



Great Falls of the Missouri



Meriwether Lewis left Clark at the Marias River on June 11, 1805 and set out to find the falls of the Missouri.

On June 13, while walking a mile north of that river:

... my ears were saluted with the agreeable sound of a fall of water and advancing a little further I saw the spray arise above the plain like a column of smoke which would frequently disappear again in an instant ... I did not however loose my direction to this point which soon began to make a roaring too tremendous to be mistaken for any cause short of the great falls of the Missouri.

1.) About noon he reached Big Falls ...

I hurried down the hill which was about 200 feet high and difficult of access, to gaze on this sublimely grand spectacle. I took my position on the top of some rocks about 20 feet high opposite the center of the falls. ... the remaining part of about 200 yards on my right forms the grandest sight I ever beheld ...

2.) Lewis headed upstream on the morning of June 14 to see how far the falls continu About 5 miles from the Big Falls he:

... arrived at a fall of about 19 feet; the river is here about 400 yds. wide. this pitch which I called the crooked falls occupys about three fourths of the width of the river ...

Big Falls

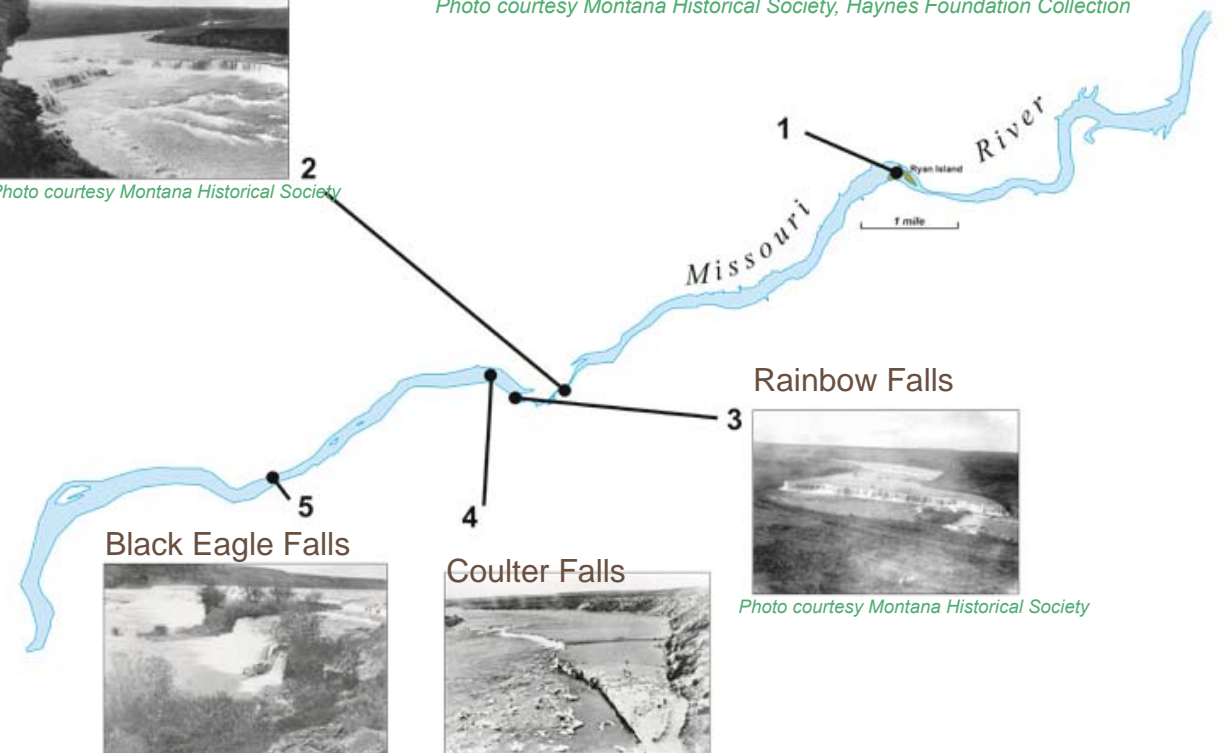


Photo courtesy Montana Historical Society, Haynes Foundation Collection

Crooked Falls



Photo courtesy Montana Historical Society



Black Eagle Falls



Coulter Falls



Rainbow Falls



Photo courtesy Montana Historical Society

Photos courtesy Cascade County Historical Society

3.) Carefully noting the particulars of Crooked Falls, Lewis then . .

