

# STATE OF COLORADO

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**COLORADO GEOLOGICAL SURVEY**— *servicing the people of Colorado*

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COLORADO



DEPARTMENT OF  
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## **FOR IMMEDIATE RELEASE**

Nov. 15, 2011

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## **CGS study identifies geology as culprit for poor water quality in parts of Colorado**

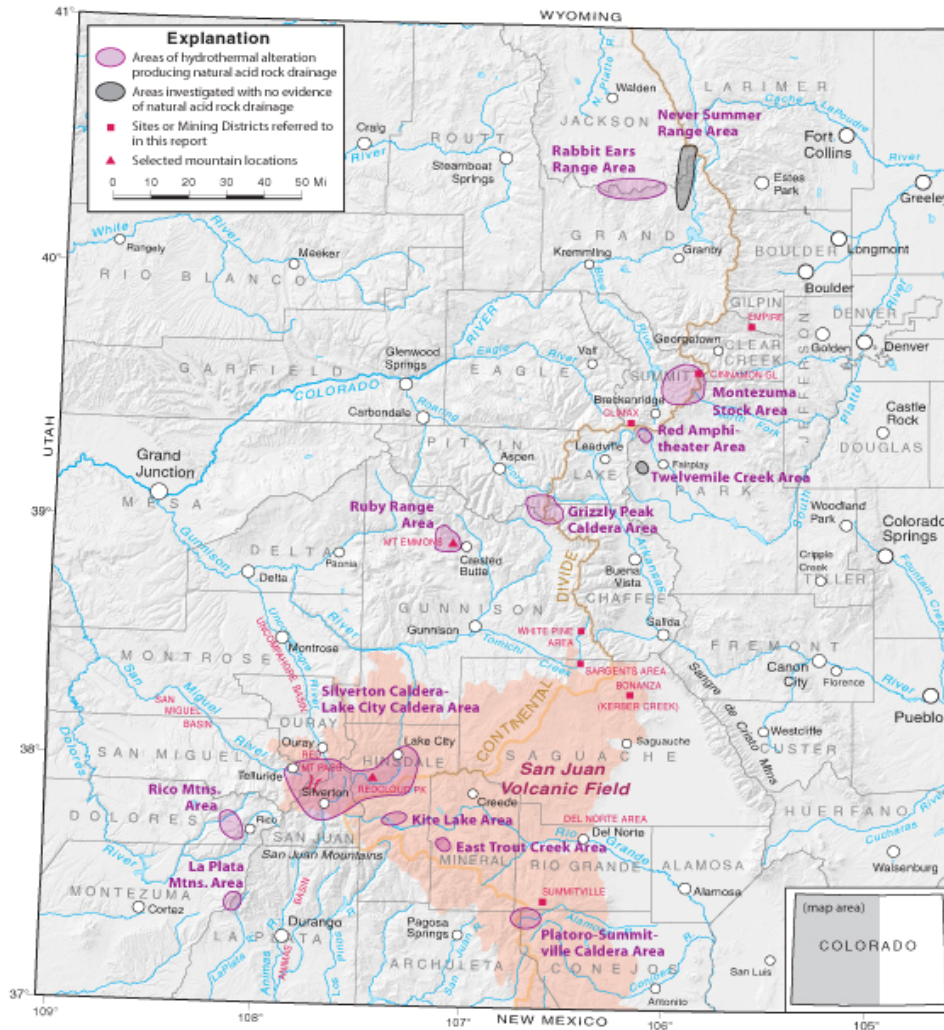
Is high, pristine mountain water always clean and pure? Can streams unaffected by human activities and livestock influences be unfit for human consumption, or fish? A new study by the Colorado Geological Survey (CGS) has some surprising answers. The study examines specific areas in Colorado that have naturally poor, surface-water quality due to the area's geology.

The report, titled "Natural Acid Rock Drainage Associated with Hydrothermally Altered Terrane in Colorado," identifies a number of streams in eleven different headwater areas of Colorado where surface water is acidic and has high concentrations of metals upstream of any significant human impacts.

Rocks in these areas were altered by intensely hot water circulating in the earth's crust, often associated with volcanic activity during Colorado's geologic past. The "hydrothermal alteration" of the rocks changed their composition by dissolving some minerals and depositing others. In the affected areas, the hydrothermal-alteration process deposited metal-sulfide minerals, commonly pyrite (fool's gold), in the rocks.

When these rocks are exposed at the surface, they interact with oxygen and the iron sulfide "rusts" to form iron oxide minerals, creating striking yellow, orange, and red colors – similar to the oxidation of metal in an old rusty car. "Acid rock drainage" occurs when the sulfur that is displaced by the oxygen combines with water to form weak sulfuric acid. The acidic water then dissolves minerals from the bedrock, often adding significant amounts of dissolved metals to these headwater streams. Natural acid rock drainage has been active in Colorado for thousands, possibly millions of years.

The CGS collected 101 water samples from headwater areas and identified specific streams in the following areas as being affected by natural acid rock drainage: Silverton area, Lake City area, Platoro-Summitville area, Kite Lake area and East Trout Creek in the San Juan Mountains, the La Plata Mountains, Rico Mountains, headwaters of Lake Creek south of Independence Pass, the Ruby Range near Crested Butte, Red Amphitheatre near Alma, headwaters of the Snake River in eastern Summit County, and the Rabbit Ears Range.



Colorado headwater areas where geology generates natural acid rock drainage, causing poor water quality. For better viewings options for this map, visit <http://geosurvey.state.co.us/water/Acid%20Water%20Natural/Pages/ImageGallery.aspx>

Through detailed geologic mapping, the study characterized the type and intensity of hydrothermal alteration and correlated the geology with surface-water chemistry. Many of the areas exhibiting intense hydrothermal alteration also contain historic mine sites. Frequently, acid rock drainage from natural sources and mine sites combine to cause severe downstream water quality problems. In these situations it is important to distinguish the natural, or background, water quality so that realistic clean-up goals for water quality can be set.

Funding for this study came from the Colorado Geological Survey portion of the Department of Natural Resources Severance Tax Operational Account. Colorado severance taxes are derived from the production of gas, oil, coal, and metallic minerals.



This stream, in the East Mancos River headwaters in the La Plata Mountains of southwest Colorado, is naturally acidic with high concentrations of metals simply because of the surrounding geology.

To order the *Natural Acid Rock Drainage: Associated with Hydrothermally Altered Terrane in Colorado* please call 303-866-2611 Option 0, or visit our online book store at <http://geosurveystore.state.co.us> and search for NARD. Price is \$30.00 plus shipping.

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