

The background of the slide is a topographic map of the Earth, showing landmasses in green and brown and oceans in blue. The EarthScope Project logo is centered at the top. It features the word "earth" in a white serif font, "scope" in a larger white serif font with a small globe icon inside the letter 'o', and the word "PROJECT" in a smaller, spaced-out, orange sans-serif font below it.

earth scope PROJECT

EarthScope: Educational programming in Museums ... “Science Cafes”

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New Mexico Museum of Natural History and Science



Acknowledgements

EarthScope is funded by the National Science Foundation and conducted in partnership with the U.S. Geological Survey.

EarthScope is constructed, operated, and maintained with UNAVCO, Inc., IRIS, and Stanford University, with contributions from NASA and several other national and international organizations.

New Mexico Museum of Natural History and Science and partners:
New Mexico State Library, KNME, New Mexico Tech, U.S.G.S. and UNM
Statewide Science Café model funded by an E&O grant from IRIS,
courtesy of John Taber, E&O Program Manager.

Teacher Workshop funded and presented by UNAVCO and IRIS



science for a changing world





Why EarthScope?

Geoliteracy

- Geology and geophysics are frequently perceived as “difficult to understand” by the general public
- BUT - geologic landscapes are popular tourist attractions
- AND - there is great interest in earthquakes, volcanoes, mountains, and natural resources
- AND in local connections and newsworthy programs and projects
- Therefore, the EarthScope Project is a perfect opportunity to excite and educate the general public about the geosciences



Museum Public “Explorations” Programs



Geoliteracy

How does the public learn about geological research and geoscience topics? About EarthScope?

- Universities?
- Web sites?
- News media?
- Special publications?
- Local museums, state parks, science centers, nature/education centers, NPS parks and monuments?



Museum education poster uses landscape to teach geology



Museum/NPS video and public field trips





Our Advantage

Informal science education centers serve a wide and diverse audience.

- **Graphics/display expertise**
- **Accessible, visitor-friendly and non-threatening**
- **Pre-K through Senior Citizen**
- **Underrepresented populations**
- **Flexibility in approach**
- **Abstract or theoretical concepts linked to object-based learning**
- **Community resource for science information**
- **Link to local scientists and sites**



**NM Museum of Natural History
serves 38% Hispanic
9% Native American**



**Visitors explore seismicity in our earthquake exhibit
Designed in-house, funded by IRIS, partners ASL and NMTech**



Why EarthScope?

Scientific Mission...

- Exploration of the North American Continent
- More than a decade-long national geoscience program
- The largest real-time Earth Science scientific experiment ever!





Why EarthScope?

Our Laboratory...

- Plate Boundary Processes - large scale
- Individual regions, volcanoes, faults, old mountains - small scale
- Diversity of the U.S. Continent...local and regional link





EarthScope - Challenges especially in informal/public programming

- Large-scale, long-term project
 - Maps and structural graphics
 - 3D and 4D visualization
 - Integration across disciplines
 - Integration of many data sets
 - Many scientific “languages”
 - Old crustal terranes and plate boundaries
 - Connection between surface and subsurface
- ...Exciting Science...Difficult Science Education...





Why EarthScope?

Scientific Literacy

People are interested - but they do not always understand...

- what it takes to do science
- why we do it
- how to interpret the data
- what we ultimately learn.

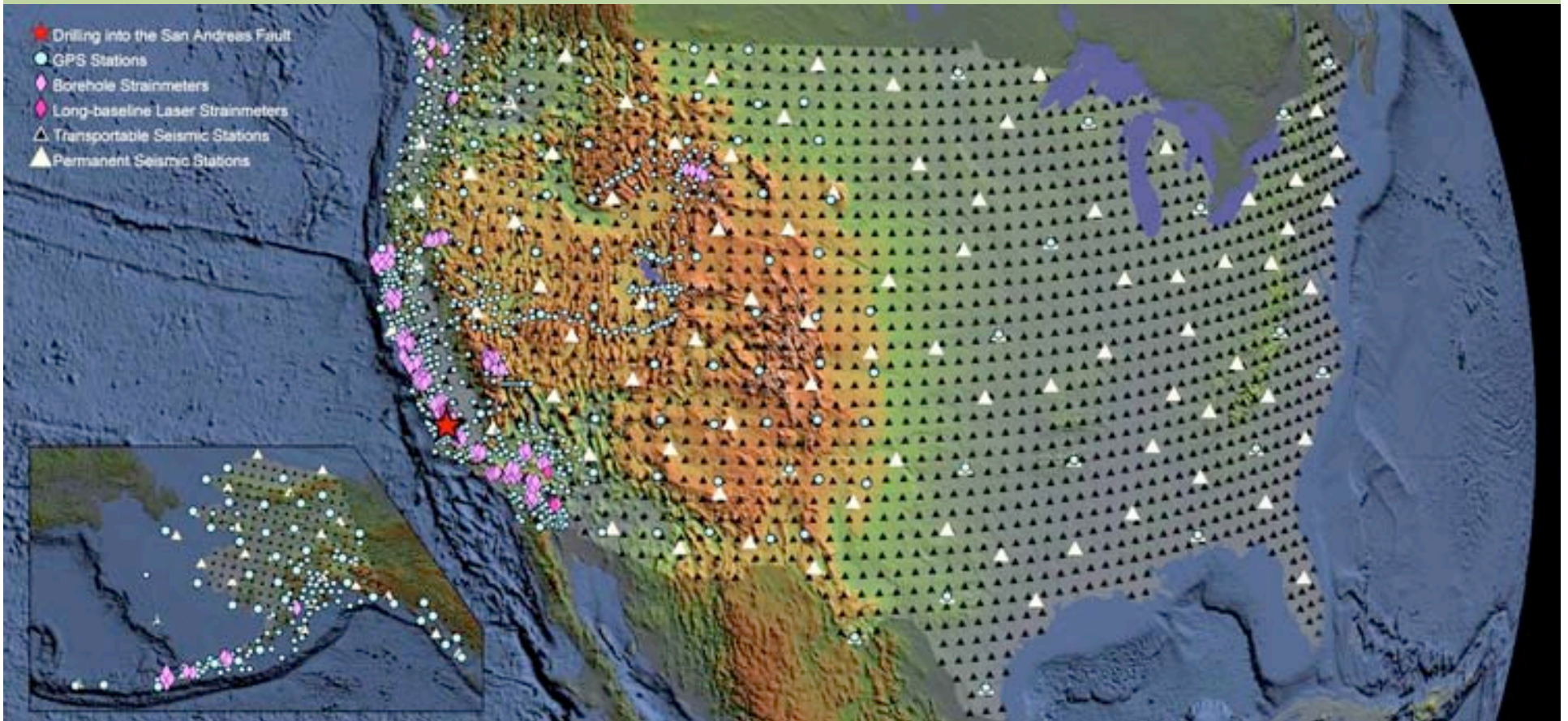
EarthScope can illustrate the “process of science”!