. . . hearing a tremendous roaring above me I continued. . . a few hundred yards further and was again presented by one of the most beatifull objects in nature, a cascade of about fifty feet perpendicular stretching at rightangles across the river from side to side to the distance of at least a quarter of a mile. here the river pitches over a shelving rock, with an edge as regular and streight as if formed by art, without a nich or brake in it; the water decends in one even and uninterrupted sheet . . .

4.) It was near noon on June 14, when Lewis continued upstream from Rainbow Falls:

. . . I discovered another fall above at the distance of half a mile . . . I found this to be a cascade of about 14 feet possessing a perpendicular pitch of about 6 feet. . . in any other neighbourhood but this, such a cascade would probably be extoled for it's beaty and magnificence, but here I passed it by with but little attention . . .

5.) After passing Colter Falls Lewis:

. . . arrived at another cataract of 26 feet. this is not immediately perpendicular, a rock about $\frac{1}{3}$ of it's decent seems to protrude to a small distance and receives the water in it's passage downwards and gives a curve to the water tho' it falls mostly with a regular and smoth sheet. the river is near six hundred yards wide at this place . . . below this fall at a little distance a beatifull Island well timbered is situated about the middle of the river. in this Island on a Cottonwood tree an Eagle has placed her nest; a more inaccessible spot I beleive she could not have found . . .

Creating the Falls

Start with the rocks

Rivers flowing from the west deposited alternating layers of sand, silt and mud on the coastal plain and shore of a sea that occupied this area during the Early Cretaceous Period. These sediments became the sandstone, siltstone and mudstone of the middle part of the Kootenai Formation.

The Sunburst Sandstone at Big Falls

The Sunburst Sandstone (deposited 120 million years ago) is a resistant sandstone at the base of the middle Kootenai Formation. Deposits typical of tidal channels and estuaries have been identified in these rocks and can be seen north of Ryan Island Park. The height of Big Falls (about 90 feet) is partly due to the thickness of the Sunburst Sandstone there.

Beds overlying the Sunburst — the upper falls

The middle Kootenai Formation rocks that overlie the Sunburst Sandstone are alternating layers of thin sandstone and less resistant siltstone and mudstone. The sediments were deposited in stream beds and inter-stream areas inland from the shore on a coastal plain or delta plain; they show no evidence of marine conditions.

Middle Kootenai
Formation near
Ryan Island
Park and Big
Falls

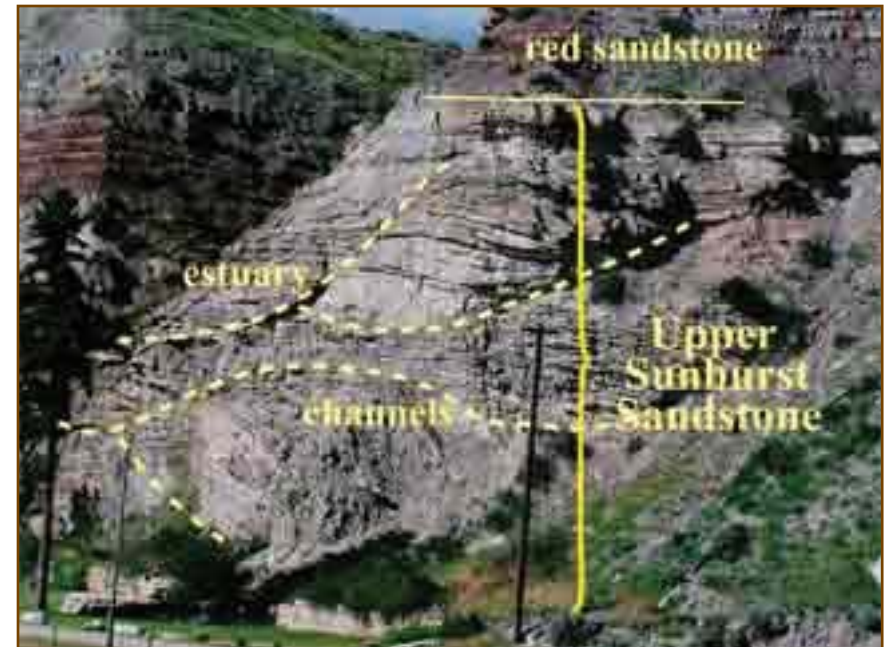
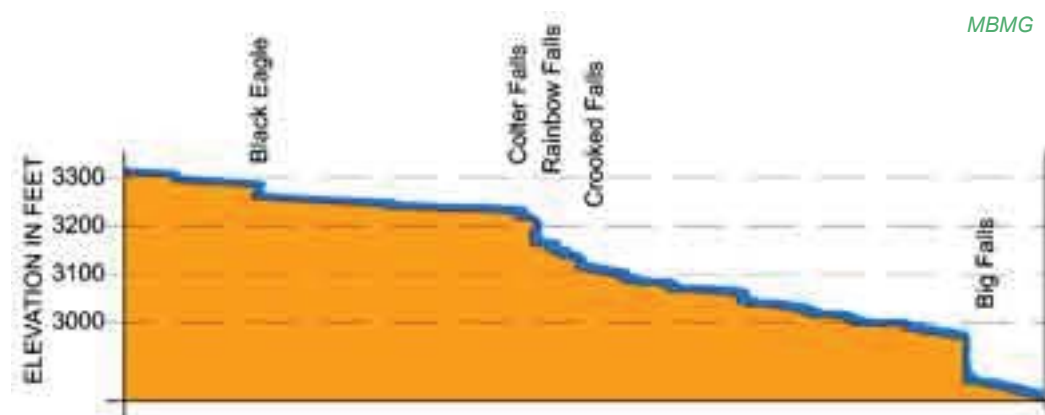


