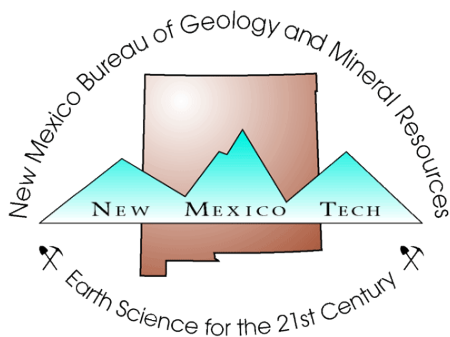


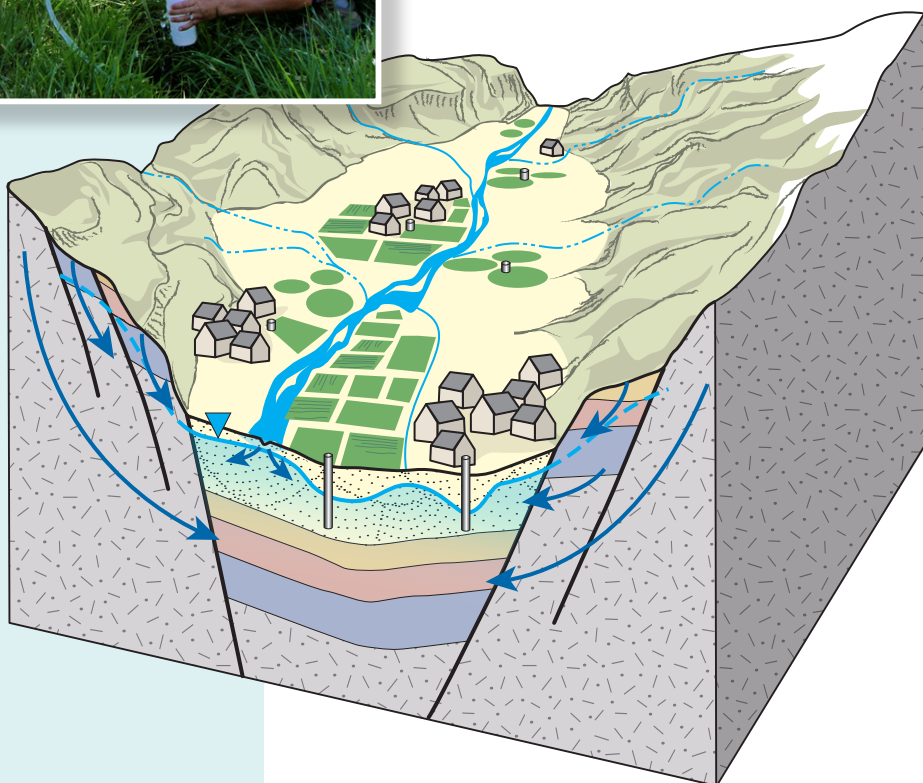
The New Mexico Bureau of Geology and Mineral Resources

A Division of
New Mexico Tech



Aquifer Mapping Program 2016–2017

Aquifer mapping is the scientific process of characterizing the groundwater quantity and quality within New Mexico's aquifers. With a combination of techniques based in geology, hydrology, geochemistry and geophysics, we create a variety of maps and interpretations of our aquifers. We are the only non-regulatory state agency engaged in this specialized, multidisciplinary water science and research. We are building upon a wealth of existing information, adding new and innovative techniques and data, and ultimately providing the state with a better understanding of our water resources.