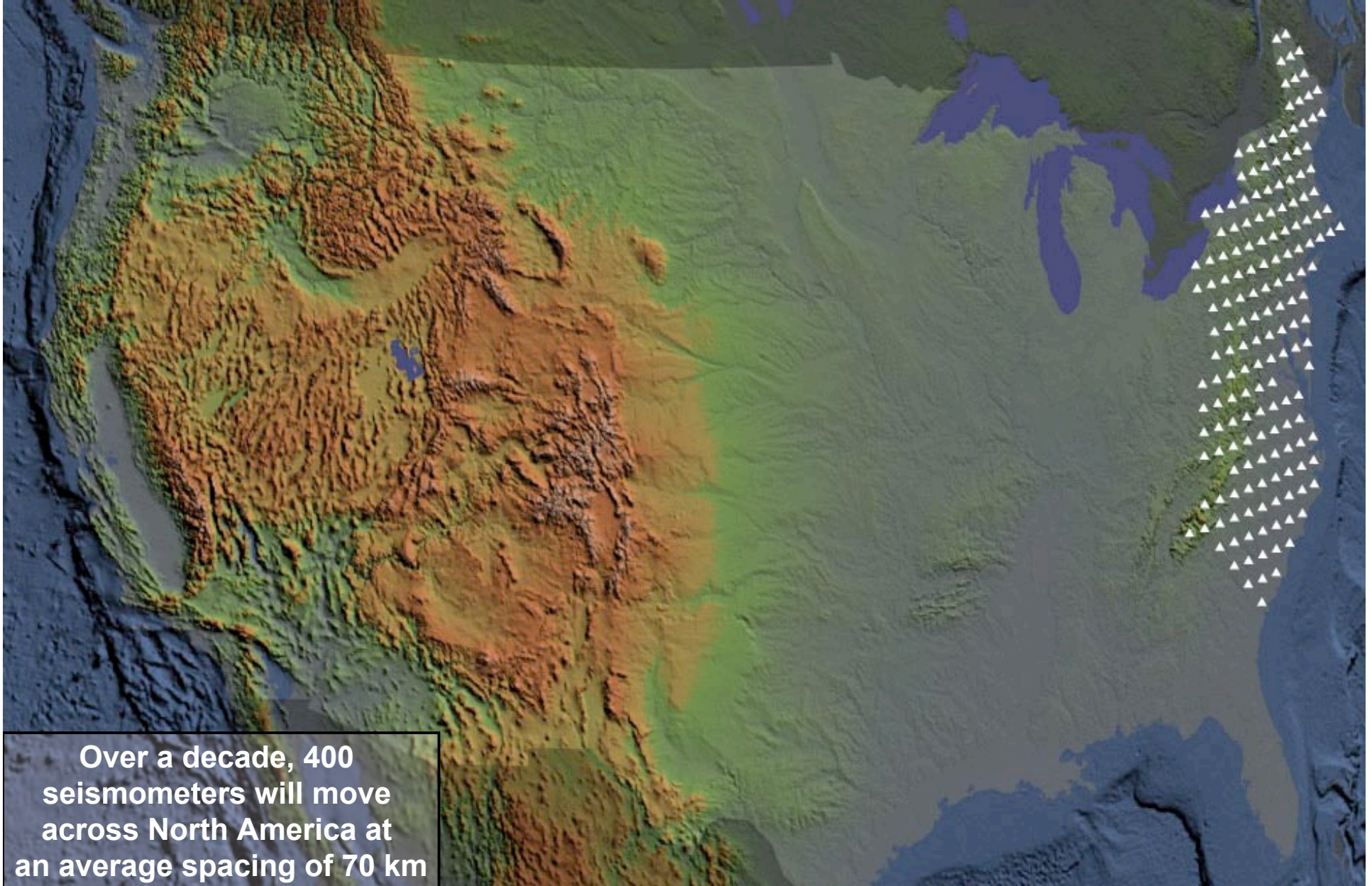
EarthScope Instrumentation

- San Andreas Fault
- GPS stations
- Seismic stations
- strainmeters
- 400 transportable seismic stations occupying 2000 sites
- Each in place for 18 months
- USArray (Transportable array)
- Installed and operated by USArray/IRIS





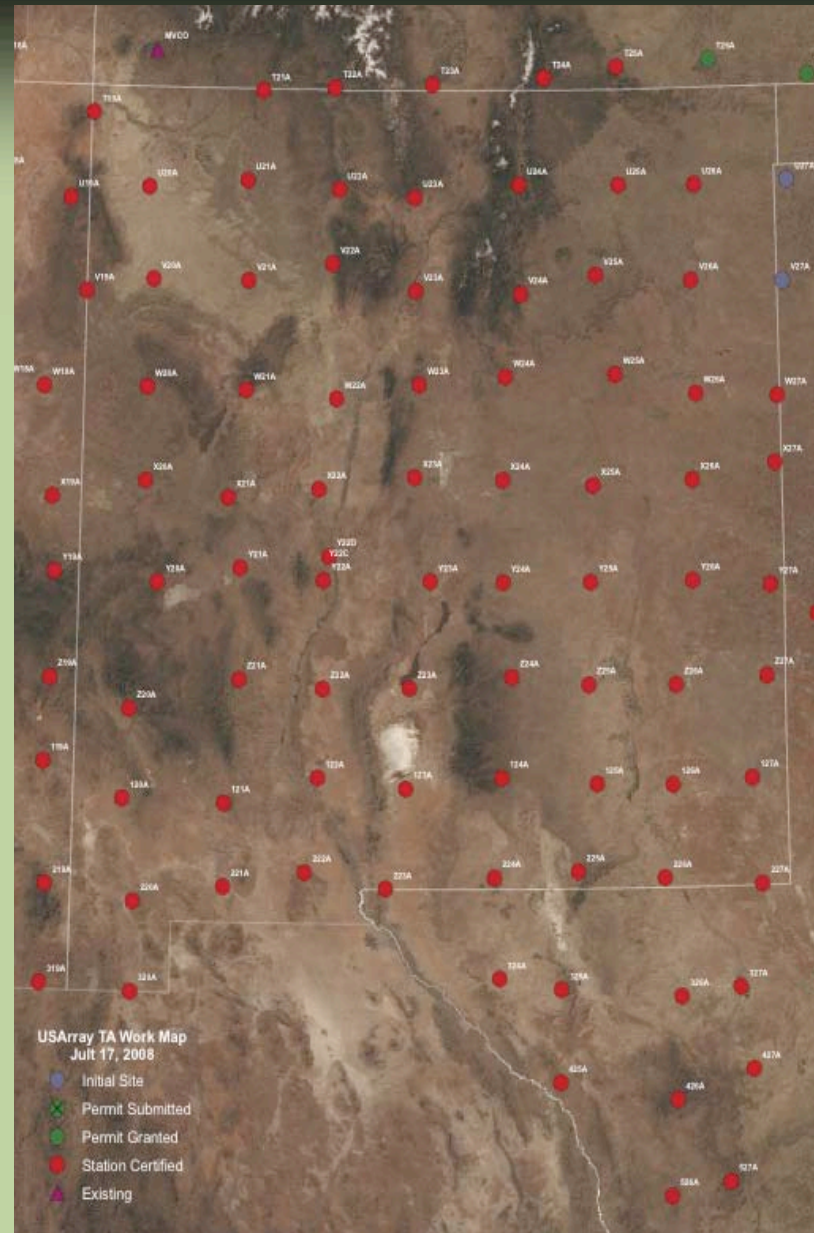
National project with local impact



Over a decade, 400 seismometers will move across North America at an average spacing of 70 km



USArray in New Mexico





Research on Learning in Museums...

- **Self-selected audience**
... but also self-directed
- **Family/group learning**
- **Multi-generational**
- **Visitor circulation/wayfinding**
...10 minutes per exhibit
...30 min - 2 hrs
- **Not a captive audience**
- **Repeat visits**
- **Object-based**
- **Experiential**
- **On-site and off-site**





Exhibits

- Research on learning and movement through public spaces
- Collaboration between scientists, educators, exhibit designers, fabricators, and graphic artists
- Front end, formative and summative evaluation
- Bright graphics and clear examples
- Experiential
- Text scientifically accurate but non-threatening and easy to read
- Layered text - newspaper headlines/story vs textbook



Interactive Mars Rover exhibit



Walk-through volcano



Ice Age mammoth



Museum Exhibits

•Permanent Exhibits

Quaking Earth in partnership with IRIS
(Incorporated Research Institutions for Seismology)



“Make your own earthquake”



Quaking Earth



Walk-through Volcano



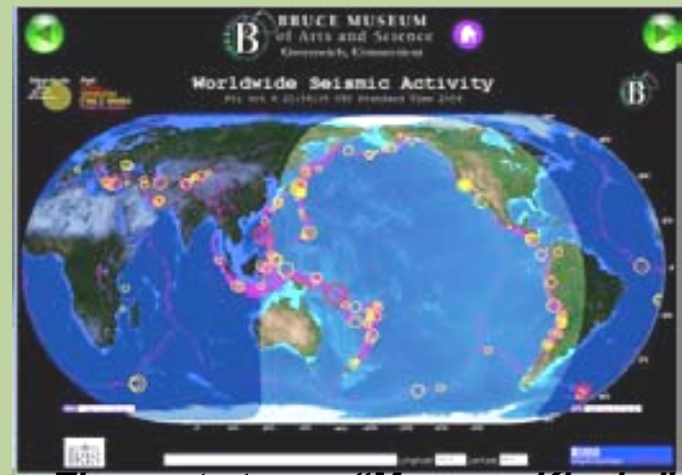
Traveling Earthquake Exhibits

IRIS Traveling Exhibit

- Many visitors are repeat visitors - museums and science centers are always looking for good short-term exhibits
- Successful IRIS traveling exhibit developed with partners USGS and New Mexico Museum of Natural History
- Exhibited at museums nationwide beginning in 1998
- Seen by more than 5 million visitors as of 2006



IRIS traveling exhibit built by this museum and seen by millions



The next step.... "Museum Kiosks"



Targeted Programs...

- Family Days
- Teacher Workshops
- School outreach
- Adult Lectures/classes





For K-12 Teachers, Museums offer...

- A resource for geoscience information
- Ways to link their students to “real world” science
- Professional development workshops
- Grade appropriate curricula for their students



■
**Museum workshops
and field trips for K-12
teachers**





Teacher Professional Development Workshop Middle - High School Earth and Physical Science Albuquerque, NM



Funded/supported
by IRIS and UNAVCO



35 teachers
SF Indian School
Isleta
Laguna-Acoma
Belen
Ruidoso



National and State Education Standards

New Mexico Museum of Natural History and Science



Regional and local EarthScope research

Jayne Aubele



The New Mexico Connection



USArray in New Mexico





The New Mexico Connection



**Albuquerque Seismological Laboratory
...one of the global seismic network stations!**



EarthScope - New Mexico



Did you know?

