



Earth Data Analysis Center (EDAC), University of New Mexico

Cooperating Technical Partners (CTP)

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Technical Pilot Project

New Mexico Stream Gage Analysis

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Brief History of Stream Gages in New Mexico

“The first USGS stream gage just turned 125 years old, and the U.S. Geological Survey and many partner agencies are commemorating the event while celebrating the founding vision that continues to yield information needed to protect, manage, and sustain our Nation’s surface waters and minimize damages from floods and droughts. Ten years following the USGS’s birth in 1879, and under the advisement of John Wesley Powell, the proposition to inventory the flow of all streams in the arid West and evaluate the potential for crop irrigation came to fruition in Embudo, New Mexico on Jan. 1, 1889.

Reporting river flows is not just a job at USGS – it’s a matter of public safety, environmental protection, and wise economic development. Stream gage data is used to forecast floods and droughts, manage flood flows, deliver water supplies, establish water rights, and protect threatened aquatic habitats. Major users of USGS gage data include the National Weather Service, the Bureau of Reclamation, the U.S. Army Corps of Engineers and many other Federal, State, Tribal, and local agencies. Thousands of boaters and fishermen also access the data every day to plan recreational outings.

Situated 43 miles from Santa Fe, New Mexico’s state capital, Embudo was selected as the site of the first gaging station because of the need for systematic water resource assessments of western states. Embudo not only offered a favorable climate and easy rail access, an important consideration for transporting the imperative scientific and camp equipment, but qualified for congressional funding tapped specifically for the “arid West.” (*Celebrating the First USGS Streamgage*. Heidi Koontz. USGS, 04 Apr. 14. Web.<https://www2.usgs.gov/blogs/features/usgs_top_story/celebrating-the-first-usgs-streamgage/>).

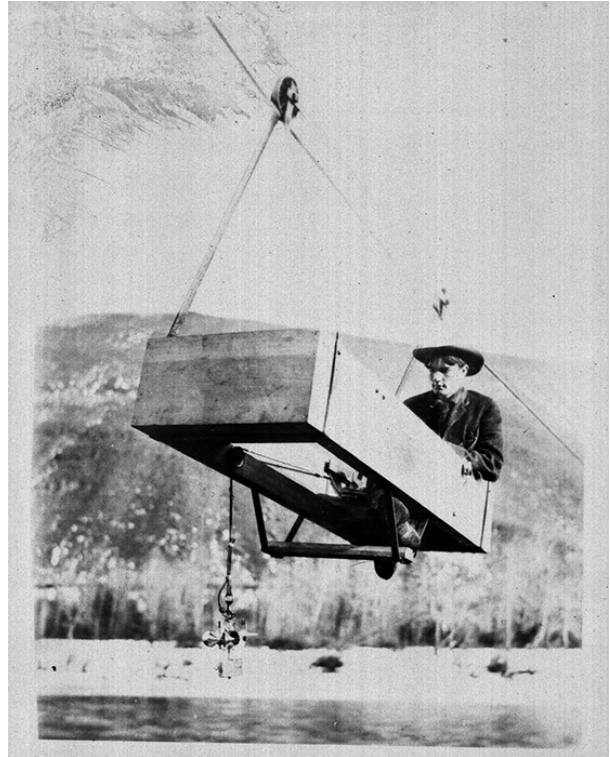


Figure 1 – Stream gaging at Embudo, New Mexico, circa 1888, photo courtesy of the U.S. Geological Survey

Current Need

The best source of hydrologic data comes from stream and precipitation gages. Without these data, flood hazard modeling relies on other models such as the USGS Regression Equation. With New Mexico's varied terrain, including ample karst topography, these models may not accurately reflect conditions experienced by local floodplain and emergency managers. Unfortunately, New Mexico still lacks sufficient stream and precipitation gages.

The current trend due to fiscal constraints, is that state and federal agencies can no longer afford to purchase, install, and maintain additional gages needed across the state.



Figure 2 - Embudo Gage Station on the Rio Grande, New Mexico, photo courtesy of the U.S. Geological Survey, Mark Gunn/USGS

Figure 3, shows all of the individually identified gage locations throughout New Mexico. As you would expect, gage installations concentrate in and around major population centers and along our primary rivers. While this is a start, in terms of gage coverage across the state, more gauging stations are needed to provide more accurate picture of the overall hydrology within watersheds.



