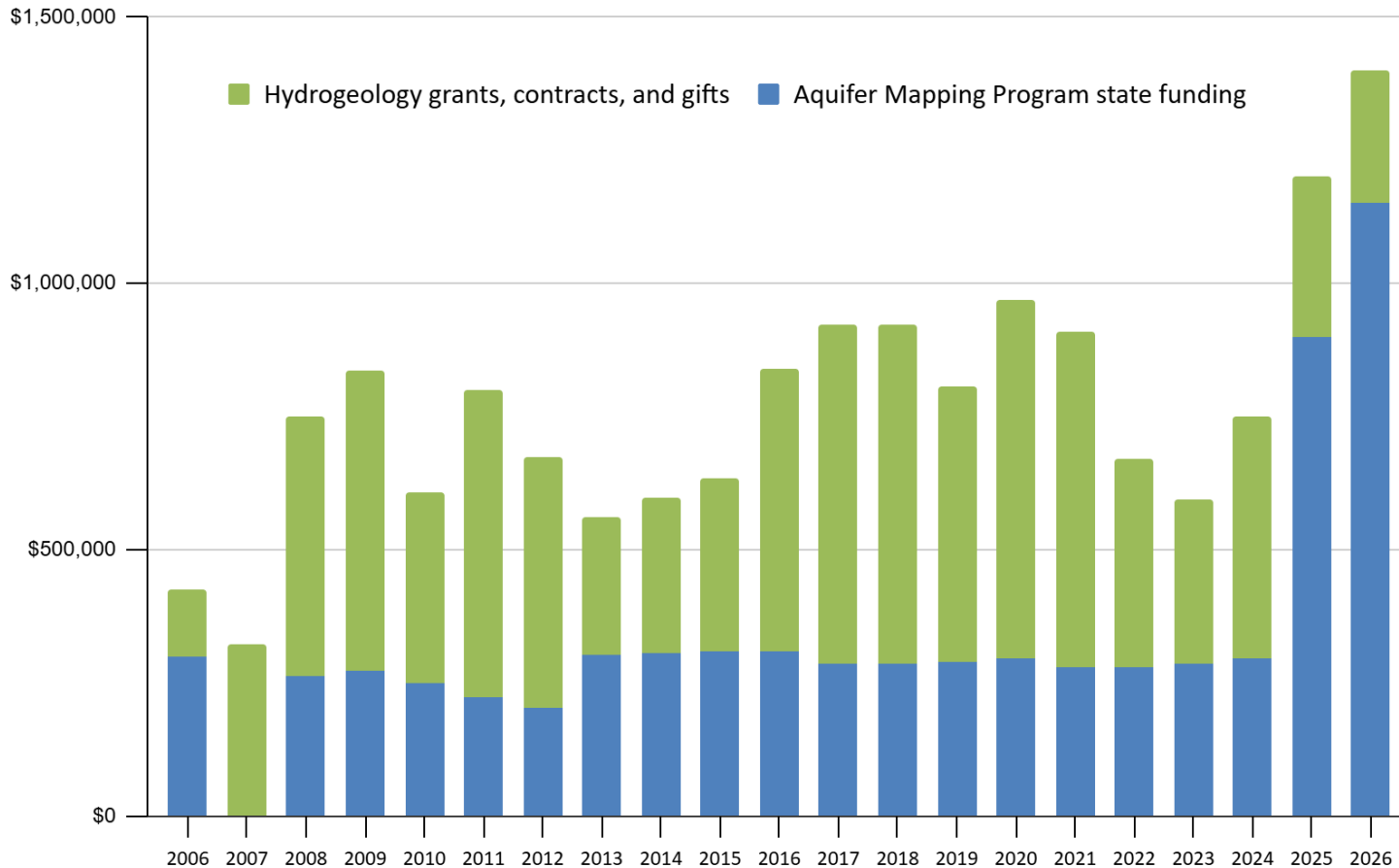


OUR GOAL IS TO PROVIDE THE STATE WITH ANSWERS!

- 100+ well network for dedicated groundwater monitoring
- Regional and statewide dashboards with groundwater level tracking
- Online, accessible aquifer visuals
- Detailed subsurface data and model layers for groundwater management and planning
- For stakeholders - Published best estimates of aquifer boundaries, existing water quality (fresh and brackish), and production potential



CURRENT AQUIFER MAPPING BUDGET AND SINCE 2006



Plus \$7.5M
non-
recurring
for
FY2026

AQUIFER CHARACTERIZATION AND MONITORING: TARGET FUNDING

Goal: Map all aquifers by 2037 with 100+ new monitoring wells for tracking change

Recurring funding:

- Annual funding now at \$1,150,000 (FY26)
- **Additional funding needed: \$1M**
 - Recurring costs to cover new staff FTEs, software licenses, project/data management
- After 2037, program focus shifts from building / data acquisition to long-term maintenance and updating / improving models

Non-recurring funding:

- Received \$7.5M for FY26
- **Target funding for FY27: \$20M**



NON-RECURRING FUNDING GOALS

Estimated funding to complete characterization of aquifers and establish groundwater monitoring network over next 11 years

Year	FY	Drilling wells	Surveys/Mapping	Consultants/ Researchers	Other data collection*	Annual estimate	Major costs (estimate)
1	2026	\$650,000	\$3,500,000	\$2,350,000	\$1,000,000	\$7,500,000	2-4 test wells; 3-4 surveys
2	2027	\$12,000,000	\$4,000,000	\$3,000,000	\$1,000,000	\$20,000,000	10-12 wells; 3-4 surveys
3	2028	\$12,000,000	\$4,000,000	\$3,000,000	\$1,000,000	\$20,000,000	10-12 wells; 3-4 surveys
4	2029	\$12,000,000	\$4,000,000	\$3,000,000	\$1,000,000	\$20,000,000	10-12 wells; 3-4 surveys
5	2030	\$12,000,000	\$4,000,000	\$3,000,000	\$1,000,000	\$20,000,000	10-12 wells; 3-4 surveys
6	2031	\$8,650,000	\$3,000,000	\$3,000,000	\$1,000,000	\$15,650,000	8-10 wells; 2-3 surveys
7	2032	\$8,000,000	\$3,000,000	\$3,000,000	\$500,000	\$14,500,000	8-10 wells; 2-3 surveys
8	2033	\$8,000,000	\$3,000,000	\$3,000,000	\$500,000	\$14,500,000	8-10 wells; 2-3 surveys
9	2034	\$8,000,000	\$3,000,000	\$3,000,000	\$500,000	\$14,500,000	8-10 wells; 2-3 surveys
10	2035	\$8,000,000	\$1,000,000	\$3,000,000	\$500,000	\$12,500,000	8-10 wells; 1-2 surveys
11	2036	\$8,000,000	\$1,000,000	\$2,000,000	\$500,000	\$11,500,000	8-10 wells; 1-2 surveys
12	2037	\$2,000,000	\$1,000,000	\$1,000,000	\$500,000	\$4,500,000	wrap up 2-4 wells; shift to O&M and updates
		\$99,300,000	\$34,500,000	\$32,350,000		\$175,150,000	100+ wells tracking fresh and brackish water; major and minor aquifers mapped

* Other data collection includes student/ staff support, lab analyses, and field campaigns in regions of study

Questions?

Thank you for your support and helping us get this important work done!

Stacy.Timmons@nmt.edu

575-835-6951

**If you have a well to recommend for our
groundwater monitoring network, email us at:
nmbg-waterlevels@nmt.edu**

