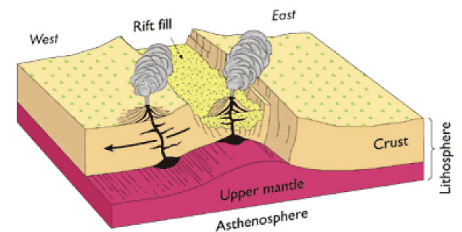


# Rio Grande Rift F.A.Q.

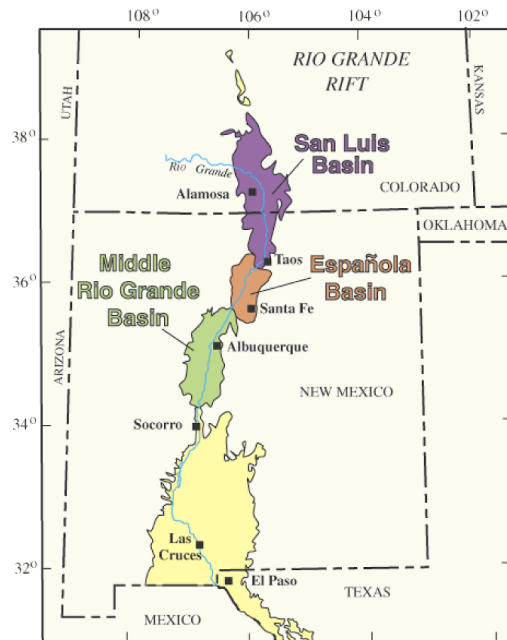
## Measuring Rio Grande Rift Crustal Deformation

### What is the Rio Grande Rift?

A rift is a surface feature characterized by an elongated valley. Rifts are created when Earth's crust stretches and thins. The Rio Grande Rift began forming between 35 and 29 million years ago when Earth's crust began to spread apart, triggering volcanism (volcanic activity) in the region. It runs south to north from the state of Chihuahua, Mexico, to Leadville, Colorado, and perhaps even further north. Rifts like the Rio Grande form basins (topographic depressions) that fill with sediments over millions of years. In Albuquerque, New Mexico, the basin sediments are three miles thick. The Rio Grande Rift continues to widen today very slowly.



The graphic above depicts a cross-section of a rift. Image courtesy of the USGS.



Map of Rio Grande Rift region (above) showing the primary basins of the rift. Image courtesy of the USGS.

### Where are there other rifts in the world?

Most rifts are found along mid-ocean ridges. Only a few are located on land, such as the Rio Grande Rift, East African Rift (sometimes referred to as the Great Rift) and Lake Baikal, a lake-filled rift in Russia. Oceanic rifts are typically found at divergent plate boundaries, where plates are moving apart. In contrast, continental rifts such as the Rio Grande are not located at plate boundaries. These continental rifts form in "extensional tectonic" settings in which Earth's crust thins and weakens due to the rising of hot rock deep below the surface.

### Is there a risk of earthquakes in or around the Rio Grande Rift?

There is geologic evidence that large earthquakes (7.0 to 7.3 magnitude) have occurred in south-central Colorado within the past 5,000 to 15,000 years. Although it is less likely to have large-scale seismic activity than regions such as the San Andreas Fault in California, a large earthquake (7.0 magnitude or larger) will occur in the Rio Grande Rift area at some point in the future. Throughout New Mexico and Colorado as a whole, seismic activity associated with earthquakes is considered to be low to moderate, with a slightly higher risk in and around the rift region.

### Could there be volcanoes around the rift?

Intense volcanism has occurred in the region since the onset of rifting millions of years ago. For example, Valles Caldera near modern-day Los Alamos, New Mexico, is one of the world's largest and youngest calderas. It was created 1.2 million years ago through the collapse of a magma chamber. Geologists consider the volcanic features in the rift region to be dormant, not extinct.

### Did the Rio Grande River create the rift?

No. The Rio Grande Rift was formed by extension of Earth's crust. As basins were formed by rift faulting and crustal thinning, they captured drainages and gradually directed flow along the rift. As water progressively incised (cut through) the weakened rocks, a river formed. The waters of today's Rio Grande River flow from its headwaters in southern Colorado through New Mexico, following the pre-established rift valley before turning east along what is now the border of the United States and Mexico, and then into the Gulf of Mexico.



Rio Grande River near Taos, New Mexico. Image courtesy of the Bureau of Land Management.

## How are scientists studying the Rio Grande Rift?

Since the movements of the rift are small and slow (between 0.5 and 2 millimeters per year) scientists are testing a new technology to see whether it can tell them more about the rift.