Photo courtesy of Robert K. Schwartz



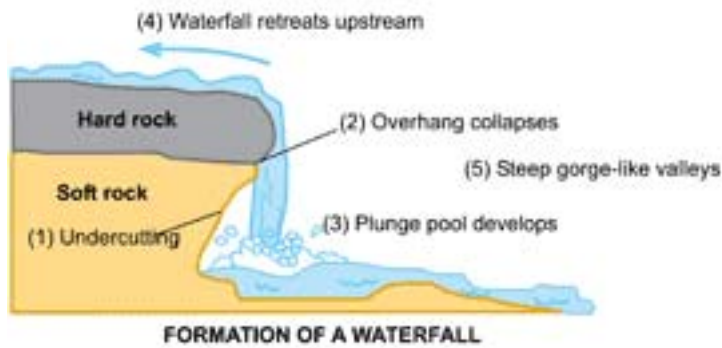
Crooked, Rainbow, Coulter, and Black Eagle falls cascade over these rocks

Bring on the Glaciers

About 15,000 years ago glacial ice advanced just south of Great Falls, burying the Missouri's valley. When the ice retreated, the Missouri River cut a new channel between Sand Coulee Creek and Box Elder Creek (see map). Torrents of water began draining through this new channel.

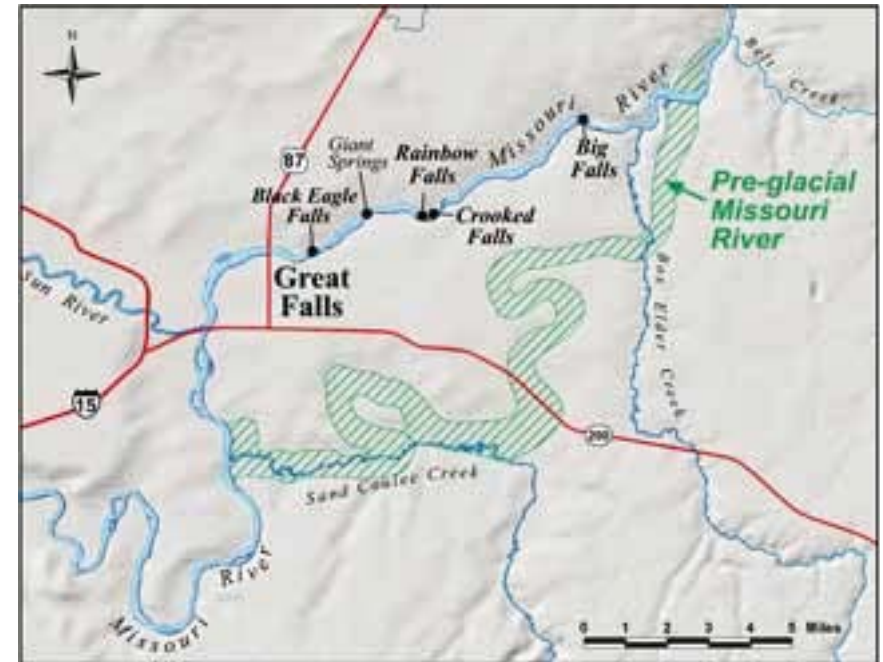
Post-Glacial Erosion

The Missouri cut its new channel through resistant sandstone interbedded with less resistant siltstone and mudstone. Waterfalls formed as the river flowed over the jointed and fractured rock. Eventually falling water undercuts the more resistant sandstone layers and, as the undercut enlarges, the sandstone collapses along joint surfaces. This process continues and the waterfall moves upstream.

