Climate Change Impacts on New Mexico's Mountain Sources of Water

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New Mexico faces a daunting challenge—the State's demand for fresh water exceeds the supply from all sources. The problem will be exacerbated in the 21st Century by a combination of factors, including global climate change, increasing population, constraints associated with traditional water rights and interstate water compacts, and the general lack of scientific knowledge applicable and available to local and regional planners and policymakers.

The largest source of surface water in NM is the Rio Grande, which derives between half and three-quarters of its dependable surface water supply from high elevation snowpack in its northern, mountainous headwaters region. Long-term climate change warming trends combined with the predicted climate impacts of extended droughts present an extreme challenge to water management in NM. It is critically important for NM to understand the effects of global climate changes on its mountain sources of water.

NM EPSCoR is designed to enhance research competetiveness through investment in three strategic areas:

1 Research Infrastructure

Research infrastructure investments support development of watershed-scale observational databases and coupled atmosphere-land-hydrology models needed to understand global climate change effects on NM water supply and water quality.

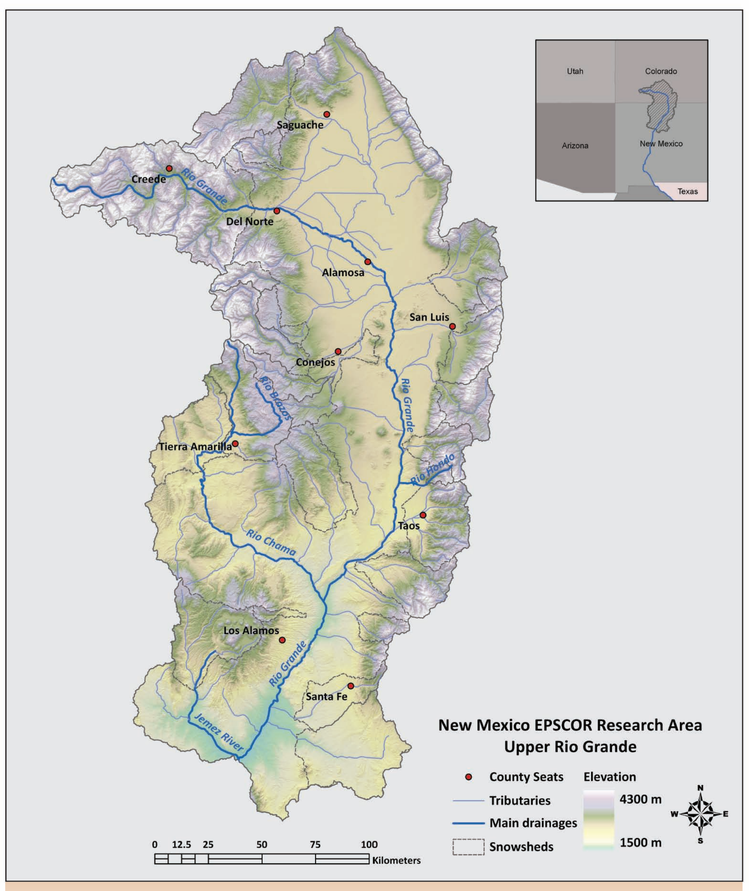
Researchers will employ a combination of remote sensing data, field data from new observational networks, and coupled climate and hydrology models.

- Large scale climatic influences on New Mexico
- Linking climate to hydrologic variability
- Coupled climate-hydrologic models

Upgrades and installation of eighteen enhanced capability SNOTEL sites will provide important information on snowpack in high elevations.

- Climate change effects on water quality
- Socioeconomic impacts of water management

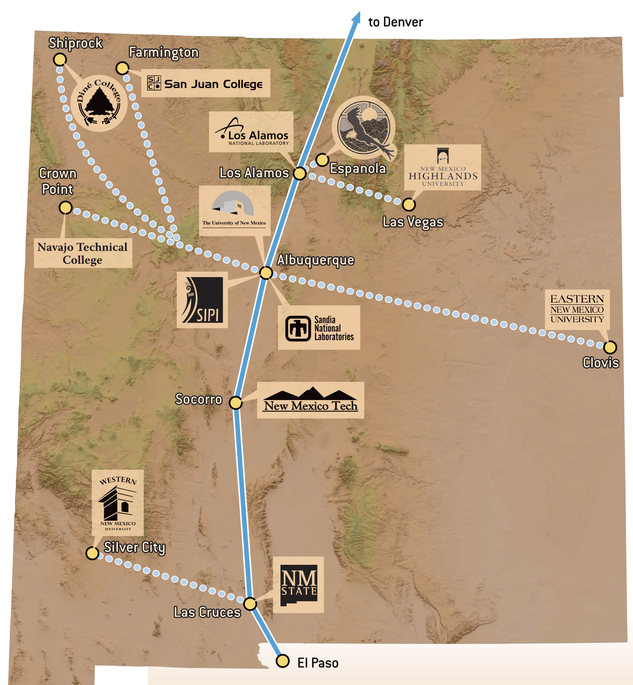
Acequias are the traditional communal water management system of northern NM still in use today. Investigators seek to model social and hydrologic linkages.



The study area permits scaling climate and hydrologic models from intensive studies on snowmelt-driven rivers, up to the watershed scale, and up to the regional scale.

2 Cyber Infrastructure

Advances in our ability to observe and simulate future climate scenarios and mountain hydrologic processes cannot be achieved without investment in innovative uses of cyberinfrastructure.



An expanded state data network will improve connectivity to all EPSCoR partner institutions, including regional and tribal colleges, better integrating research resources among schools, national laboratories, and state government.

- Efficient data acquisition, processing and storage
- Interoperable data discovery and delivery based on open standards
- Technologies for scientific collaboration
- NM Climate Change Web Portal
- High performance computing in model deployment

ENCANTO, an SGI Altix ICE 8200 supercomputer, is used by EPSCoR for execution of integrated climatological-physical-socioeconomic simulations. EPSCoR employs an HPC programmer to advance development of parallel-computing solutions for climate change research in New Mexico.

The multi-disciplinary, multi-scale effort is envisioned to transform climate change science and policy-making in NM by providing the tools required for quantitative, science-driven discussion of difficult water policy options facing the State in the 21st Century.

3 Human Infrastructure

Enhancing the human infrastructure in New Mexico's academic and research enterprise is central to EPSCoR. Three inter-related plans aim to create an informed citizenry and develop future leaders in research and governance.

Education plan:

- Summer Institute for Teacher Professional Development
- Undergraduate Research Opportunities Program
- Los Alamos National Labs Climate Change Graduate Research Training
- Junior Faculty Leadership Training Workshops

New Mexico Museum of Natural History & Science will design and install a new Climate Change Exhibit featuring NOAA's *Science on a Sphere* and integrating research by NM EPSCoR scientists.

Outreach plan:

- Climate Change Exhibit at New Mexico Museum of Natural History and Science
- Climate Change Seminar Series
- Science Cafes
- New Mexico First Town Hall Policy Meeting
- Climate Change Web Portal

Diversity plan:

- Place-based 9th grade science curricula for rural Hispanic and Native American communities
- Broadening participation in undergraduate and graduate research opportunities
- Diversity and inclusiveness training for junior faculty
- Science Café series developed specifically for northern New Mexico cultures and peoples

With a minority as majority population, New Mexico has a unique opportunity and special responsibility to provide leadership in addressing the shortage of scientists representative of the nation's growing minority populations.

New Mexico EPSCoR

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