Figure 3 - Identified Gage Locations within New Mexico

Figure 4, shows the breakdown of the number of gages per HUC8 watershed,

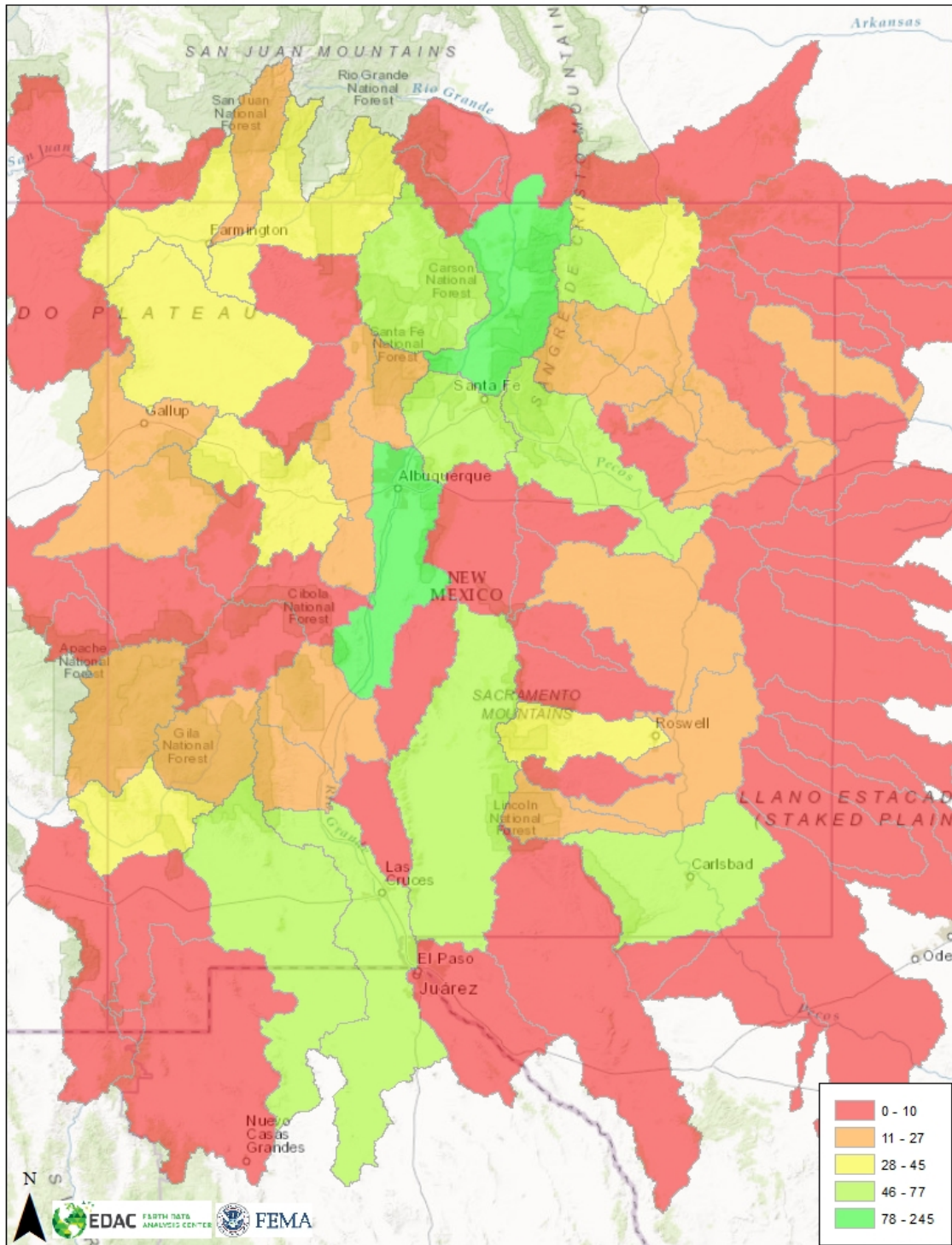


Figure 4 - Gage Count per HUC 8 Watershed in New Mexico

20 of our 85 watersheds in New Mexico have zero gages, and 50 have less than 10. Given the results in Figure 4 of the stream gage analysis, this figure clearly documents the deficiencies and the priorities based on areas of need within the current stream gage network. In addition to identifying deficiencies, this report identifies potential partners who may be interested in mitigating stream gage deficiencies, and provides a stream gage inventory which will be made available at no cost through the New Mexico Resource Geographic Information System ([RGIS](#)) and on www.nmflood.org. By addressing risk at a watershed level, we can narrow our focus and efforts to craft a more strategic approach to New Mexico's flood risk moving forward.

Funding Strategy

Funding from non-federal entities is always a challenge in New Mexico. State Department budgets are being cut 5% across the board and with the deficit created by the reduction/loss of tax revenue from oil and gas sources, there is little relief in sight.