**The EarthScope USArray
Operations Facility for the U.S.
is in New Mexico at NM Tech**



Science Café



Informal science for the community
...a little information
...a face-to-face meeting with an expert
...food
...the opportunity for discussion

In partnership with our local PBS station

earth scope

Taking the Earth's Pulse

A science café about the Earthquakes & Volcanoes of New Mexico – and the Planet Beneath Our Feet

FREE

NEW MEXICO MUSEUM OF NATURAL HISTORY & SCIENCE
1801 Mountain Road
Albuquerque, NM
Saturday, August 16
10 am – noon

- Special Guest Scientist
- Refreshments

505-841-2872
more info visit: www.nmnmuseum.org

Presented by the New Mexico Museum of Natural History & Science and the New Mexico State Library

EarthScope for local communities



The Science Café Model

- Funding by a grant from IRIS E&O
- Aztec, Raton, Clovis, Deming and Albuquerque
- Partners: NM State Library and local libraries, KNME-TV, Sandia National Labs, IRIS/Passcal Center and USArray, ASL, NM Tech, and UNM (local research scientists)
- Guests: Rick Aster, Laura Crossey, Karl Karlstrom, John Geissman, and ASL staff





The Science Café Model

- Intro to EarthScope and brief discussion of relevant local geology
- Presentation on EarthScope research
- Extensive Q&A
- Hands-on activities
- Posters and material give-aways
- Food provided locally
- Door prize drawings





Science Café

Raton, NM
Arthur Johnson Memorial Library
48 participants



***“turnout for the event was
beyond expectations”***





Science Café

Clovis, NM
Clovis Carver Public Library
62 participants



"better than anything else we have done for adults"





Science Café



Aztec, NM
Aztec Public Library
122 participants



***“knowledgeable presenters and
great publicity and posters”***





Science Café



**Deming, NM
Marshall Memorial Library
90 participants**

***“our patrons raved about it,
EarthScope was the best
presentation we ever had”***





The Science Café Model

Overview and Assessment

- IRIS - funding
- Museum - staff time (3 months) and vehicle (2000 miles)
- Partnerships
- Logistics
- Museum provided a complete program
- Local libraries - generate local connection and increase attendance
- ES researchers - able to present their work and connect to the public
- Funds for local advertising, site-specific brochures and locally purchased food
- Professionally developed marketing
- Posters as a continuing teaching tool



VOLCANO TYPES of New Mexico

Volcano Type	Simple Drawing/Section	New Mexico Example	How and Why It Erupts
caldera (super volcano)			Calderas are formed when a volcano erupts and the magma chamber empties, causing the ground to collapse. They are the largest and most powerful type of volcano.
dome			Dome volcanoes are formed by the accumulation of thick, sticky lava flows that build up around the vent.
composite			Composite volcanoes are built up from alternating layers of lava and ash, making them highly explosive.
cinder cone			Cinder cones are built from loose fragments of lava that are ejected from the vent and fall back to the ground.
shield			Shield volcanoes are built from fluid lava flows that spread out in all directions, creating a broad, shield-like shape.
lava flow			Lava flows are formed by the movement of molten lava from the vent to the surrounding landscape.
maar			Maars are formed by the explosion of a magma chamber, creating a wide, shallow crater.
volcanic neck			Volcanic necks are formed by the accumulation of lava flows around a central vent.
field of small cones (volcanic field)			Volcanic fields are formed by the eruption of many small cones in a single area.

New Mexico Museum of Natural History and Science
Imágenes de la historia natural

Earthquakes In New Mexico

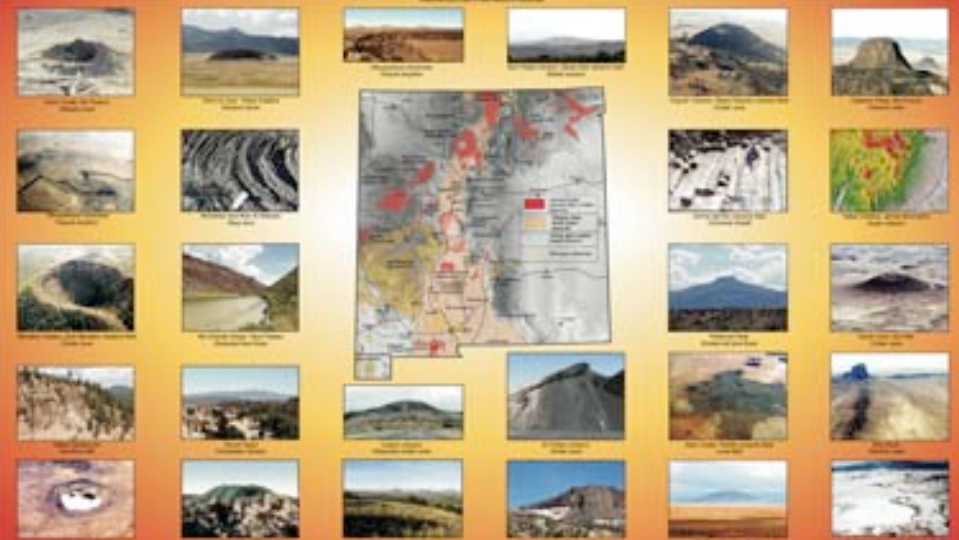


Discover New Mexico's VOLCANOES!



New Mexico Museum of Natural History and Science
Imágenes de la historia natural, No. 5

NEW MEXICO Land of VOLCANOES



New Mexico Museum of Natural History and Science
Imágenes de la historia natural, No. 2



The Science Café Model

EarthScope Expenses

Printing

Professional Services

Materials

Food for participants @ cafes

Marketing (ads in local newspapers for each cafe)

Mailing (brochures & posters to libraries/participants)

Travel for Museum coordinators

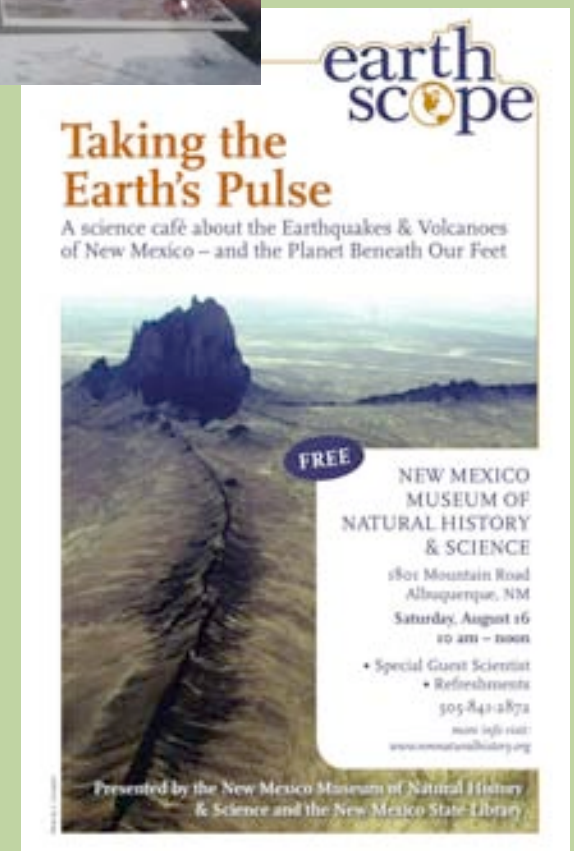
Salary for Museum logistics assistant (part time)

Travel for EarthScope guest presenters

Stipends for EarthScope guest presenters

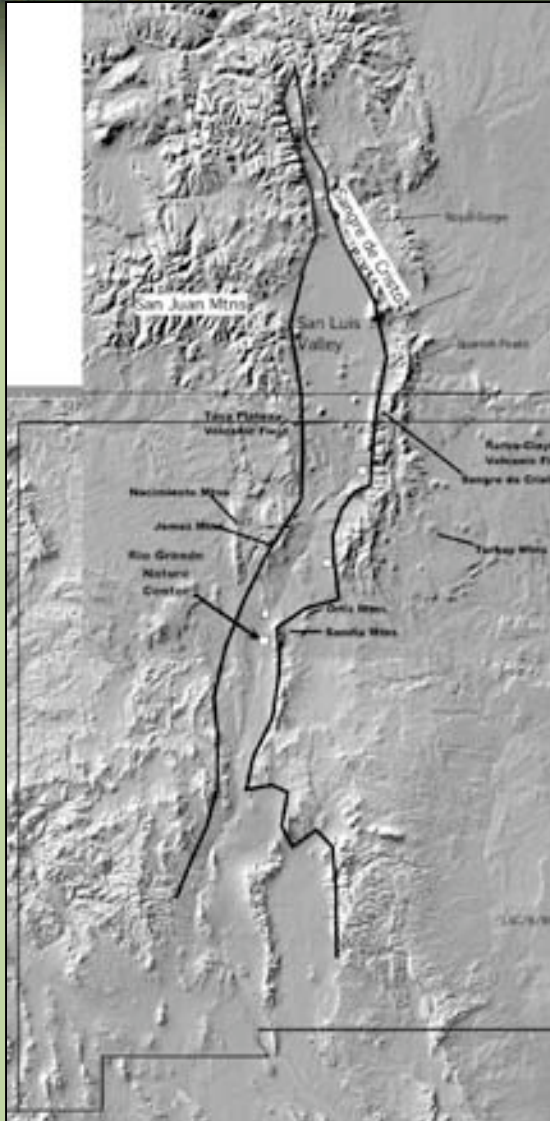
Results

- Total café attendance: 402
- Library staff: 34
- Local newspaper stories in Raton Range, Trinidad Chronicle News, and Deming Headlight





Revealing New Mexico's Secrets!

