



Montana Geology '97

January

S	M	T	W	T	F	S
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December

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The Jerusalem Rocks

Hoodoos and hideaways haunt a stretch of Montana badlands, where erosion carves soft sandstone and harder cap rock into weird shapes. Known locally as Jerusalem rocks—the name apparently came from a shepherd[er] who called the area Little Jerusalem—these formations overlook the Hutterite grain field blanketing a broad channel [probably Buckley Coulee] gouged 10,000 [?] years ago by glacial melt [water]. —Thomas O'Neill*

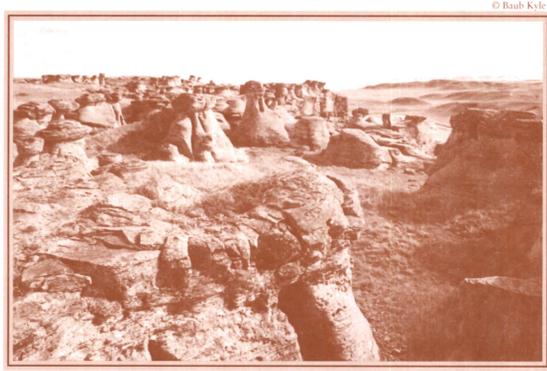
North and west of Shelby, Montana, the Upper Cretaceous (Campanian) Virgelle Sandstone forms a prominent east-facing rim. Here, west of the Sweetgrass Arch, the Virgelle Sandstone is regarded as a formation, whereas east of the Arch the Virgelle Sandstone is merely the lower member of the Eagle Sandstone. West of the arch, the Two Medicine Formation, which includes the upper member of the Eagle, overlies the Virgelle. The Telegraph Creek Formation underlies the Virgelle east and west of the Arch. The Virgelle and Eagle sandstones were deposited during an eastward advance of the western shoreline of the Upper Cretaceous Seaway—a sea that extended from the Gulf of Mexico to the Arctic Ocean. Mountains west of the seaway provided clastic sediment to the shoreline. In the Shelby area the Virgelle Sandstone consists of sand that was deposited in wave-dominated deltaic and interdeltaic environments.



Location



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The Virgelle Sandstone is characterized by light-brown to buff-weathering, thick-bedded to massive sandstone that forms rounded rims and bluffs. The sandstone is fine grained, light grey to light-brownish grey and speckled with limonite. Differential weathering commonly creates pitted surfaces, rounded cliffs and rimrocks and cave-like overhangs, has produced the landforms in the photographs. Locally these landforms are known as the *Jerusalem Rocks*. These *hoodoos*, or pillars, owe their existence to a

caprock—resistant beds that contain higher proportions of iron-oxide cement than the underlying sandstone.

*Thomas O'Neill 1984, *Lakes, Peaks and Prairies—Discovering the United States–Canadian Border*, National Geographic Inc.

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– Science –

Topical Studies in Regional Geography
conducting investigations of Montana geology

Montana Atlas Program
revising and updating the state geologic map and derivative maps in 1° x 2° quadrangles

Economic Geology
making detailed studies of Montana's metalliferous deposits, industrial minerals, and coal

Cooperative Research Programs with the U.S. Geological Survey
concentrating on coal lands, hydrology, and revision of the state geologic map

Groundwater Resources Investigations
evaluating the quality and the quantity of ground water

Hydrogeologic Research
assessing water-related environmental concerns, including saline seep and mine water drainage

Geothermal Investigations
mapping and measuring Montana's natural hot water resources

Coal Hydrology
investigating ground water in coal areas before, during, and after mining

Computerized Resource Data Storage and Retrieval Systems
compiling and storing Montana's coal, water, and mineral resources information

Geographic Information Systems
producing computer-generated maps of geology, minerals, and hydrology

Montana Groundwater Characterization
monitoring and characterizing the state's groundwater aquifers

Mine Hydrology and Mine Waste Disposal
investigating mine impacts on ground water and surface water

Earthquake Studies Research
seismic monitoring in Montana

Charter, Scope, and Organization

The Montana Bureau of Mines and Geology (MBMG) was established in 1919 as a public service agency and research entity for the State of Montana.

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

- To collect, compile, and publish information on Montana's geology; mining, milling, and smelting operations; and groundwater 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 groundwater quality and quantity.

In accordance with the enabling act, MBMG conducts research and provides information, but has no regulatory functions. To carry out its duties more effectively, the bureau operates in five divisions: Research, Administration, Analytical, Information Services, and Computer Services.

The director serves as the State Geologist and represents Montana in the Association of American State Geologists.

– Service –

Research for Montana

Public Inquiry
on Montana geology and ground water

Publication and Map Sales
providing documents on bureau research, USGS topographic and geologic maps, derivative maps, and access to federal aerial photos

Analytical Services
analyzing the chemical quality of ground water and surface water, analyzing soils, rocks, and biological tissue for metal content

Statewide Groundwater Assessment
systematically evaluating Montana ground water and aquifers

Water Supply Evaluation
evaluating the quality and quantity of water for municipalities and state agencies

Staff Mining Engineer
assisting small mining operations

Mineral Museum
displaying over 1,200 high-quality mineral specimens, group tours available

Lectures and Public Addresses
speaking to public groups on bureau research, and Montana geology and hydrology