Working around the state, to characterize New Mexico's aquifers, our research topics include:



Good resource management requires good science and collaboration

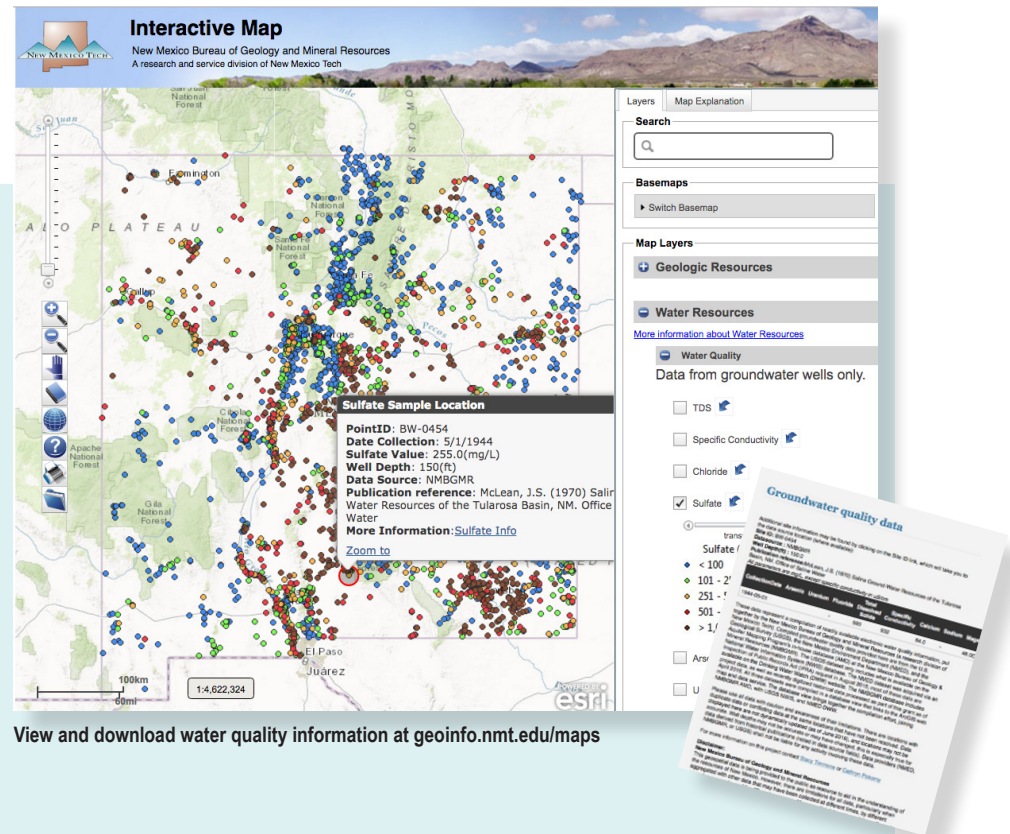
- Geologic maps
- Hydrostratigraphic characterization
- Water-level measurements and groundwater flow conditions
- Geochemical characterization
- Hydrologic and well database
- Geophysical surveys
- Deep drill holes
- 3D geologic models

Water quality characterization

Utilizing our state-of-the-art laboratory facilities that serve the public and the research communities, our water chemistry data provide a useful tool for understanding water resources. As water flows in and over the diverse geology of our state, ions and minerals are added to the water. Many of our hydrogeology studies, such as our work in the Sacramento Mountains, Taos or Curry-Roosevelt Counties, utilize water chemistry to “fingerprint” the geologic sources of naturally occurring minerals and contaminants in the water. Applications for these data include characterization of groundwater–surface water interactions, as we are utilizing along the **Animas River, following the Gold King Mine spill** (working with the New Mexico Environment Department). We also use water quality information to help us characterize the relationship between our fresh and **brackish water resources**.