It is the belief of EDAC and FEMA Region 6 team that a sustainable plan going forward must involve smaller regional organizations such as flood control authorities and regional planning associations. As a result of this study and in coordination with the Silver Jackets, NM Department of Homeland Security and Emergency Management, and the NM Floodplain Managers Association, the CTP will begin an outreach effort engaging entities throughout the state where gaps in gage coverage have been identified within their jurisdictions. Many of these organizations have the infrastructure and staff in place to maintain and install gage equipment.

Potential partners include, but are not limited to:

- [SSCAFCA](#) – Southern Sandoval County Flood Control Authority
- [AMAFCA](#) – Albuquerque Metropolitan Arroyo Flood Control Authority
- [ESCAFCA](#) – Eastern Sandoval County Flood Control Authority
- [ISC](#) – NM Office of the State Engineer / Interstate Stream Commission
- [MRCOG](#) – Middle Rio Grande Council of Governments
- [Dona Ana](#) County Office of the Flood Commission
- [MRGCD](#) – Middle Rio Grande Conservancy District
- [NWNMCOG](#) – Northwest New Mexico Council of Governments
- [EPCOG](#) – Eastern Plains Council of Governments
- [NCNMEDD](#) – North Central New Mexico Council of Governments
- [SWNMCOG](#) – Southwest New Mexico Council of Governments
- [SCCOG](#) – South Central Council of Governments
- [SNMEDD](#) – Southeastern New Mexico Economic Development District

By creating strong partnerships, EDAC can help identify potential funding opportunities and engage with at risk communities at a regional level. We will begin by addressing watersheds with low gage counts and reaching out to planning entities whose jurisdiction they fall into. By pointing these organizations to available mitigation grant opportunities at the State and Federal levels, utilizing their available resources as in-kind or leverage matches, we can begin an effective and focused approach to getting better coverage throughout the State.

EDAC has an existing positive working relationship with SSCAFCA, AMAFCA and the Dona Ana County Office of the Flood Commission. We will work with these organizations initially to develop a workflow that not only improves gage coverage in their jurisdictions, but is repeatable throughout the state. Utilizing the lessons learned we will be able to create presentation and training materials to further our message with other agencies. EDAC is also planning to create a Gage Sub Committee under the States Geospatial Advisory Committee (GAC). This group of volunteers could stay engaged at the Local, State, and Federal level to identify needs and funding opportunities.

Stream Gage Inventory

EDAC has completed an initial collection of gage location data stemming from a variety of sources. This data is available from www.nmflood.org in geodatabase format as well as from the Resource Geographic Information System ([RGIS](#)) which is the official geospatial data clearinghouse for NM. Initial collection efforts focused primarily around USGS NHD data, as well as data from the NM Office of the State Engineer. Datasets include:

- 2015 Office of the State Engineer Gages
- 2013 USGS Gages
- 2014 USGS Gages
- 2015 USGS Gages
- 2016 USGS Gages
- NHD Point Events 2016
- NHD Stream Gage Events 2013
- NHD Stream Gage Events 2011



Figure 5 - Measuring Stream Depth, photo courtesy of the U.S. Geological Survey

EDAC, as the state's Cooperating Technical Partner (CTP) with FEMA, and a participant in the Silver Jackets program anticipates expanding this database as partnerships grow allowing us to continually expand gage coverage in the state.

Additional Resources

New Mexico has several existing resources available for water conditions and monitoring throughout the state. Due to recent drought conditions and the fact that the majority of our lands are classified as some varying degree of desert, water resource management is crucial going forward. Both from an extreme hazard potential and with a water management resource perspective.

USGS Water Resource Information System

<http://waterdata.usgs.gov/nm/nwis/rt>

The USGS Water Resource Information System is the best available one stop location for finding Daily Stream Flow Conditions within New Mexico

