

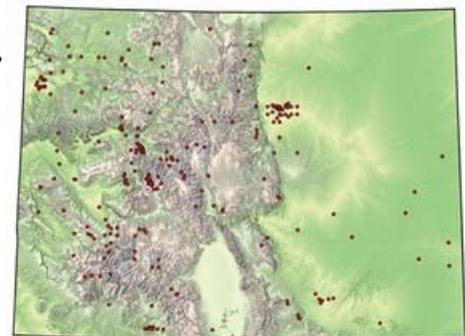
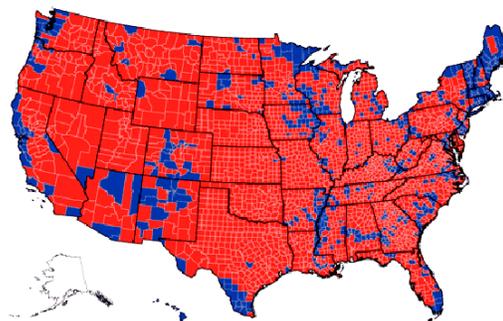


Association of Environmental and Engineering Geologists

Colorado Earthquakes and Seismic Hazard

Charles S. Mueller
Research Geophysicist, U. S. Geological Survey

Earthquakes are occasionally felt in Colorado, but rarely cause significant damage. About two dozen earthquakes have caused moderate, localized damage – Modified Mercalli Intensity VI or greater – in historical times. The event of November 1882, probably located north of Denver along the Front Range, is the largest known Colorado earthquake with magnitude estimates ranging from 6.2 to 6.6. The U. S. Geological Survey (USGS) makes probabilistic, national-scale seismic hazard maps that consider hazard not only from specific fault sources, but also from historical background earthquakes that may or may not be associated with known faults. Many non-tectonic earthquakes occur in Colorado, so the formulation of seismicity catalogs for hazard analysis requires special care. Compared to the 2002 edition of the USGS maps, the 2008 hazard has decreased significantly at many sites in Colorado. I illustrate these changes at four sites using some of the analysis tools that are available at the USGS website. Reasons for the differences include updates to seismicity catalogs, fault parameters, and ground-motion attenuation equations, as well as changes in background seismicity modeling.



MEETING DATE

Thursday
January 13TH, 2011

TIME

5:45 p.m. Social Hour
6:30 p.m. Dinner
7:30 p.m. Presentation

LOCATION

American
Mountaineering
Center
710 10th St.
Golden, CO 80401
Conference Room A
See Map Below

COST

\$25 Members
\$27 Non-members

RESERVATIONS

meetings@aeqrms.org
or
WWW.AEGRMS.ORG

**BY NOON,
TUESDAY
January 11TH**

Call for Abstracts

Technical Session #16
2011 GSA Cordilleran-Rocky Mountain Section Meeting
Utah State University, Logan, Utah

Advocates: Jerome V. DeGraff (USDA Forest Service) and Richard Giraud (Utah Geological Survey)

When Water Conveyances Are Breached: Causes and Impacts

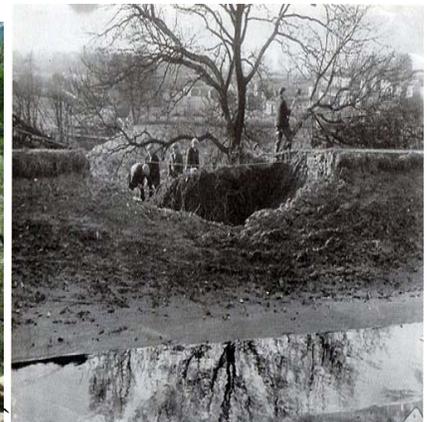
Throughout the western United States, many miles of canals, pipelines, penstocks and other water conveyances exist. These conveyances are vital to sustain endeavors such as irrigated agriculture, municipal water supply, industrial operations and hydroelectric power generation. These structures are built across a geologically diverse landscape making them vulnerable to breaching due to earthquakes, landslides and soil conditions. Breaching may also result from design flaws and lack of maintenance. The impacts from breaching include landslides, flooding, soil erosion and excessive sedimentation as well as economic hardship due to loss of function. This technical session will examine and describe specific examples, the scope of this problem and efforts to address its impacts.