Water quantity estimation

Having an accurate understanding of the quantity of water available relies upon an understanding the saturated thickness of the aquifer and the basin's geologic structure. In many regions of New Mexico, this basic geologic information is lacking. New funding this year from the **Healy Foundation** will enable



View and download water quality information at geoinfo.nmt.edu/maps

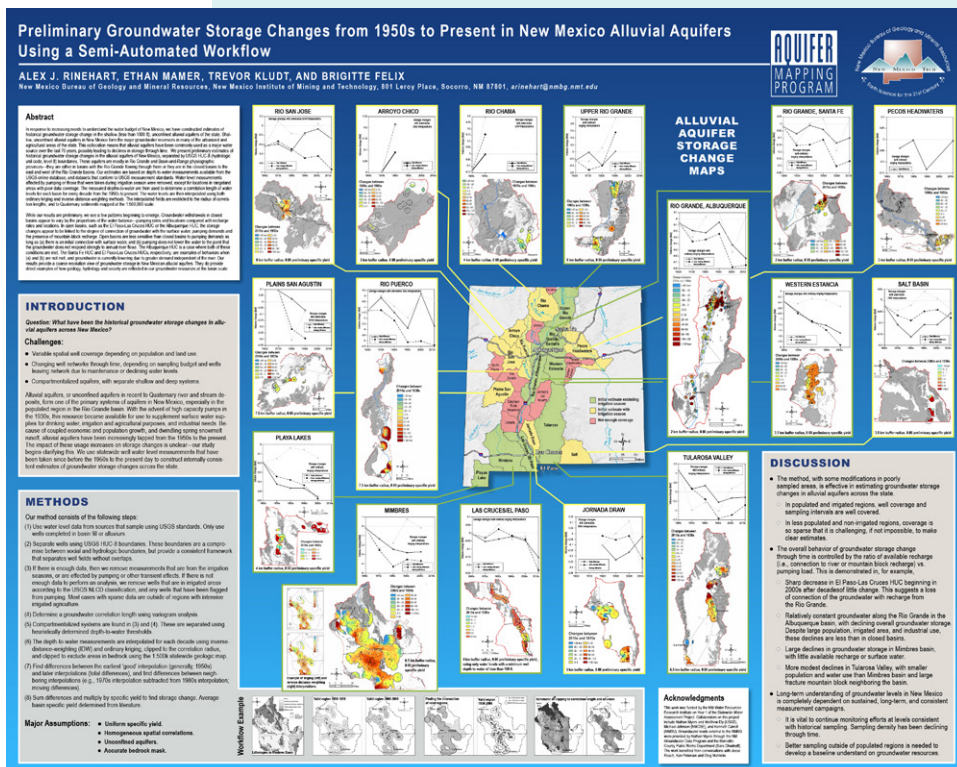
us to begin New Mexico's first comprehensive three-dimensional aquifer maps.

Our **geologic mapping program** at the Bureau of Geology strives to map, in detail, the distribution of aquifer-bearing units and the structures that compartmentalize our aquifers. With this information, we can better estimate the quantities of water available. Funding from the NM Water Resources Research Institute, as part of a statewide water assessment, supports our work using historic groundwater levels to estimate groundwater storage changes.

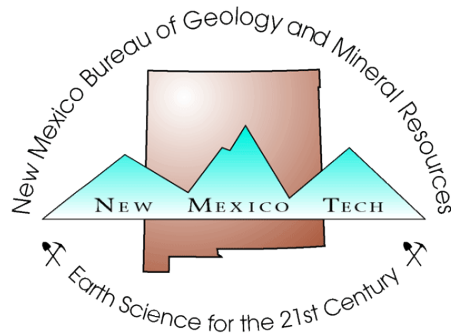
Evaluation of the subsurface groundwater connections between regional basins requires a solid understanding of the geologic framework. Utilizing our geologic mapping program and deep well data (cuttings and core archived with our oil and gas program), we can add new **geophysical techniques**, including gravity, resistivity, and magnetics, to describe groundwater basins and their margins.

Monitoring efforts

Some of the most important information related to water in New Mexico is the long-term monitoring data collected on groundwater levels, surface water flow, and water quality changes. As the state's geologic survey, part of our mission is to act as a repository for earth science related data. New efforts underway supported by new funding from the Healy Foundation will build the **Collaborative Groundwater Level Monitoring Network**. With collaboration from New Mexico Rural Water Association and the New Mexico Environment Department, we are providing new groundwater monitoring for rural water communities. With groundwater monitoring, we hope to help prevent water outages such as the one that occurred in Magdalena in 2013.



