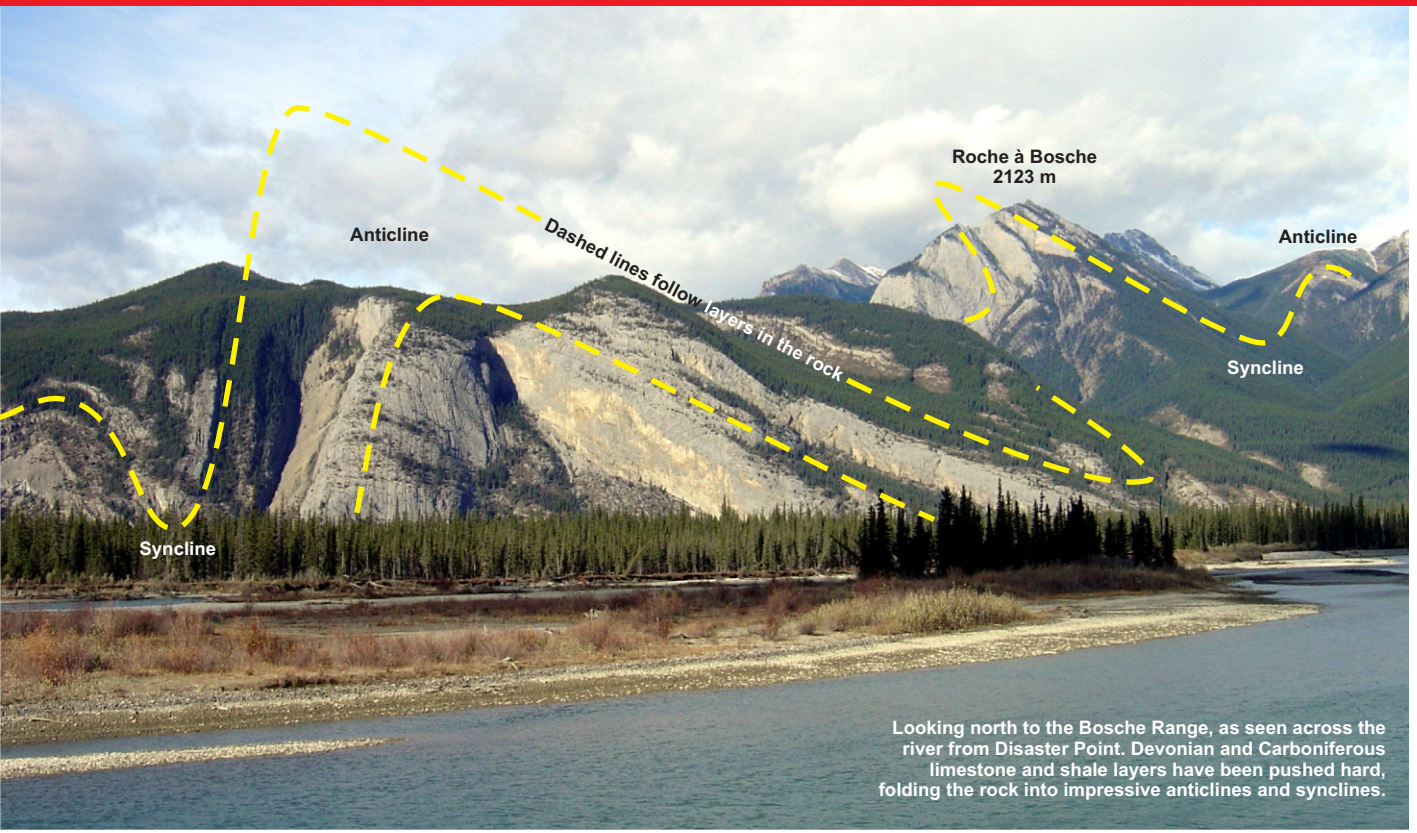


Looking north to the Bosche Range, as seen across the river from Disaster Point. Devonian and Carboniferous limestone and shale layers have been pushed hard, folding the rock into impressive anticlines and synclines.