Technical Session #16 in:

<http://www.geosociety.org/Sections/rm/2011mtg/techprog.htm>

Abstracts due on Feb. 15, 2011:

<http://www.geosociety.org/Sections/rm/2011mtg/registration.htm>



Words from the Chair

Greetings Rocky Mountain Section,

Happy Holidays and New Year to all. I hope that 2010 was a good year for all of you and that 2011 will be even better. I know that many businesses in our sector felt the bite of the recession in the last 12 months and mixed messages abound for 2011.

It seems that every article I read offers an opposite prognosis for the coming year. The most reliable sources—if any predictions can be considered such—call for modest growth in our target markets.



We all know that a down economy produces stiffer competition for the projects that do move forward. For us consultants, sometimes we feel we don't have any choice but to low-ball our bids just to bring some cash in the door. However, please remember that no matter how lean you go on your proposal, you are still held to the same ethical and professional standards as always. Cutting exploration and analysis costs creates more unknowns for our recommendations. I was recently providing expert support to a contractor involved in a large claim wherein what was categorized as very good rock for tunneling by the design geologists ended up being poor to very poor rock, which resulted in massive cost over-runs, injuries to workers, and delays. While the Earth is too complex to “get it right” all the time, the importance of a complete and thorough geologic investigation and analysis is crucial for most any construction project. I encourage you to do what you must to keep the work coming in, but don't compromise the need to do what is necessary to complete your explorations and analyses.

Nate Soule,
Section Chair



Local Geology Field Trips

We are starting a new newsletter section this year. The intent is to point out sites of geologic interest in the Front Range region that are simple and nearby and in some cases overlooked. Any suggestions or contributions are welcome and can be sent to newsletter@agrms.org

The Devil's Backbone

Loveland, CO

The Devil's Backbone is two-mile long near-vertical outcrop of Dakota Sandstone and is part of the southwest flank of the Milner Mountain Anticline. It is an open-space park of Larimer County and is located just north of US-34 at the western edge of the city where the suburban developments transition to rural farms and more spread-out homes. There are several miles of trails that loop around and cross over the outcrop. These trails are not strenuous and are an easy hike or fun run and offer many grand views of the surrounding areas. Unlike many other Boulder and Larimer County parks in the foothills dogs *are* allowed on the trails.

Most of us are familiar with the hogback of Dakota Sandstone that traces most of the eastern edge of the Front Range unofficially marking the start of the Rocky Mountains. It is a fairly straight north-south running ridge that dips to east at around 30° with a steeper west side. In many places it is shadowed to the west by hogbacks and flat-irons of older units like the Fountain and Lyons Formations and to the east by the younger Fox Hills Sandstone and Fort Hays Limestone. Just west of the city of Loveland the hogback makes a one-mile "jump" to the east and abandons its monoclinic structure and becomes an anticline centered on Milner Mountain to the north of the Devil's Backbone. From the top of the Backbone the "normal" east-dipping Dakota hogback can be seen both to the east and the west. This suggests that the Devil's Backbone is a piece of the Dakota that is expressed vertically due to the folding of the Milner Mountain Anticline.

To the west the parallel hogbacks of the Fountain and Lyons formations can be seen with some small reservoirs located in and around. Many quarries are located in this section of the Lyons producing stone used in many of the buildings in the Front Range, and most likely providing the name of the nearby town of Masonville. The valley to the east shows small outcrops of many different formations and when explored reveals more detail about the structure of the anticline. Faults may also be hidden in places around the park. For the most part this field trip is a lesson in structural geology but many other things can be observed if more time is taken and if nothing else there are good views in every direction.



Looking West at the Devil's Backbone



View to the North-Northwest, Milner Mtn in the background

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