Groundwater storage changes in New Mexico poster presented at the New Mexico Geologic Society Spring Meeting 2016. Funded by NM WRRRI, with projects covering the Rio Grande alluvial aquifers in 2016.



Aquifer Mapping Program 2016–2017 Projects

San Agustin Plains and Alamosa Creek watershed

Client and study area: Support for New Mexico interests (NMOSE/ISC, NM EMNRD, NM Department of Game and Fish) in the Plains of San Agustin and Alamosa Creek watershed, eastern Catron and western Socorro counties.

Issues: Groundwater availability and sustainability in the Plains of San Agustin; groundwater quality and source of water to springs at the Monticello Box, Alamosa Creek watershed.

Products: Hydrogeologic information for state agencies and the public about groundwater in the central Plains of San Agustin and Alamosa Creek watershed, and their interconnection with the Rio Grande Valley; public outreach and education.

Funding: Aquifer Mapping Program, Bureau of Geology, National Cooperative Geologic Mapping Program, Healy Foundation, and the NMOSE.

Curry-Portales groundwater basins aquifer lifetime map

Client and study area: Clovis, Portales, communities in Curry and Roosevelt Counties

Issues: Limited groundwater in the High Plains (Ogallala) aquifer, with little to no recharge, has communities in eastern New Mexico making tough groundwater management decisions. More information on the remaining amount of groundwater in the region is essential for planning needs.

Products: In order to address reduction in the available groundwater in the High Plains aquifer in eastern New Mexico, we will develop maps of aquifer declines, which show the remaining lifetime of the aquifer. Maps like these have been developed in Texas and Kansas, but never before in New Mexico.

Funding: City of Clovis and regional collaborators, Bureau of Geology.

Collaborative groundwater level monitoring

Client and study area: Rural communities of New Mexico

Issues: Facing long-term droughts and climate change, many rural communities, especially those on single wells for water supply, need information on groundwater availability. By providing groundwater level monitoring, we will help inform these communities and the state about the dynamics of the water supply to these rural regions.

Products: New data to inform decision-making and funding prioritization. We will provide groundwater level data in regions with significant gaps. It will be publicly viewable and downloadable through interactive maps. In some locations, real time data will be available.

Funding: Healy Foundation, Aquifer Mapping Program, Bureau of Geology.

3D Aquifer map development

Client and study area: 3–4 regions or aquifers of New Mexico each year

Issues: Only limited regions of the state have detailed maps of aquifers, and there is no central location of maps of all aquifers. Many maps of aquifers are surface maps, or simple 2D maps. In order to evaluate the available quantity of groundwater, we first need more complete 3D maps of aquifers. This process is time intensive, requiring geologic and hydrologic expertise.

Products: Over several years, publicly available maps of aquifers will display the known extent of active aquifers. Maps will have associated text to describe what is known about groundwater in each region, and can highlight regions where more information is required.

Funding: Healy Foundation, Aquifer Mapping Program, Bureau of Geology.

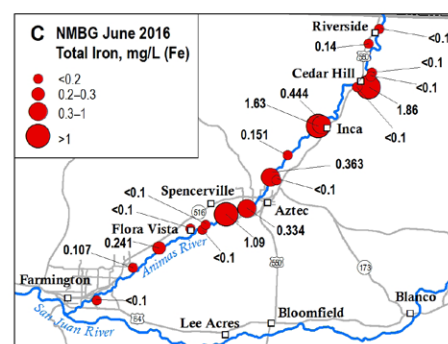
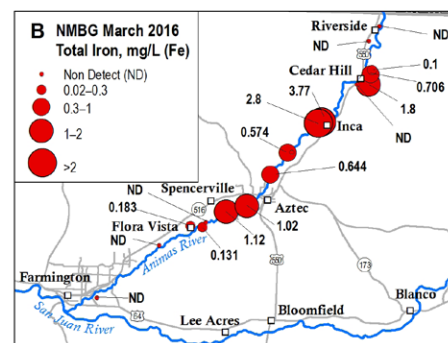
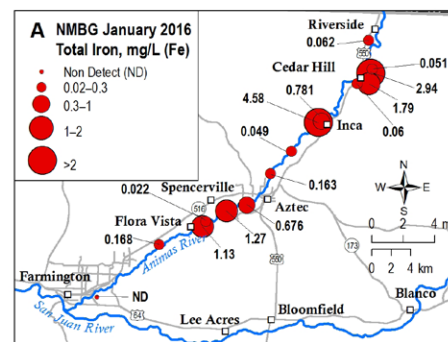
Animas River long-term monitoring