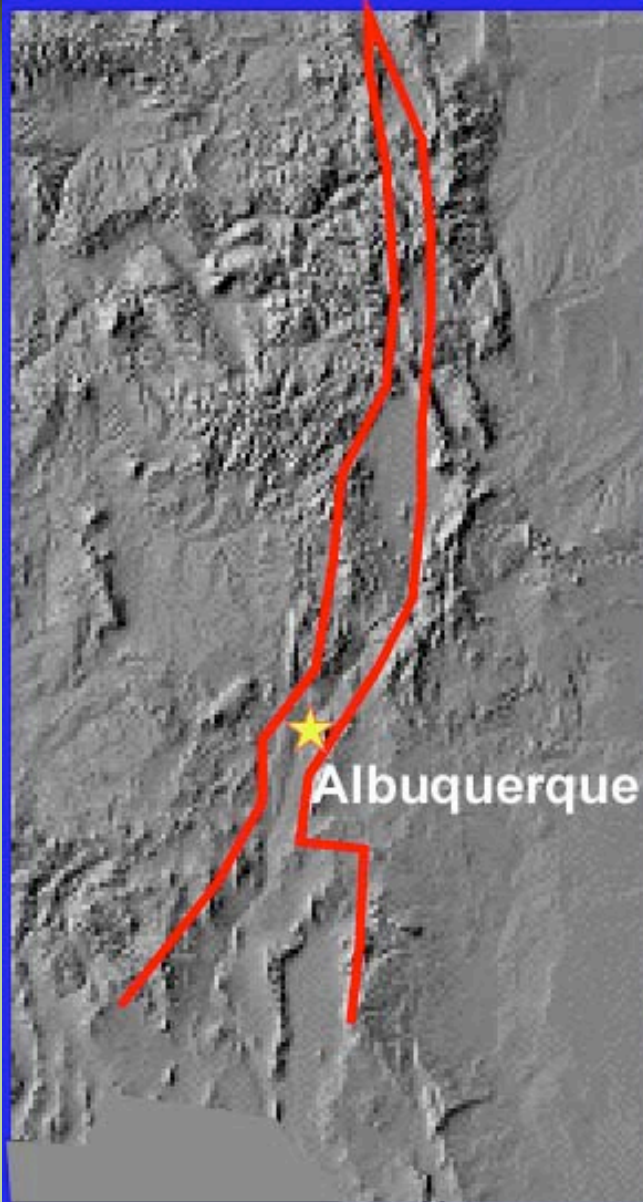


Recently active volcanoes and large earthquakes

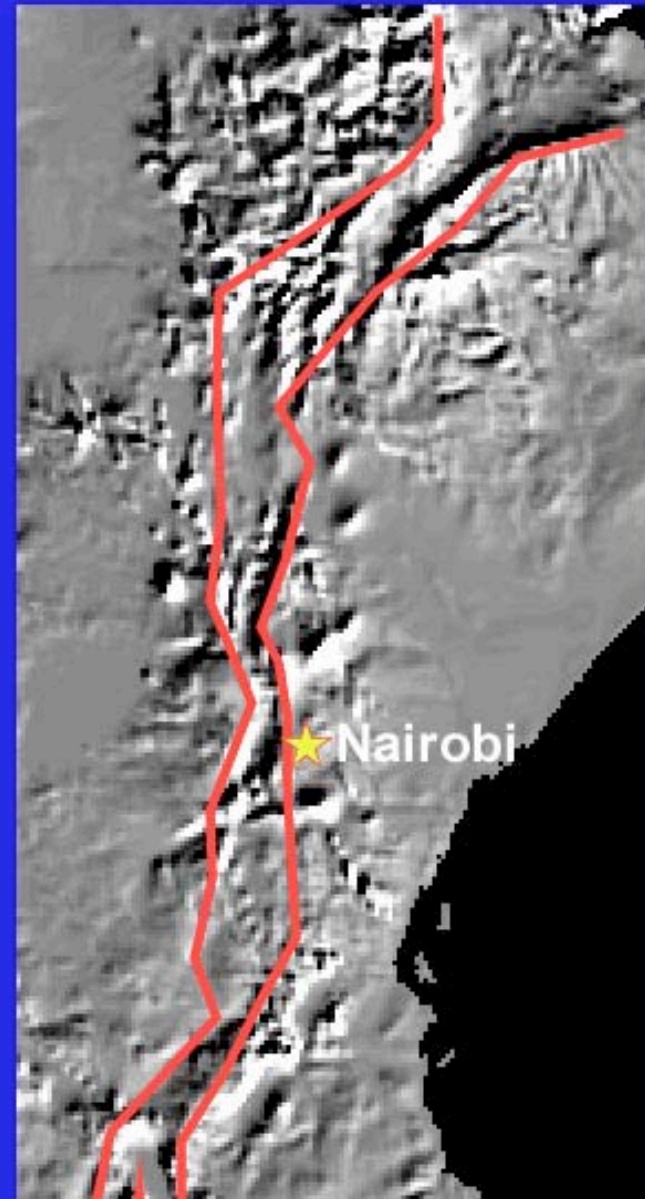


How are the landscape and geology of New Mexico linked?

