

COLORADO ROCKS

What are some of the most common kinds of rocks found in Colorado?

Basalt is a dark, iron-rich volcanic rock. Common throughout Colorado, it occurs as lava flows, dikes, and “cinder cones” of porous, gas-rich lava fragments (called scoria). Basalt and similar igneous rocks are found at Huerfano Butte north of Walsenburg; Grand Mesa; Flat Tops Wilderness Area; South Park; and Rocky Mountain National Park. The youngest lava flow and cinder cone in Colorado are along I-70 at Dotsero in Eagle County, and are only about 4100 years old. **Andesite** lava is similar to basalt but lighter in color and contains more silica and less iron. The lavas that cap North and South Table Mountains near Golden are **Shoshonite**, which is intermediate between basalt and andesite but unusually rich in potassium.

Conglomerate is a sedimentary rock composed of rounded pebbles or cobbles, cemented together to form a hard, solid rock. It was once gravel forming the bed of ancient rivers.

Gneiss is a hard metamorphic rock which is banded or layered and is often folded. It shows evidence of the great pressure and deformation to which it has been subjected, and it is often be cut by dikes of granite or pegmatite. Gneiss can be gray, pink, or black in color; most gneiss was once a mixture of sand, mud, and flows or masses of igneous rock. Large parts of the Front Range are composed of gneiss that is one of the most ancient rocks found in Colorado, about 1.7 billion years old.

Granite is one of the most common kinds of igneous rocks on continents. It forms from silica-rich magma that cooled slowly and crystallized deep underground. Granite is composed of the minerals quartz, feldspar, and mica or hornblende, and may be white, gray, or red. The Pikes Peak Granite is a red granite about one billion years old, and covers about a thousand square miles from Colorado Springs north to US-285. Other granites are widespread in the Colorado mountains, including the Silver Plume Granite and a related, slightly darker rock, the Boulder Creek Granodiorite.

Kimberlite is one of Colorado’s most unusual rocks. It is igneous rock from deep (50 miles or more) within the Earth’s mantle, and is the source rock of diamonds. A group of several dozen kimberlite pipes and dikes have been found mostly in Larimer County, CO and adjacent Wyoming. They have produced gem quality diamonds, including two 28-carat diamonds found in 1996 and 1997. Kimberlite is a fragmental igneous rock containing rounded or broken crystals of olivine (mostly altered to serpentine), pyroxene, garnet, mica, ilmenite, and other minerals, plus rock fragments from the crust and mantle, in a fine-grained dark gray-green matrix of serpentine, chlorite, talc, calcite, mica, and iron oxides.

Limestone is a sedimentary rock composed of particles of lime (calcium carbonate). Limestones usually form in shallow seas and often contain marine fossils. They provide evidence that such seas once covered much of Colorado during several periods of geologic time.

Marble is limestone that has been changed (metamorphosed) by heat and pressure. Colorado Yule Marble, quarried at Marble in Gunnison County, was used for building the Lincoln Memorial and the Tomb of the Unknowns in Washington, D.C., and the old U.S. Post Office in Denver (18th & Stout St.).

Pegmatite is a type of granite that cooled extremely slowly and was particularly rich in water, causing it to form very large crystals. Common pegmatites are composed of quartz, feldspar, and mica, but they may also contain unusual and valuable gem minerals such as beryl, tourmaline, and topaz. The region around Crystal Peak in Park and Teller Counties, Colorado, is famous for pegmatites within the Pikes Peak Granite that contain large crystals of smoky quartz and amazonite, a beautiful blue-green variety of feldspar.

Petrified Wood is a fossil, the trunks or limbs of ancient trees that have been buried and gradually replaced by hard silica (quartz) from minerals dissolved in ground water. Petrified wood is widespread in the plains of eastern Colorado, and Florissant Fossil Beds National Monument preserves spectacular, intact trunks of huge trees, now petrified, which were buried by a volcanic mudflow.