Location and directions:

Forty kilometres east of Jasper along Highway 16 (39 km west of Hinton), just west of Roche Miette, watch for a parking area on the eastbound side of the highway. ***Caution:*** bighorn sheep may be standing in the road here. GPS coordinates: N53° 10.461', W117° 58.348'. Elevation 1000 m above sea level

Bending rock

From the parking area you get a great view of **anticlines** (up-folds) and **synclines** ("SIN-clines," down-folds) in the **Bosche Range**. The layers involved in the folding are mainly of limestone and shale. All were originally laid down flat. If anyone needs proof that hard stone can be bent, this is it!

The building of the Canadian Rockies was accomplished by horizontal shoving, not by vertical uplift. Think of an enormous bulldozer pushing against the whole sedimentary stack, some 20 kilometres thick, until it started to fold up like an accordion. What had once been a region of flat-lying sedimentary layers about 400 km wide was compressed to half that width. The rock split into huge overlapping sheets, rather like shingles on a roof, each "shingle" typically over a kilometre thick and many square kilometres in size.

Within each of these **thrust sheets**, yet more shortening-up was accomplished by folding, such as we see here. But how could hard, cold stone be bent that way? Why didn't it just shatter?

Answer: *the rock was bent very slowly*, over many millions of years. There was enough time for the layers to deform gradually, even down to the molecular level within the crystals of lime. Also, *the rock was confined*, held down under the weight of two or more kilometres of overlying layers, giving it no space in which to break up. All the overlying rock has since been eroded away.

Bighorn sheep, mountain goats and black shale

This is a great place to see bighorn sheep and mountain goats. The geology, the topography and the weather have created a perfect environment for the animals.

First, the climate. We are in the eastern **front ranges** of the Canadian Rockies, on the rise about 70 million years ago. The mountains don't extend much farther east. But to the west the land is mountainous all the way to the Pacific Ocean. Moisture picked up from the seawater moves eastward across the ranges, dropping out as rain and snow. There isn't much water vapour left in these airmasses by the time they reach the eastern edge of the Rockies. So the climate is dry. Grass and shrubs do better here than trees. Bighorn sheep are **grazers** (grass-eaters), while mountain goats both graze and **browse** (eat the leaves of wildflowers and shrubs). This is a great place for them to dine.

Mountain goat drinking at the Disaster Point animal lick. Parks Canada photo.

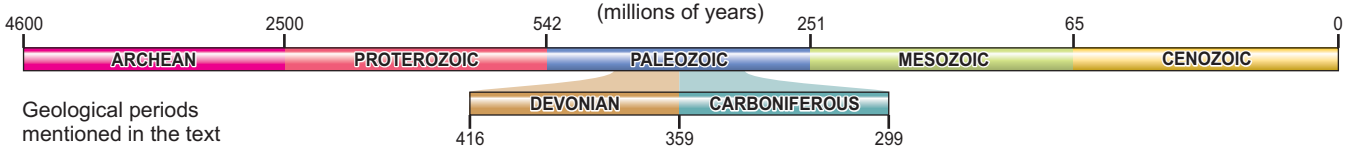
Second, it's a windy place. Strong southwesterlies pick up what little snow falls in winter and carry it northeastward, up the southwest-facing slopes of ridges such as the one above you and over the top, where it forms drifts on the leeward northeastern side. The wind benefits the sheep and mountain goats, because it keeps the slopes practically snow-free through the winter. Food is easy to find here year-round.

Third, these animals are frequently attacked by cougars, wolves and coyotes. But here again, geology and biology work together to ensure survival of all these species. The topography is steep and cliffy, carved by water and glacial ice from thick beds of tough gray Devonian and Carboniferous limestone. When the predators come around, the sheep and mountain goats can quickly run to the rocks. This is their **escape terrain**. They are naturally better climbers than their enemies, so usually they get away. Enough young ones survive each year to keep the flocks going. On the other hand, enough are caught and eaten to keep the predators going, too. It's a fine balance.

Fourth, mountain goats and bighorn sheep need **sulphur**, and they find it here. Sulphur is an essential element in the proteins that make up hair. Both species grow and shed thick coats each year. The Devonian black shale you see exposed across the pond is rich in **pyrite**, chemical formula FeS_2 (iron sulphide). By licking the shale, the animals get the sulphur they must have.