Rio Grande rift

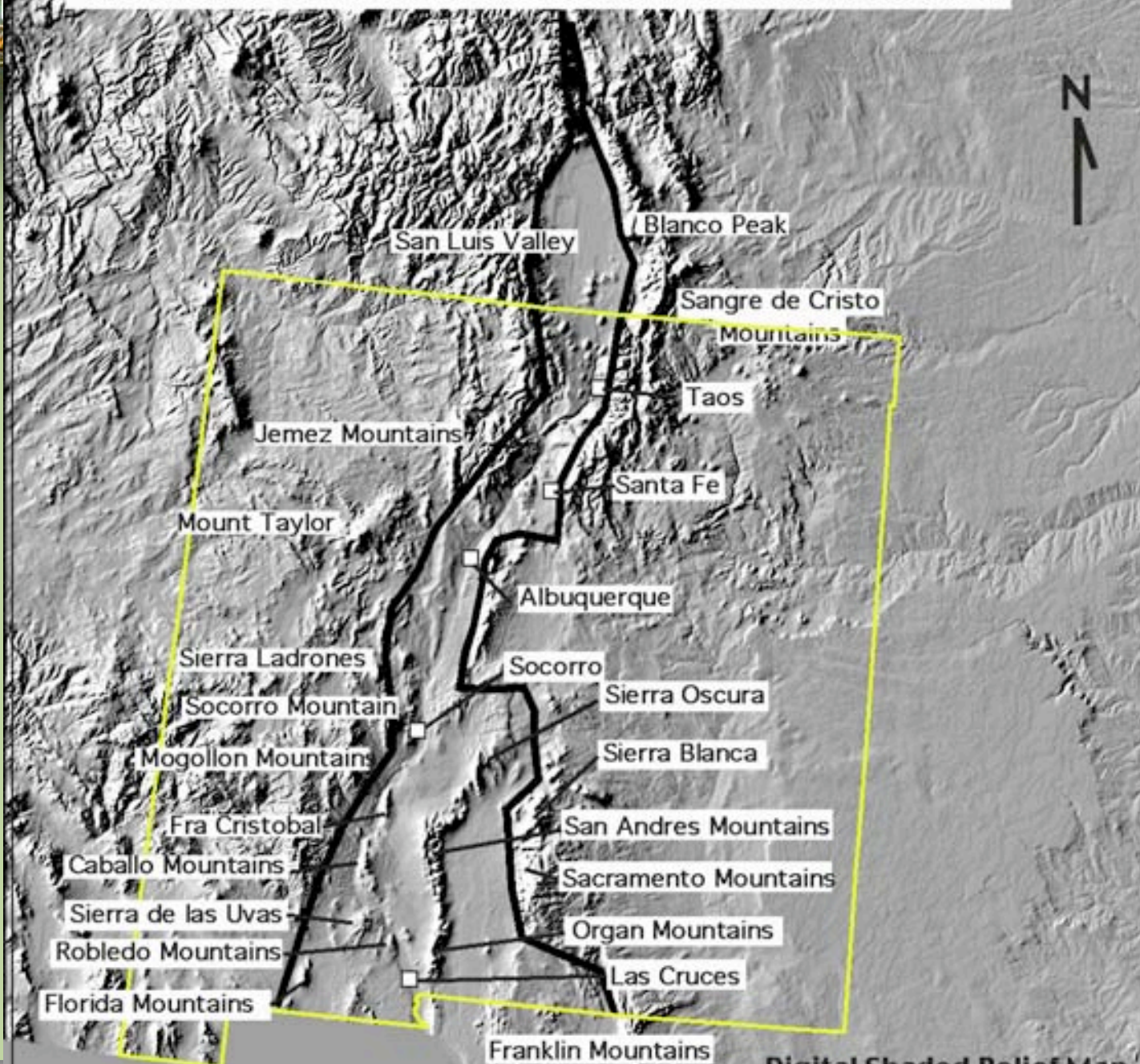


East African rift



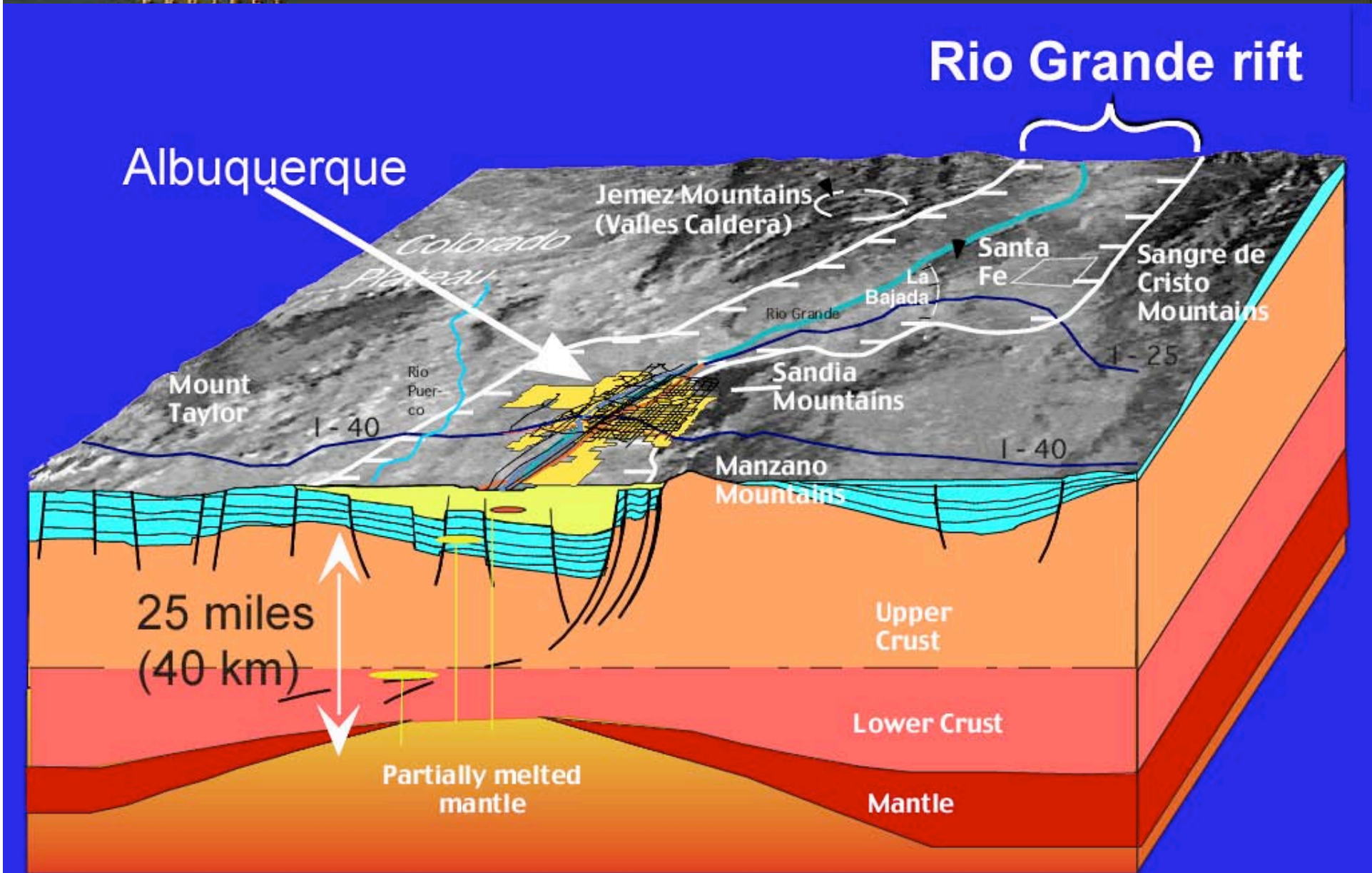


Rio Grande Rift: Colorado to Southern New Mexico





Albuquerque: City in a Rift Valley



Albuquerque: City in a Rift Valley

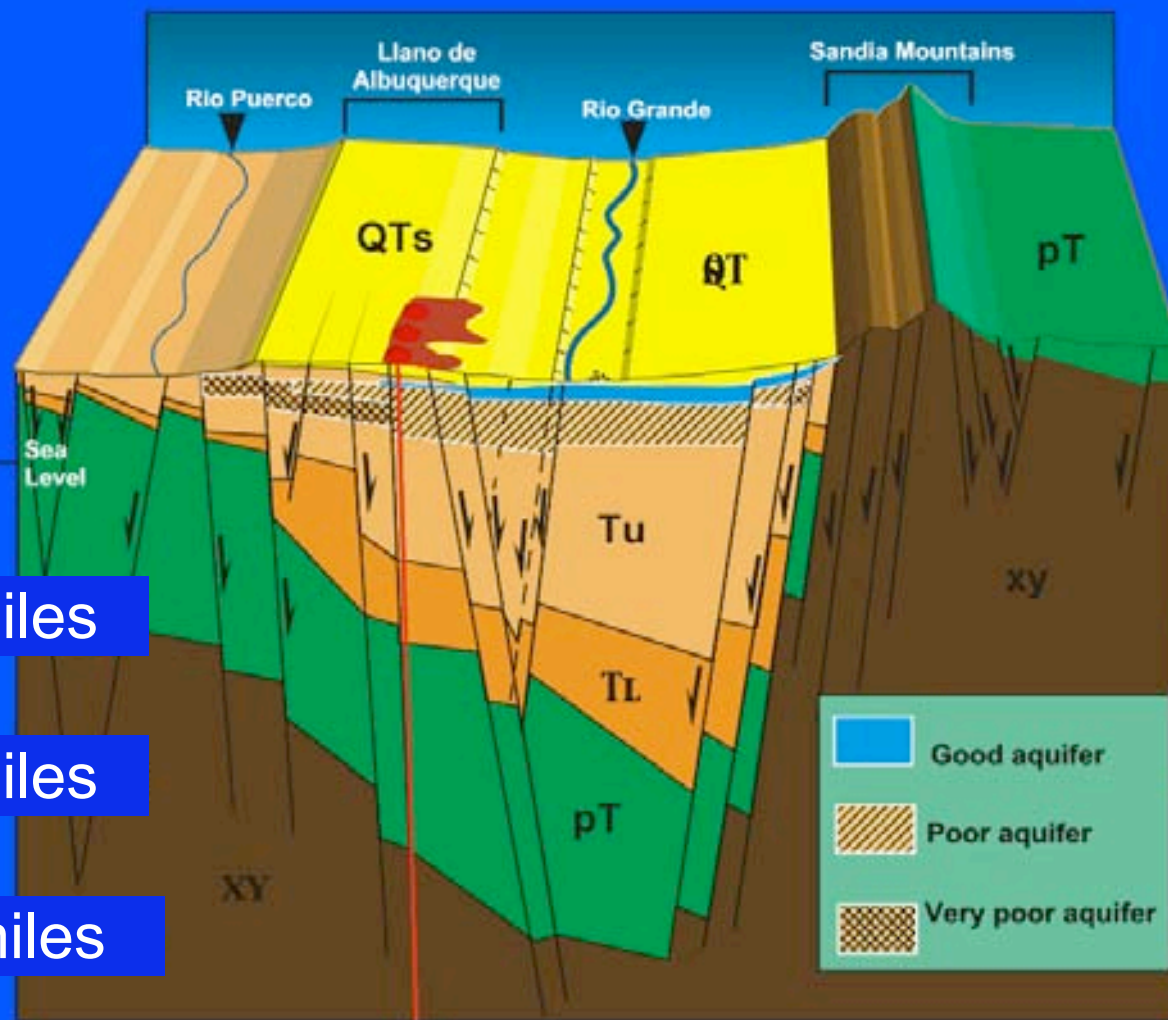
West

East

2 miles

4 miles

6 miles



xy
Proterozoic