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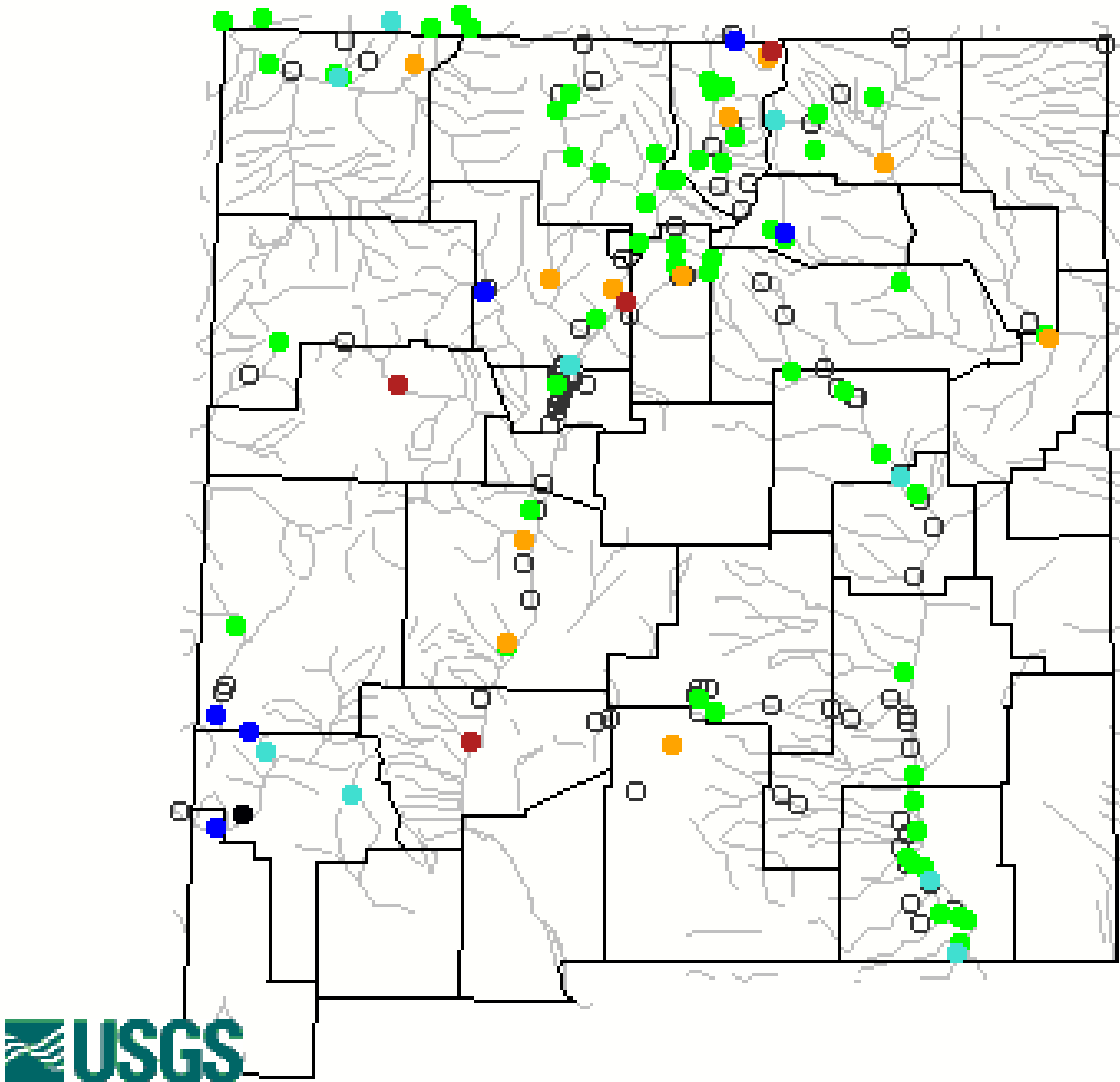


Figure 6 - USGS Water Resources Information System Daily Stream Flow Conditions

“Estimates of streamflow statistics are used for a variety of water-resources and emergency planning, management, and regulatory purposes, and for design of structures such as bridges and culverts. These estimates are often needed at ungaged sites where no observed flow data are available.

To provide simple methods of estimating streamflow statistics, the U.S. Geological Survey (USGS) has developed and published regression equations estimating the magnitude and frequency of floods for every State, the Commonwealth of Puerto Rico, and a number of

metropolitan areas in the United States, and regression equations for estimating other streamflow statistics are available for many states. These equations have been compiled into the National Streamflow Statistics (NSS) Program.” (<http://water.usgs.gov/osw/programs/nss/summary.html>). The addition of more gages will improve the quality of the regression equations, particularly in more rural areas where no data exists at this time.

NM Flood

www.nmflood.org

NM Flood is a one stop resource for flood risk information in the State of New Mexico. Any and all FEMA Risk map deliverables will be posted here, as well as relevant articles and links.

NM Office of the State Engineer – Interstate Stream Commission

<http://www.ose.state.nm.us/ISC/>

“The Interstate Stream Commission has broad powers to investigate, protect, conserve, and develop New Mexico’s waters including both interstate and intrastate stream systems. The eight unsalaried members of the Commission are appointed by the Governor. The ninth member is the State Engineer who under state law is the secretary of the Commission. The Interstate Stream Commission Director serves as the deputy state engineer.

The Commission’s authority under state law includes negotiating with other states to settle interstate stream controversies. New Mexico is a party to eight interstate stream basins. To ensure basin compliance, Interstate Stream Commission staff analyze, review, and implement projects in New Mexico and analyze streamflow, reservoir, and other data on the stream systems.

The Commission is also authorized by statute to investigate and develop the water supplies of the state and institute legal proceedings in the name of the state for planning, conservation, protection and development of public waters.”