A team of scientists from the University of Colorado and the University of New Mexico, with funding from the National Science Foundation's EarthScope Program, are collecting data on how much the Rio Grande Rift is moving by setting global positioning systems (GPS) in a grid system that runs from the central Colorado Rockies into southern New Mexico. The team is seeking to determine whether GPS instruments, which rely on satellites for their measurements, can accurately measure the miniscule movements of the Rio Grande Rift.

Questions addressed by this research include:

- What seismic hazard does the Rio Grande Rift pose?
- How wide is the rift, and how does the amount and rate of deformation vary along the rift from north to south?
- How far north has the Rio Grande Rift propagated? (How far north does crustal extension associated with the Rio Grande Rift occur?)

## How can I become involved?

The scientists involved with the project are now in the process of identifying sites for the GPS stations. If you live or go to school in Colorado or New Mexico near one of the dashed circles on the map to the right, you may be able to help identify sites that have (1) bedrock exposed at the surface (the kind that rings when struck with a hammer) and (2) no sky obstructions due to vegetation or other barriers.

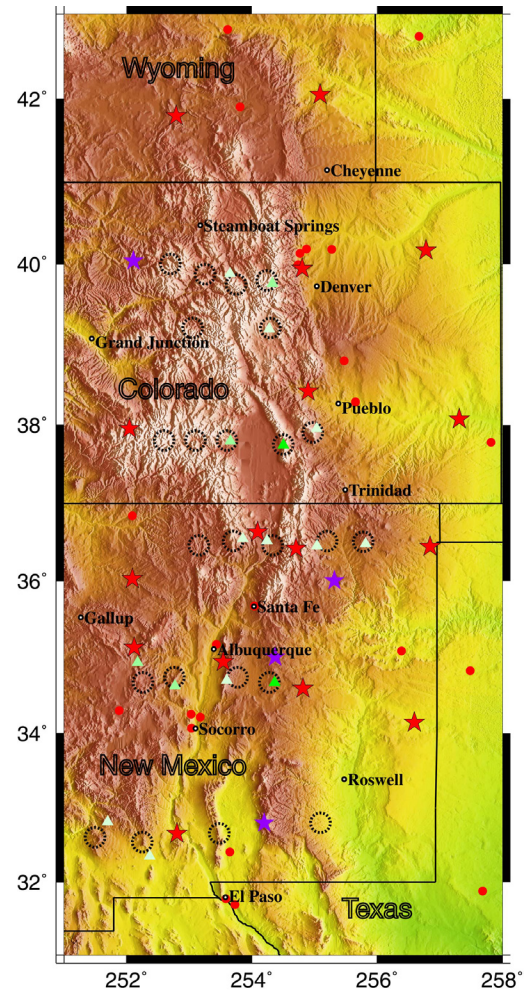
The location shown can change by up to 10 miles. If you or someone you know owns property near a target location and might be willing to host a GPS site, OR If you know of a locality on public lands that might suit our purpose, please call 505-277-2580 for suggestions of sites in New Mexico or email [mroy@unm.edu](mailto:mroy@unm.edu). In Colorado, call 303-492-5141 or email [arlowry@abdu.colorado.edu](mailto:arlowry@abdu.colorado.edu). For an education kit about rifts in general and the Rio Grande Rift in particular, contact [mark.mccaffrey@colorado.edu](mailto:mark.mccaffrey@colorado.edu).



Installed GPS station. Photo courtesy of UNAVCO.



EarthScope is funded by the National Science Foundation and conducted in partnership with the US Geological Survey. EarthScope is being constructed, operated, and maintained as a collaborative effort with UNAVCO Inc., the Incorporated Research Institutions for Seismology, and Stanford University, with contributions from NASA and several other national and international organizations. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



Proposed locations for Rio Grande Rift GPS project are shown as dashed circles, and reconnected site locations are shown as green triangles. Plate Boundary Observatory stations are shown as stars. Purple stars are installed, red stars are planned. Locations of other GPS networks are shown as circles.

## What will each GPS station look like?

The stations will have a steel tripod structure that will be drilled into bedrock and will support a GPS antenna. There will also be a steel box to house electronics and a small bank of solar panels.

## How will data be collected?

A member of the project team will visit each station every three to six months (after the landowners have been notified) to download data and service the equipment. The stations will be operational about six years (until 2010 or 2011).

**Learn More About the Rio Grande Rift Project**  
<http://cires.colorado.edu/science/groups/sheehan/projects/riogrande/>

[www.earthscope.org](http://www.earthscope.org)