crystalline rocks

pT
pre-Tertiary
sedimentary
rocks

TL
lower Tertiary
sediments

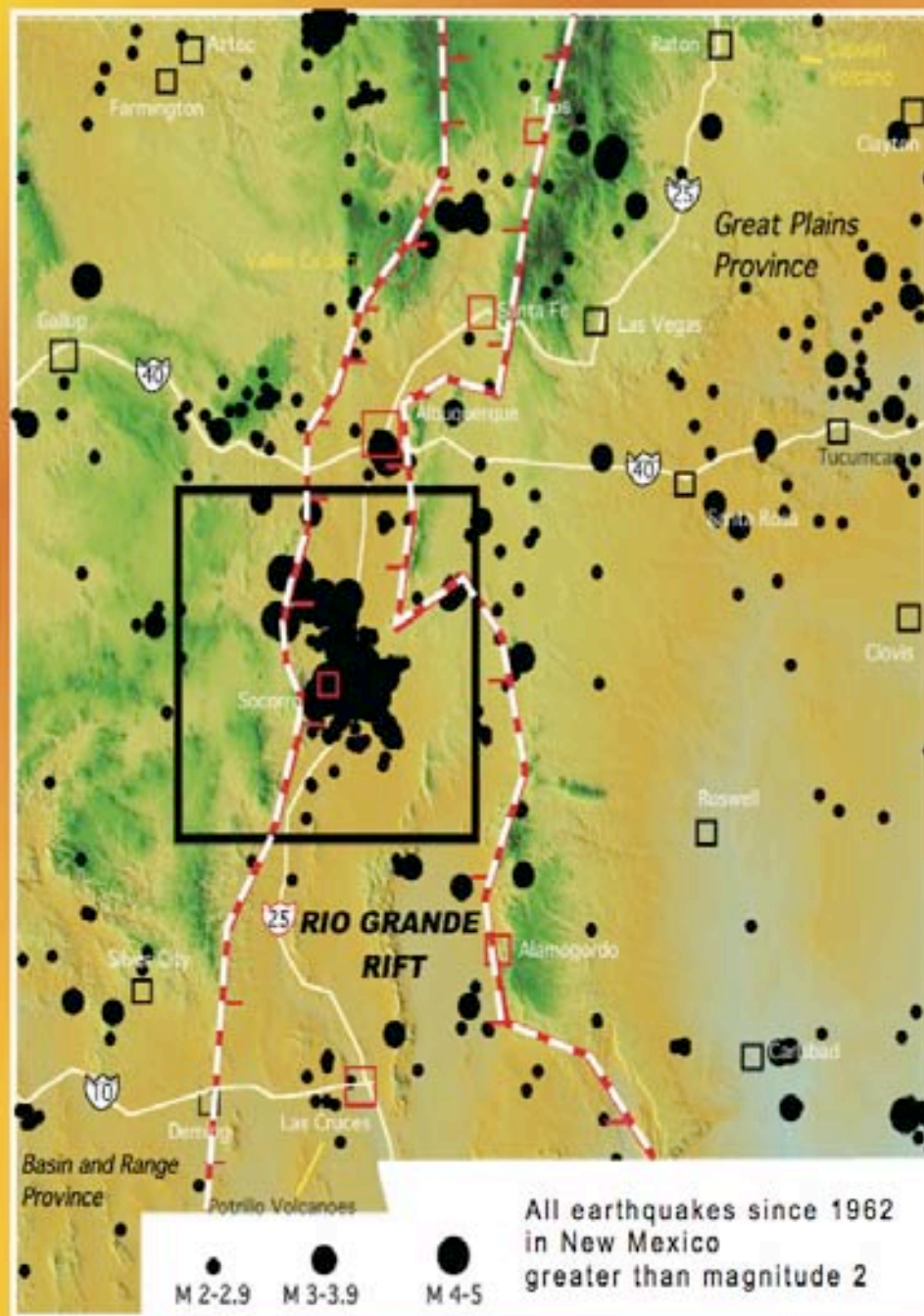
Tu
upper Tertiary
sediments

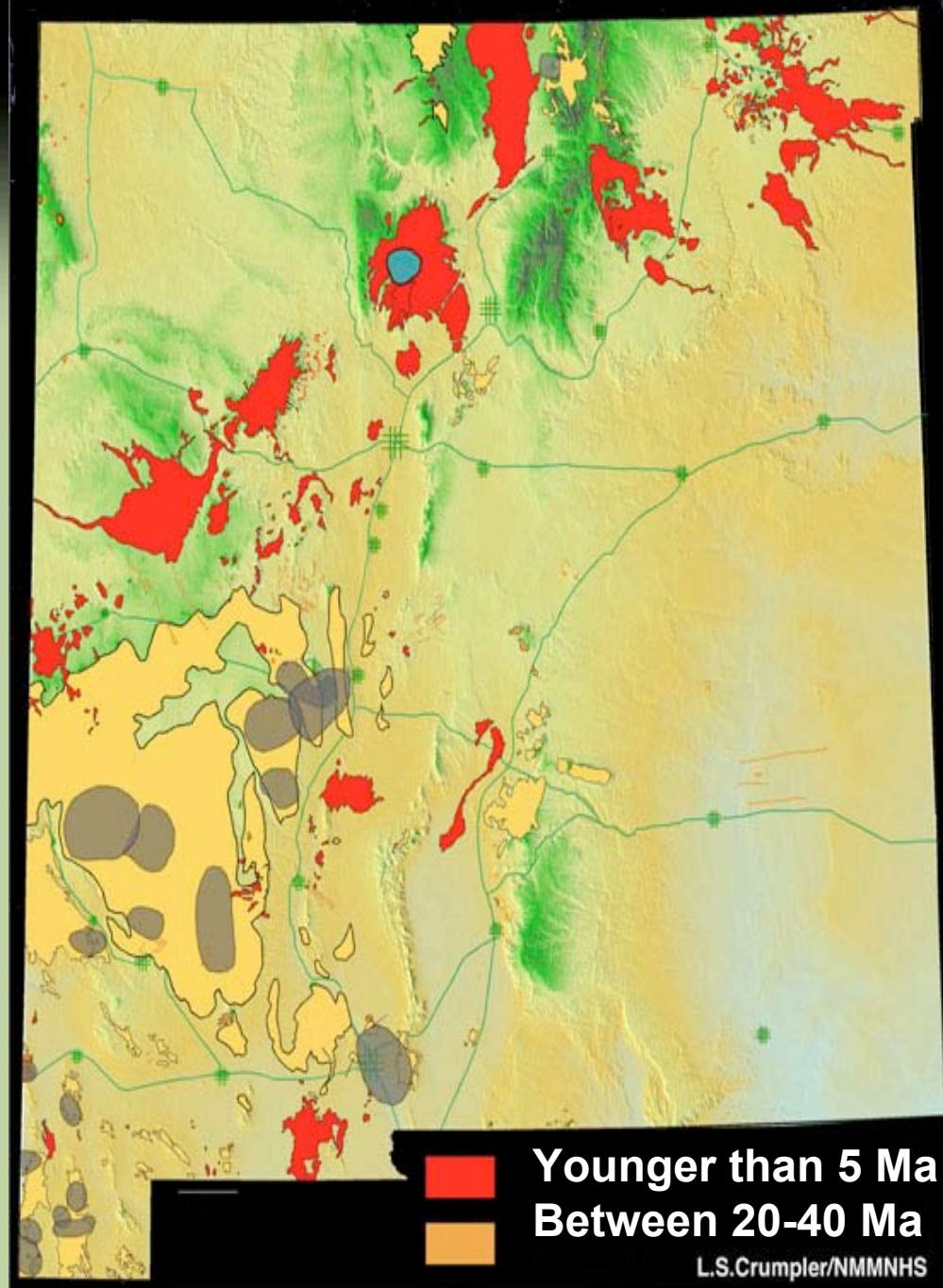
QTs
Tertiary-Quaternary
sediments



Center of the Rift- Albuquerque Volcanoes





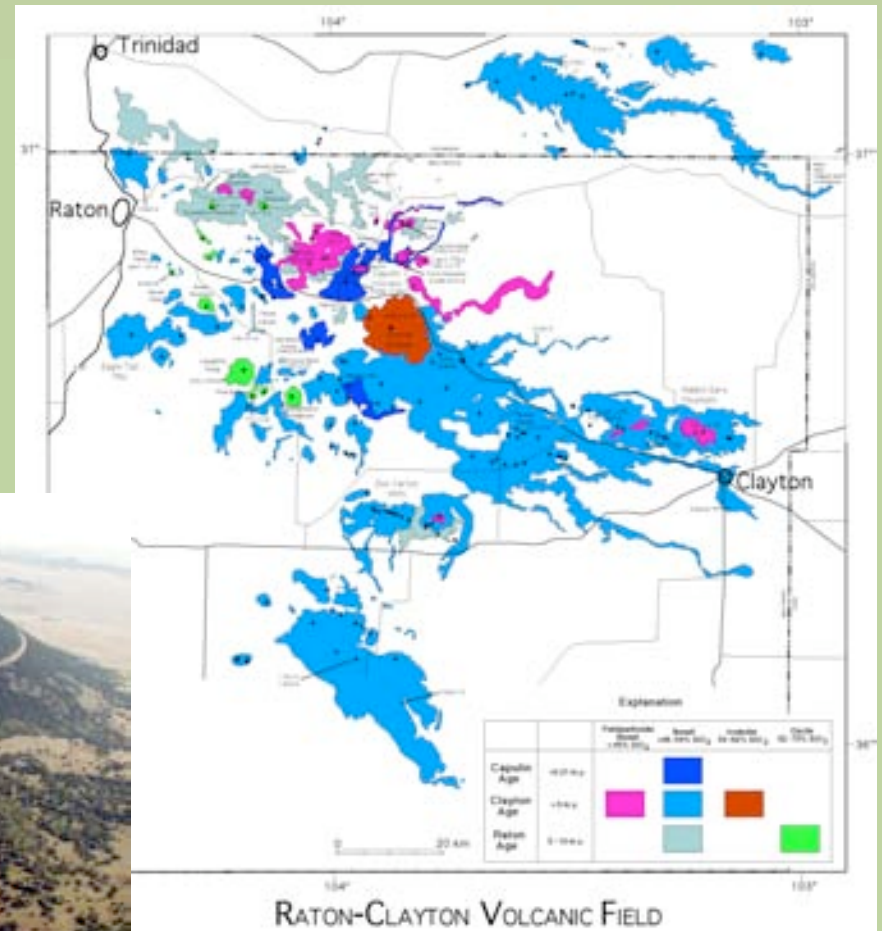
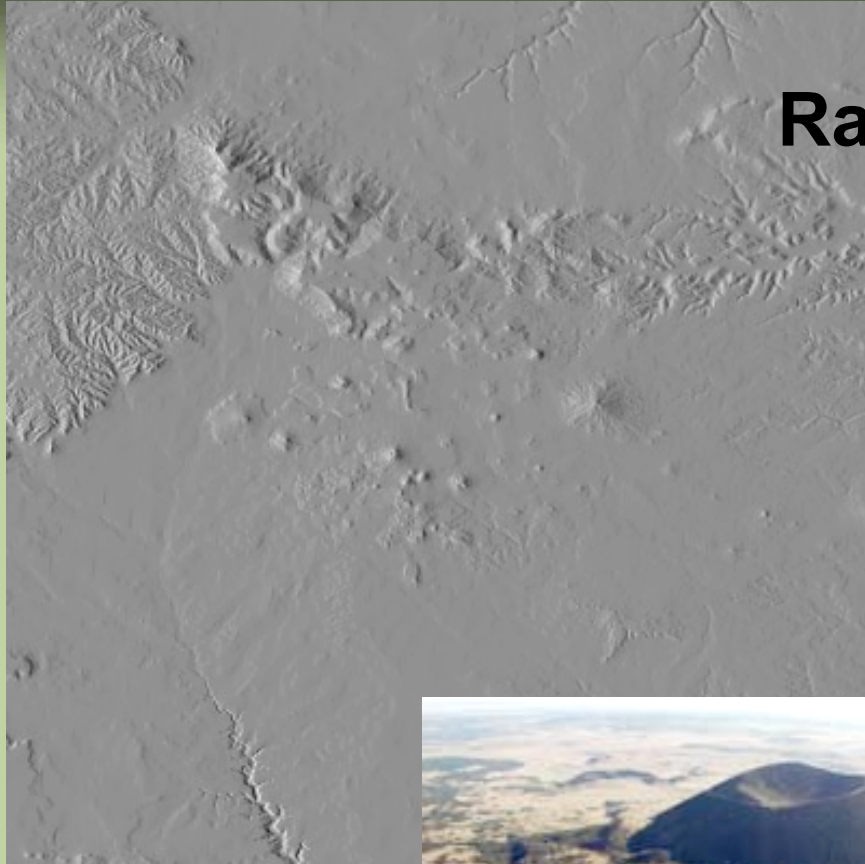