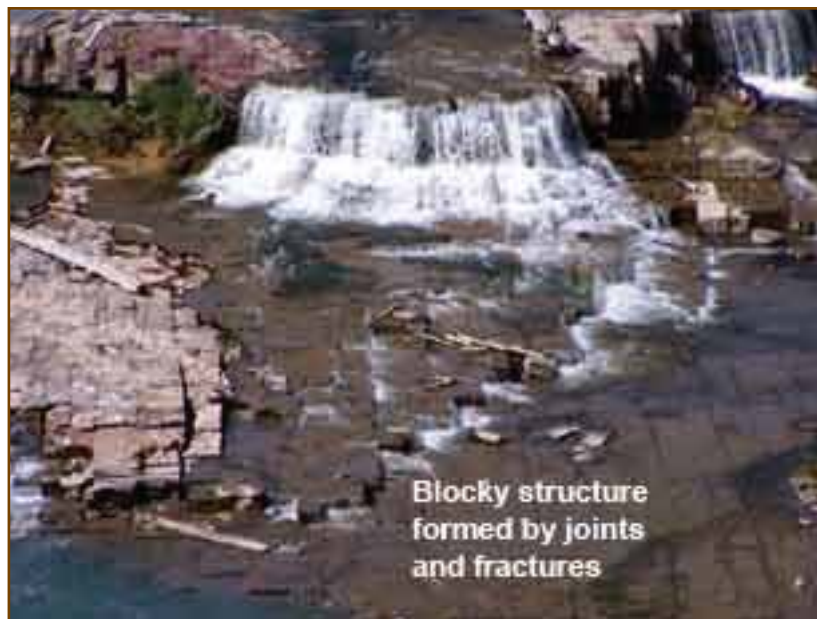


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Lewis and Clark might be amazed at how little water sometimes flows over the falls today — five dams control flow along this section of the Missouri.

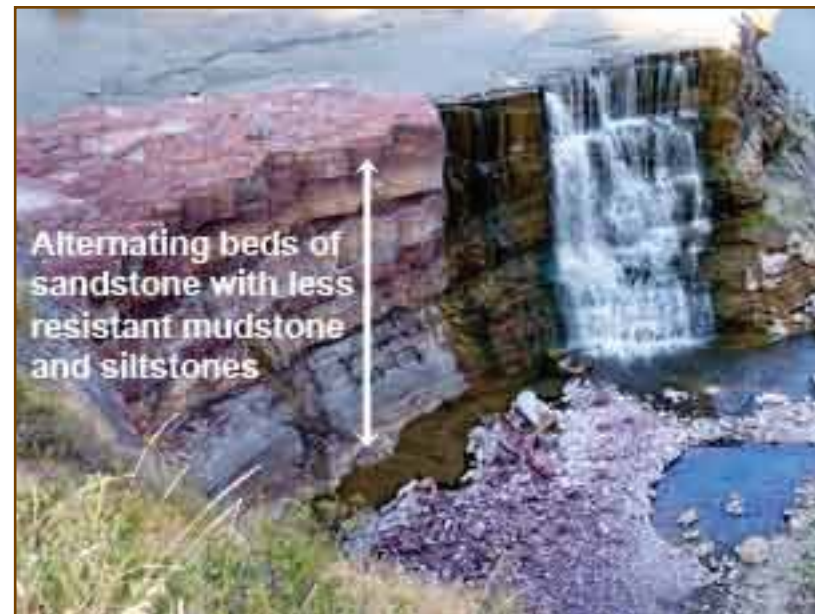


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Photos by Ginette Abdo, MBMG

Layers of maroon-colored mudstone and siltstone in the Kootenai Formation form the Black Eagle Falls. Flowing water cuts into the less resistant beds, undermining the more resistant ones.



The much-reduced flow of water over Black Eagle Falls provides a good view of the layering in the Kootenai Formation and also the blocky structure produced by jointing and fracturing. Water flowing along the joints and fractures contributes to the development of the falls