Geological time scale

(millions of years)



Geological periods mentioned in the text

Human impact

Bighorn rams licking the salty pavement along Highway 16 near Disaster Point. Photo by Jill Seaton

Our own species has built a highway right through this ecosystem. In winter Parks Canada spreads salt (NaCl, sodium chloride) on the highway, to melt the ice on the pavement and make driving safer. But the salt attracts hoofed animals - especially the sheep, who crave it even more than the mountain goats do - and many sheep have been killed while licking the road surface as trucks and cars bear down on them.

Further, people hike up the narrow valley above the shale to climb the cliffs. Bighorn sheep adjust easily to the presence of humans, but mountain goats are touchier. The climbers, of whom there are more every year, unwittingly keep chasing the mountain goats away from the black shale.

Fortunately there is sulphur in soft deposits of wind-blown silt on the lee side of the mountain, where climbers seldom venture. However, this location is in the woods, where the animals would rather not hang around because they are more vulnerable to attack by predators.

Will our own activities tip the ecological balance here? How can we be better environmental stewards?

Want to know more?

Consult these publications and websites:

• Gadd, Ben (2008) *Canadian Rockies Geology Road Tours*, pages 34 and 35 (folds), 73–79 (mountain-building), 406 (more on bending rock) and 408–412 (geology at Disaster Point).

• —— (2009) *Handbook of the Canadian Rockies*, pages 139–141 (up-piling instead of uplift, thrust sheets) and 191 (cross-section showing thrust sheets).

Check out the GeoVistas brochure for nearby Jasper Lake.

All GeoVistas brochures, including this one, are available for free download from:
www.earthsciencescanada.com/geovistas

Please refer to this publication as:

Gadd, B. (2011) *Disaster Point GeoVistas Brochure*, published by the Canadian Federation of Earth Sciences.

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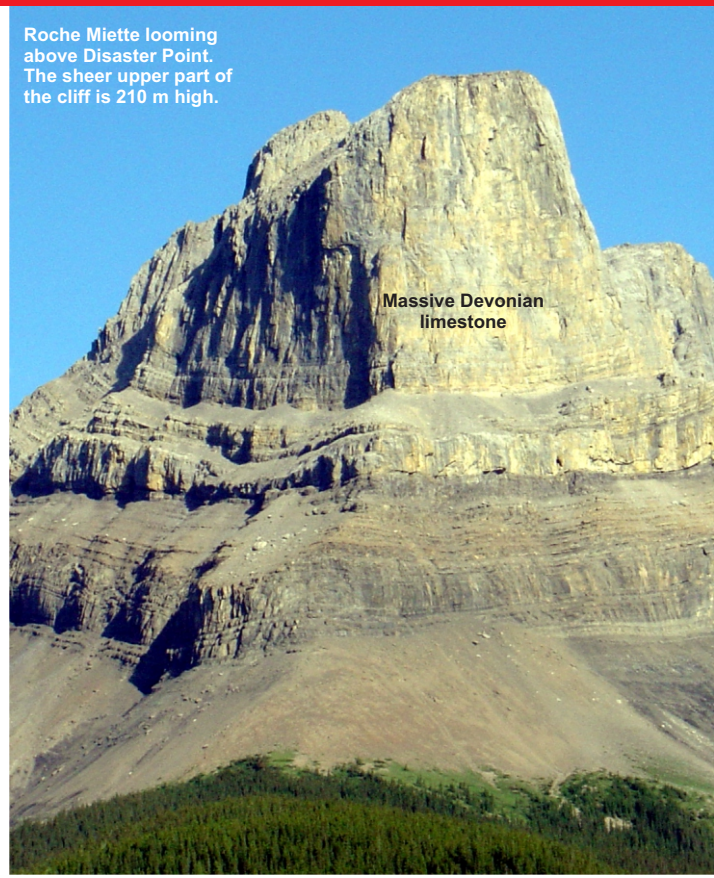

Roche Miette looming above Disaster Point. The sheer upper part of the cliff is 210 m high.

Massive Devonian limestone

Jasper National Park
Disaster Point

Lost liquor, rock in motion, wildlife in the balance

You may hear that the name "Disaster Point" comes from an incident in which packhorses fell from the cliffs into the river here. But the "disaster" was tongue-in-cheek. Sandford Fleming, well-known chief surveyor for the Canadian Pacific Railway, broke his whiskey flask on a rock just east of Roche Miette in 1872.

GeoVistas
Earth Science vignettes