Volcano Type	Simple Drawing/Section	New Mexico Example
caldera (super volcano)		
dome		
composite		
cinder (scoria) cone		
shield		
lava flow		
maar		
volcanic neck		
field of small cones (volcanic field)		

**New Mexico:
A Museum of
Volcanoes**

Raton-Clayton Volcanic Field



Great Plains (NE High Plains)

Mesozoic Rocks, flat-layered
Capped by Tertiary sedimentary rocks
And Quaternary volcanism



Near Tucumcari, NM



Capulin Volcano National Monument

Colorado Plateau



Near Grants, NM

Mesozoic Rocks, flat-layered
"Layer-cake" geology
Eroded mesas
Old volcanoes
Classic southwest scenery



Shiprock



Bisti Badlands



Great Plains (SE Llano Estacado)



Blackwater Draw / Portales

**Paleozoic
Rocks...
flat-lying..
capped by
Tertiary
sediments**



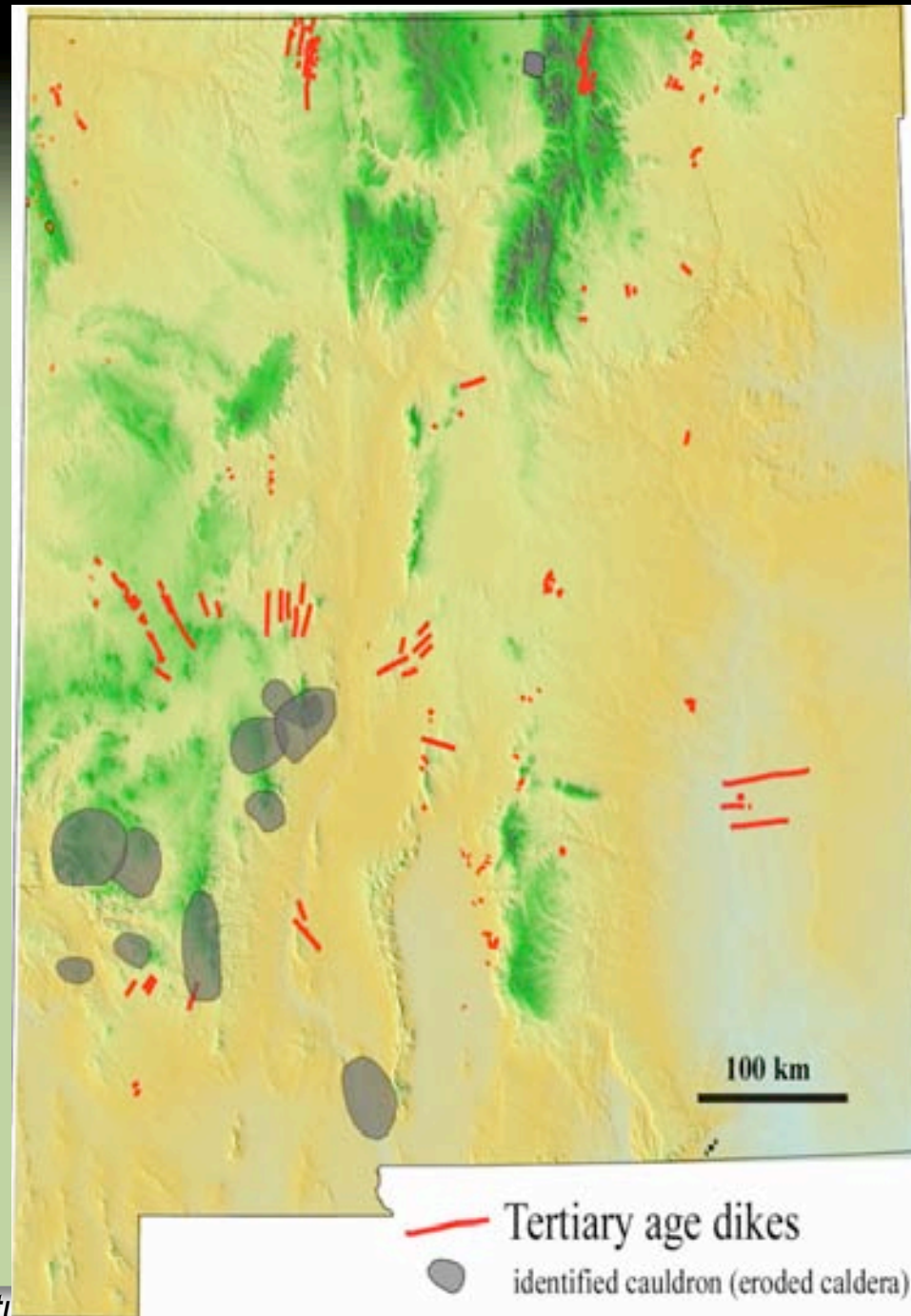
Guadalupe Mts.

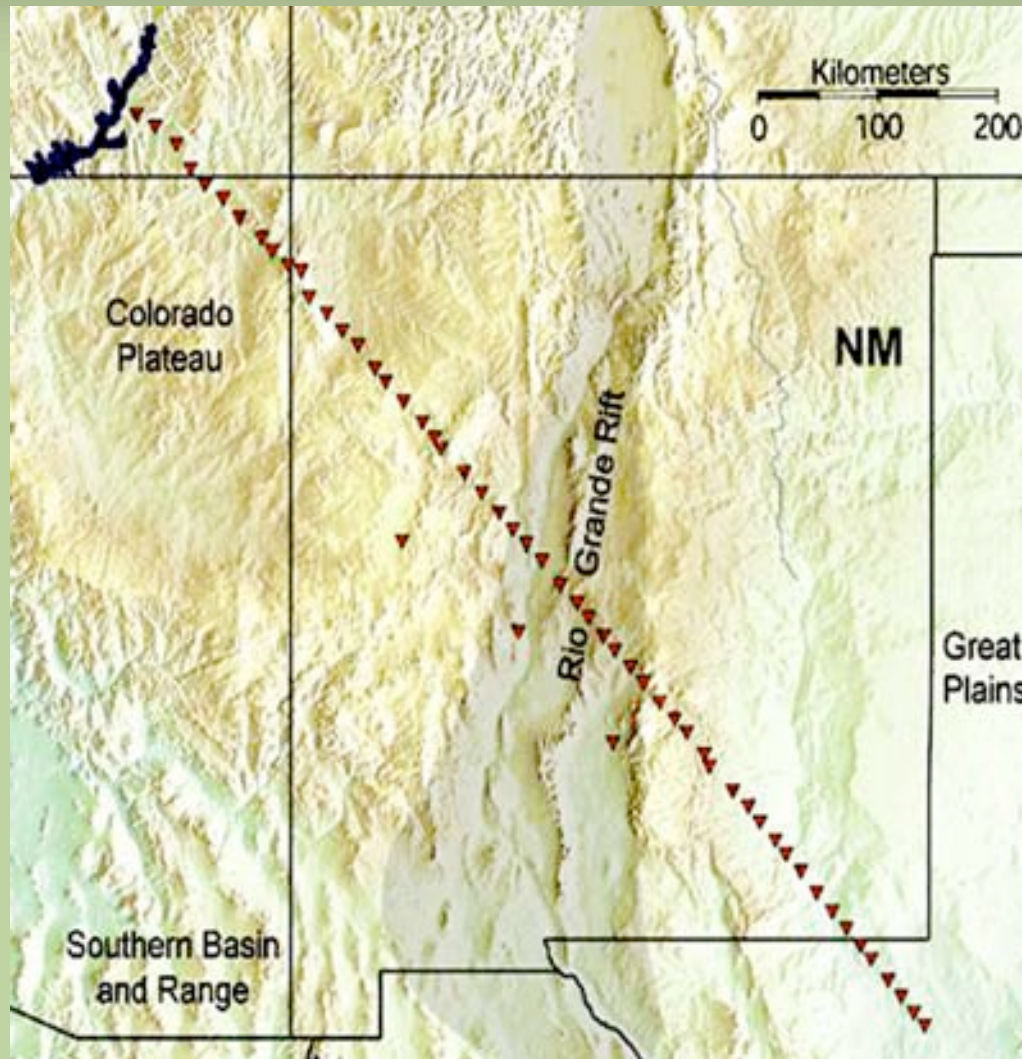


Sinkholes near Roswell and Santa Rosa



Carlsbad Caverns





RISTRA Project

Mogollon Highlands (Datil, Black, Burro, Socorro Mts.)



Mogollon Mts.

