MONTANA GEOLOGY

CITADEL ROCK

"The Far West steaming toward Fort Benton, 1872"—Gary R. Lucy©

1992

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CITADEL ROCK AND THE FAR WEST

Geology

On Friday, May 31, 1805, the Corps of Discovery went into camp along the banks of the Missouri River at the mouth of a stream they called Stone Wall Creek (present-day Eagle Creek). Captain Meriwether Lewis entered in his diary:

As we passed on it seemed as if those seens of visionary inchantment would never have and end; for here it is too that nature presents to the view of the traveler vast ranges of walls of tolerable workmanship, so perfect indeed are those walls that I should have thought that nature had attempted here to rival the human art of masonry had I not recollected that she had first began her work. These walls rise to the hight in many places of 100 feet, are perpendicular, with two regular faces and are from one to 12 feet thick, each wall retains the same thickness at top which it possesses at bottom, The stone of which these walls are formed is black, dence and dureable, and appears to be composed of a large portion of earth intermixed or cemented with a small quantity of sand and a considerable portion of talk or quarts. these stones almost invariably regular parallelepipeds, of unequal sizes in the walls, but equal in their horizontal ranges, at least as to debth. . . . These walls pass the river in several places, rising from the waters edge much above the sandstone bluffs, which they seem to penetrate; thence continuing their course on a streight line on either side of the river through the gradually ascending plains, over which they tower to the hight of from ten to seventy feet until they reach the hills, . . . these walls . . . having the appearance of the walls of ancient houses or gardens.

Nearly a century later, the "walls" that Lewis so vividly described were studied by two scientists from the U. S. Geological Survey, W. H. Weed and L. V. Pirsson. They identified the rocks as volcanic in origin, and formed as intrusive stocks, plugs, dikes and sills. Later, chemical analyses performed on samples of the solidified magma, found it to be an unusual rock type composed essentially of the minerals of alkali feldspar and augite. The rare, dark-colored, plutonic assemblage was named shonkinite, after the nearby locality of Shonkin located north of the Highwood Mountains. Shonkin is the Indian name for the mountains.

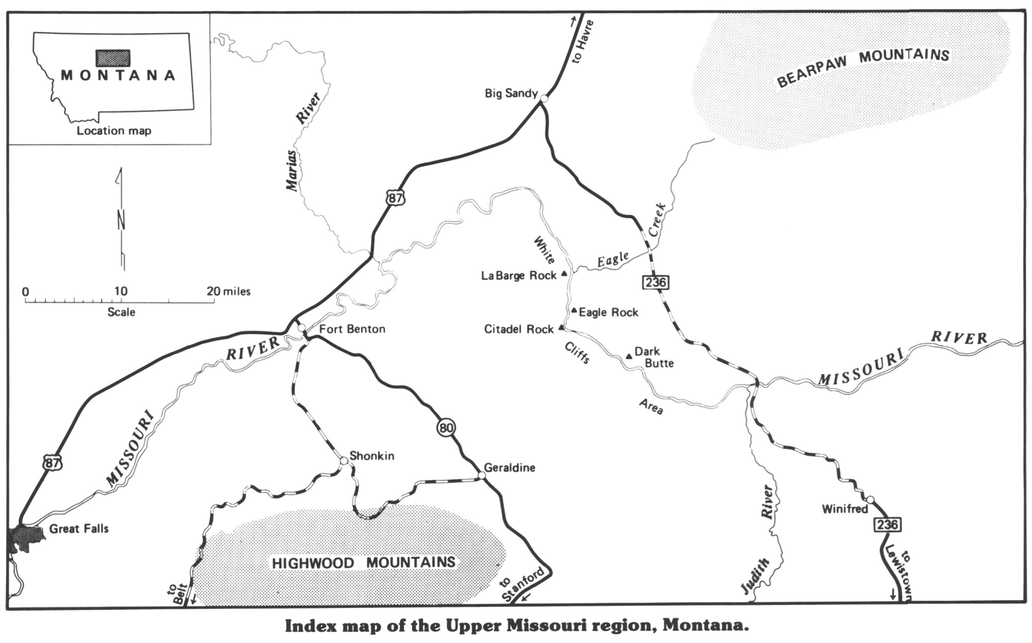
Citadel Rock is a volcanic plug—a vertical, pipe-like body of lava that represents the conduit to a former volcanic vent. The molten rock originated deep beneath the surface and flowed through fractures in the existing sedimentary rocks where it cooled and solidified. Eventually, it was exposed by erosion of the softer, overlying rocks along the river corridor.

Intrusive rocks are common along the White Cliffs section of the Upper Missouri, and provide a striking landscape where they exhibit emplacement in the white-colored Virgelle Sandstone. Other nearby landmarks, such as LaBarge Rock, Eagle Rock and Dark Butte, are similar in origin and character. Most of the volcanic activity in this part of Montana occurred during the Eocene epoch (40-60 million years ago). The similarity of ages and chemical compositions of rocks that formed the Bearpaw Mountains to the north and the Highwood Mountains to the south, strongly suggest that the intervening exposures along the river, such as Citadel rock, are related. This region of the State is referred to by geologists as the central Montana alkalic province.

History

The Missouri River, as an avenue of travel and commerce, was stimulated by the fur trade in 1830, when keelboats, mackinaws and canoes plied its waters. Steamboat navigation on the river began a year later when the *Yellow Stone* reached Pierre, South Dakota from St. Louis, Missouri. In 1832, it pushed further upstream to Fort Union at the confluence with the Yellowstone River. This outpost (near the present boundary of Montana and North Dakota) was established in 1828 and served as headquarters for the American Fur Company. It remained the western terminus for steamboat travel for nearly three decades. In 1859, the *Chippewa*, under Joseph LaBarge, landed at the mouth of the Marias River. The next year, accompanied by the *Key West*, it reached Fort Benton—the head of navigable waters on the Upper Missouri.