Client and study area: With the New Mexico Environment Department and many other collaborators, we are looking along the Animas River, from the CO-NM state line to Farmington.

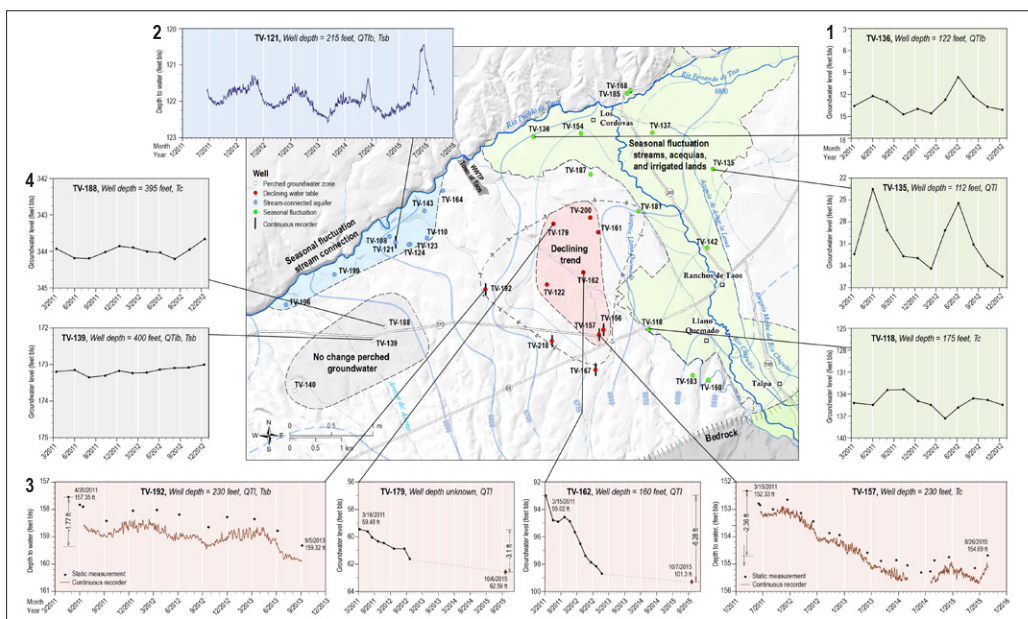
Issues: In response to the Gold King Mine spill (August 2015), as part of a long term monitoring effort underway with several other state agencies and universities, we will characterize the groundwater-surface water interactions with regard to the hydrologic interactions and the water quality in the groundwater, using private domestic wells.

Products: Maps showing how groundwater moves in the alluvial aquifer near the Animas River at different seasons and flow regimes; and reports and datasets describing the water chemistry and possible geologic or mine related influences on the groundwater along the Animas.