Remnants of old
“Super Volcanoes”
(Eroded calderas and ash flows)

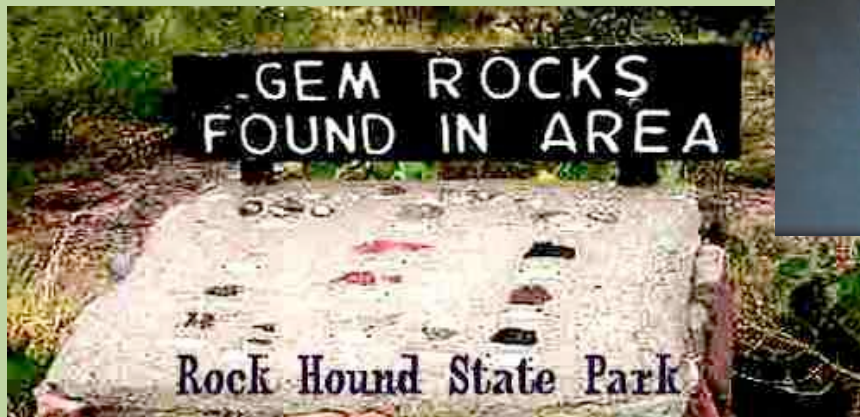


Gila Wilderness



City of Rocks State Park
Faywood, NM

Ash Flow - eroded



Volcanic rocks and hot water



**Remnants of old
“Super Volcanoes”**



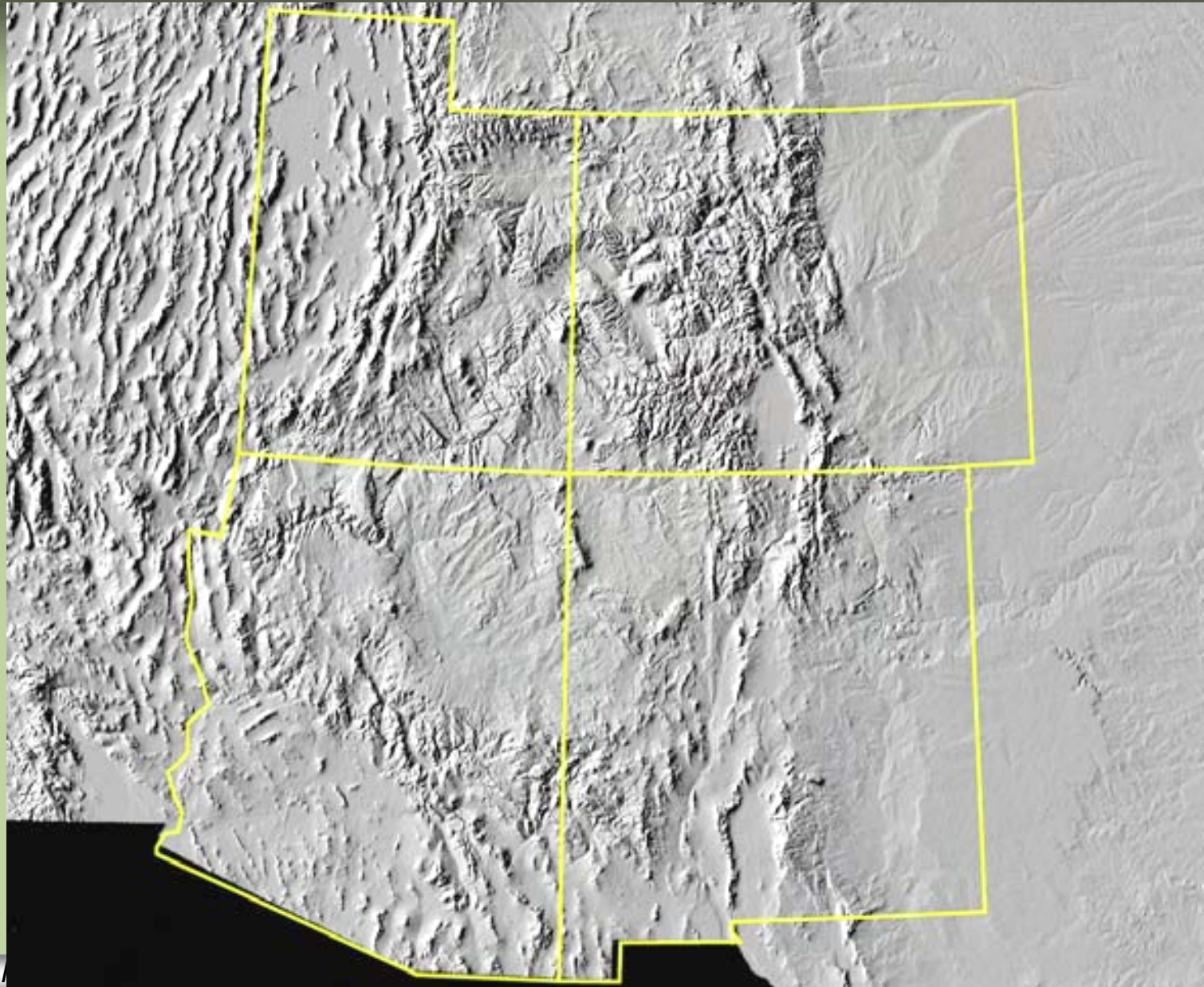
Basin and Range

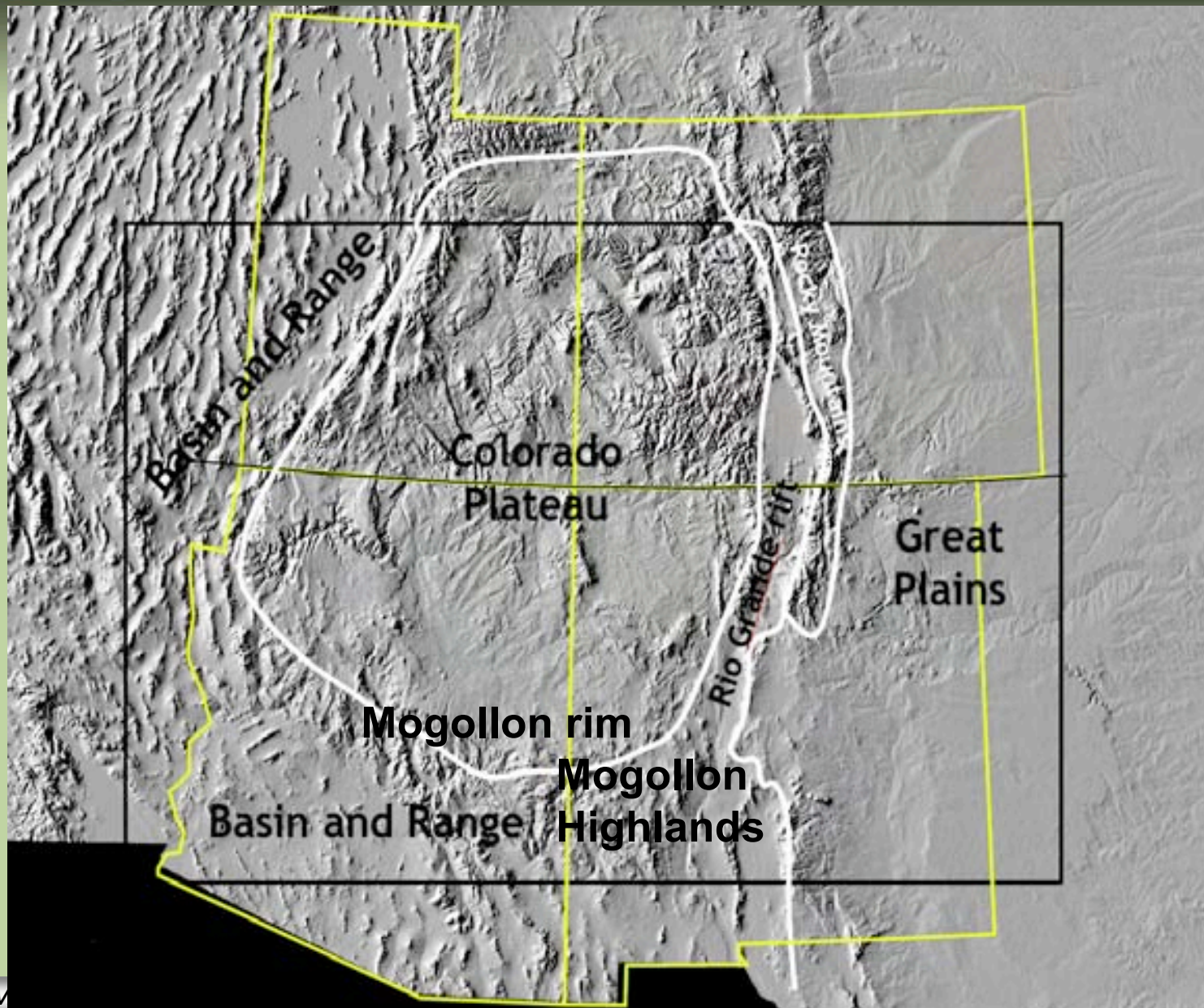
Parallel mountain ranges and valleys
All ages/types of rock uplifted
Some Tertiary volcanism

Florida Mts



Mimbres Valley







Why EarthScope?



- The EarthScope experiment exemplifies the insatiable human drive to learn.
- Encourages a feeling of national interconnectedness – a continental sense of place

Major Themes

- The EarthScope experiment invites communities to actively participate in the experiment
- Fosters an understanding that the local environment interacts with the larger, dynamic Earth system.