The era of the fur trade declined in the early 1860s when men, supplies and equipment were rushed to the Montana gold fields. River traffic would be at its peak during the next 20 years. In the shipping season of 1878, over 50 steamboats recorded moorings at Fort Benton; however, by 1880, newly built railroads began to cut into the market and freighting on the Missouri dropped drastically. On June 12, 1890, the *Batchelor* unloaded the last river-borne cargo at Fort Benton.

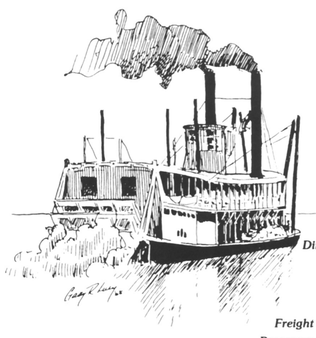


Index map of the Upper Missouri region, Montana.

The *Far West* had an illustrious career on rivers of the northern plains. Sometimes referred to as the "heroine of the upper river", she was undoubtedly the most famous mountain steamer of the period. Built in 1870, she was specifically designed for shallow water and soon gained a reputation for swift travel. In 1872, piloted by its owner, Stanford B. Coulson, the sternwheeler successfully raced the *Nellie Peck* from Sioux City, Iowa to Fort Benton and return in 17 days and 20 hours—beating the previous record by 3 hours. Low-hulled and spoon-bowed, she measured 190 feet in length and 33 feet in width, and drew only 4 feet of water while transporting 200 tons of freight and 30 passengers.

Her greatest adventure occurred in the summer of 1876, when she was chartered by the U. S. 7th Cavalry for supply and transport duty in the Sioux Campaign. On the evening of June 21st, tied to the banks of the Yellowstone at the mouth of Rosebud Creek, Generals Terry, Gibbon and Custer walked her decks and planned strategy, which, within a week, would result in disaster at the Battle of The Little Bighorn. In the aftermath of that ill-fated mission, skipper Grant Marsh prepared the main deck with grass mats and received 53 wounded troopers. Also placed on board, tethered in a specially built stall, was the injured cavalry horse *Comanche*, the only survivor of the "Last Stand" fight. Now in service as a hospital ship, an epic downstream voyage was made that would become legendary and unsurpassed in steamboating—a record run to Fort Abraham Lincoln (below Bismarck, North Dakota) of 710 miles in 54 hours.

The famed vessel made 18 trips to Fort Benton and served in various capacities throughout her life, including scouting expeditions for General Nelson A. Miles and William "Buffalo Bill" Cody. On several occasions, her main cabin hosted military war councils and Indian peace commissions. While downward bound, on October 20, 1883, she sank on a snag at Mullanphy Bend, seven miles below St. Charles, Missouri.



Far West

Specifications

Built:	1870
Builder:	Coulson Packet Company Pittsburg, PA
Cost:	$24,000
Dimensions:	190' x 33'
Weight:	397 tons
Power:	Wood-fueled (10 cords/day; 2 engines, 3 boilers; 19-foot sternwheel paddle)
Freight Capacity:	200 tons
Passenger Capacity:	30
Crew:	6
Speed:	13 mph (max.)

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Montana's geologic past—a key to its future

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conducting investigations of Montana geology
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ECONOMIC GEOLOGY
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Charter, Scope and Organization

The Montana Bureau of Mines and Geology (MBMG) was established in 1919 as a public service agency and research entity of the Montana College of Mineral Science and Technology. The Bureau Director serves as the State Geologist and represents Montana in the Association of American State Geologists.

Enacted by Legislative Assembly of the State of Montana (Section 75-607, R.C.M., 1947, Amended), the scope and duties of the agency are summarized as follows:

- To collect, compile, and publish information on Montana's geology, mining, milling, and smelting operations, and ground-water resources.
- To maintain collections of geologic and mineral specimens, photographs, models, and drawings of mining and milling equipment, and literature on geology, mining, and ground water.
- To conduct investigations of Montana geology, emphasizing economic mineral resources and ground-water quality and quantity.

In accordance with the enabling act, the MBMG conducts research and provides information, but has no regulatory functions. To carry out its duties most effectively, the Bureau operates in five divisions: Geology and Mineral Resources, Hydrology, Administration, Analytical and Information Services.

Selected Publications on Montana Geology

Bulletin 129—Montana mining directory 1989-1990, compiled by Robin McCulloch, 1991, 147 p., 11 figs., 1 table..... $10.00

Special Publication 89—Profiles of Montana geology: A layman's guide to the treasure state, David D. Alt, 1984, 168 p., 180 figs..... $12.00

Special Publication 94—Belt Supergroup: A guide to Proterozoic rocks of western Montana and adjacent areas, Sheila M. Roberts (*ed.*), 1986, 311 p., 175 figs., 11 tables, 10 color plates..... $25.00

Special Publication 95—Guidebook of the Helena area, west-central Montana, compiled by Richard B. Berg and Ray H. Breuninger (*eds.*), 1987, 64 p., 20 figs., 1 table..... $5.00

Special Publication 100—Guidebook of the central Montana alkalic province: Geology, ore deposits and origin, David W. Baker and Richard E. Berg (*eds.*), 1991, 201 p., 103 figs., 17 tables..... $18.00

Reprint 6—Gold placers of Montana (2nd edition, *revised*), Charles J. Lyden, 1987, 120 p., 23 figs., 22 maps..... $10.00

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