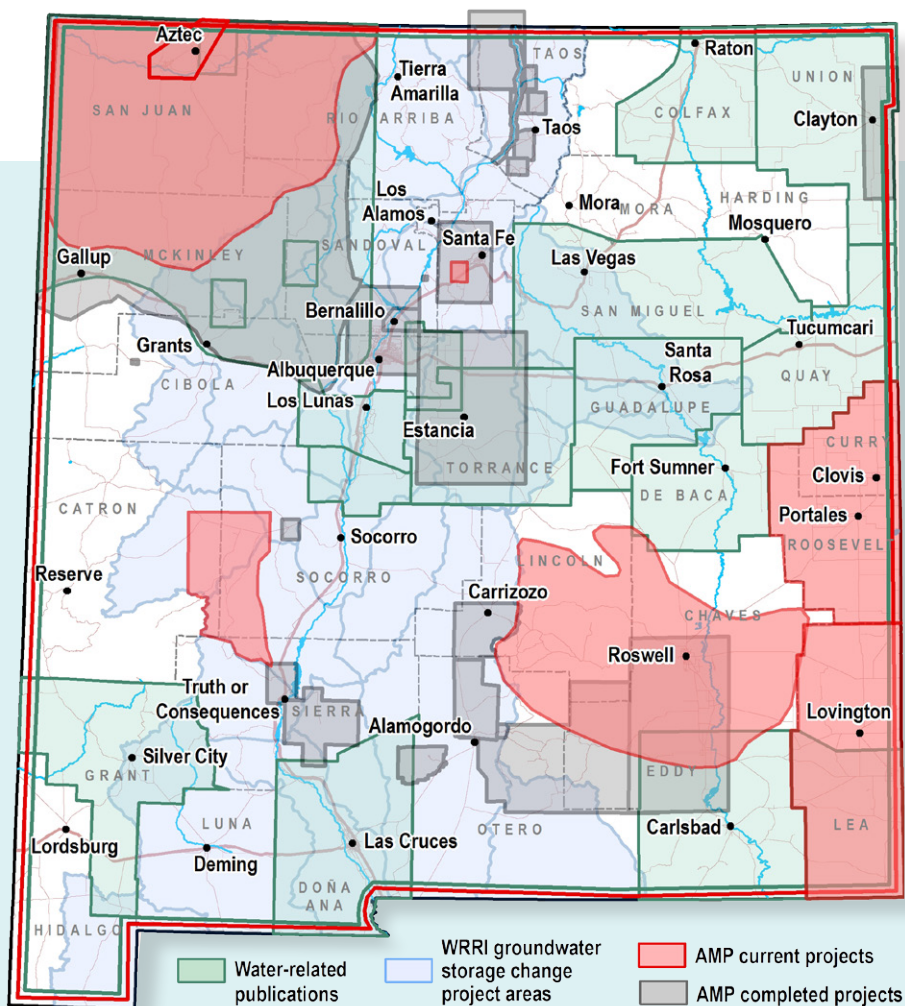
Funding: New Mexico Environment Department and U.S. Environmental Protection Agency, with collaborations at New Mexico Tech, University of New Mexico, New Mexico State University, New Mexico Office of the State Engineer, and the U.S. Geological Survey.



Seasonal changes in iron levels in groundwater observed in the Animas River alluvial aquifer.

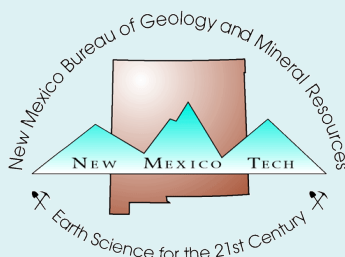
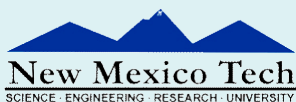


Groundwater hydrographs for select wells in the southern Taos Valley illustrate four trends in water-level changes: 1) seasonal fluctuations near streams in irrigated lands; 2) seasonal fluctuations near the lower Rio Pueblo; 3) progressive decline; and 4) no change.



Please visit our website
for information on
project areas and data

geoinfo.nmt.edu/resources/water/amp
geoinfo.nmt.edu/maps



New Mexico Bureau of Geology and Mineral Resources

We are a non-regulatory governmental agency (the state's geological survey) that conducts scientific investigations leading to responsible development of the state's mineral, water, and energy resources.