Rhyolite is a light-colored, silica-rich volcanic rock. Black, glassy **obsidian** is rhyolite that cooled very quickly, and granite forms from the same magma when it cools very slowly deep underground. **Pumice** is light, frothy rhyolite, full of gas bubbles. Ruby Mountain and Sugar Loaf near Nathrop, Colorado are made of rhyolite. There is also some obsidian at Ruby Mountain and at Silver Cliff, Custer County CO. The Wall Mountain Tuff (also called Castle Rock Rhyolite) caps some mesas near Castle Rock and is quarried as building stone; it was erupted as a glowing cloud of hot volcanic ash 35 million years ago from a former volcano in the Sawatch Range, probably near present Mount Aetna north of Monarch Pass.

Sandstone is a very common sedimentary rock, made of sand deposited in ancient river channels or along the shoreline of seas. The red, yellow, tan, gray, or white colors of sandstone are due to its varying content of iron oxide minerals. **Quartzite** is sandstone that has been metamorphosed into a hard, solid, tough rock that no longer crumbles apart between the sand grains; it can be white, gray, or red in color.

Schist is a metamorphic rock that is rich in mica or other flaky or elongated minerals that cause it to split into thin layers and give it a wavy, often sparkly appearance. Schist was once mud, which upon deep burial turned to shale (a sedimentary rock), then to slate, and finally to schist.

Shale, Mudstone, and Siltstone are fine-grained sediments (clay, mud, and silt) that have been buried in lakes or seas, compressed, and turned into rock. Shale splits easily into thin layers; it can be red, brown, gray, green, or black. Shale often preserves fossils of plants, fish, or marine invertebrates.

Water-rounded boulders have been worn into their present shape by tumbling and abrasion in the bed of a river. These “river rocks” can be of any rock type, but are usually representative of the hardest rocks to be found in a region, often including quartzite, granite, and gneiss. To geologists, rounded rocks smaller than 2½ inches in diameter are called pebbles; those between 2½-10 inches in size are cobbles, and those larger than 10 inches are boulders. Pebbles + cobbles are collectively known as gravel. Sand grains are those smaller than 2 mm (0.08 inches). Particles smaller than 1/16 mm are silt, and less than 1/256 mm = clay.

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To learn more about Colorado’s geology and its rocks and minerals, see:

Roadside Geology of Colorado, by Halka Chronic & Felicie Williams, rev. 2nd ed. (Mountain Press, 2002).

Colorado Rockhounding, by Stephen M. Voynick (Mountain Press, 1994).

Guide to the Geology of Colorado, by Andrew M. Taylor (publ. by Cataract Lode Mining Co., Golden CO, 1999).

Geology of Colorado Illustrated, by Dell R. Foutz (publ. By Dell R. Foutz, Grand Junction, CO, 1994).

Geology Tour of Denver’s Buildings and Monuments, by Jack A. Murphy, Denver Museum of Nature & Science, Historic Denver Guides, 96 p. (1995).

Hiking Colorado’s Geology, by Ralph L. & Lindy B. Hopkins (Mountaineers Books, 2000)

Messages in Stone, Colorado’s Colorful Geology, by Vincent Matthews, Katie Keller-Lynn, and Betty Fox, is newly published by the Colorado Geological Survey (Aug. 2003; \$16.95). It replaces the popular *Prairie, Peak and Plateau, a Guide to the Geology of Colorado*, now out of print.

“The Geologic History of the Colorado Mountains”, by John C. Reed, Jr., pp. 31-37 in **Guide to the Colorado Mountains**, rev. 9th ed., 1992, ed. by Randy Jacobs, Colorado Mountain Club, Johnson Books, Boulder CO.

The Colorado Geological Survey’s website at <http://geosurvey.state.co.us/>

Lists of **State rocks, minerals, gems, and fossils** can be found at: <http://www.geobop.com/Symbols/Geo/> , http://www.minsocam.org/msa/collectors_corner/index.htm , <http://www.intersurf.com/~heinrich/statefossil.html>

Geology of U.S. National Parks at <http://www2.nature.nps.gov/grd/tour/index.htm>

USGS website at <http://ask.usgs.gov> and **“Learning Web” education site** at <http://www.usgs.gov/education> including “Collecting Rocks” at http://interactive2.usgs.gov/learningweb/explorer/topic_rocks.htm

See also: <http://geology.about.com> , <http://www.geocities.com/RainForest/Canopy/1080/index.htm> and http://academic.brooklyn.cuny.edu/geology/leveson/core/graphics/snappy-rocks/rock_display.html