

A.Y. Jackson Lookout, Greater Sudbury

High Falls and Greater Sudbury's Famous Meteorite Crater

GPS co-ordinates: N46° 35.305', W81° 22.808'



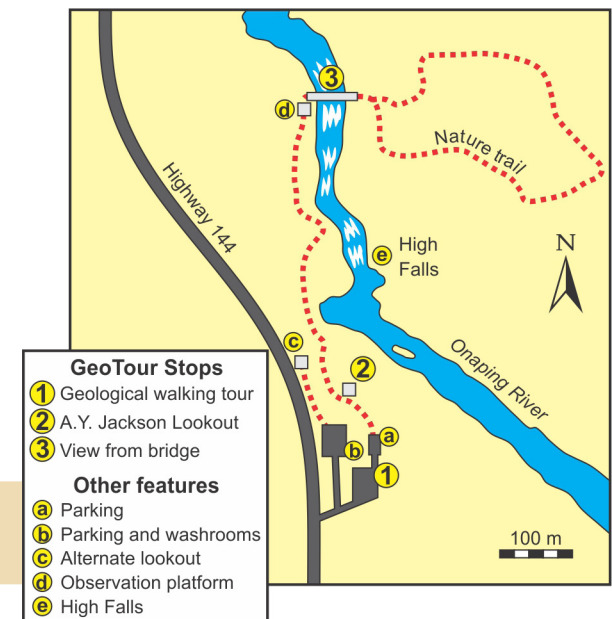
View of High Falls from the A.Y. Jackson Lookout.

The Greater Sudbury region has one of the largest concentrations of mines in the world. Over a third of a trillion dollars of metals, at today's metal prices, have been produced in 120 years of mining. This extraordinary wealth was created by a giant meteorite strike 1.85 billion years ago. This ore-bearing impact structure is one of the world's most famous geological features.

Perhaps, surprisingly, there is no better place to tell this story than the A.Y. Jackson Lookout overlooking High Falls, on Highway 144 northwest of Greater Sudbury city centre.

How to get there

The A.Y. Jackson Lookout is located on Highway 144, 35 km northwest of downtown Greater Sudbury and 5 km north of the town of Dowling.



Map of A.Y. Jackson Lookout and trail.

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Greater Sudbury's ancient meteorite strike

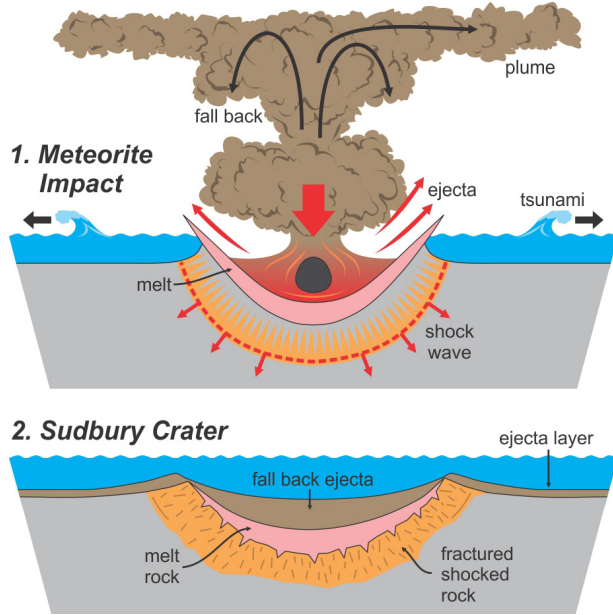
Scientists believe that a 10 km diameter meteorite struck the Earth near the present site of Greater Sudbury 1.85 billion years ago. The impact blasted out a circular crater 6 km deep and 200 km in diameter along the coastline of an ancient continent. After the impact, the crater was partially filled with melted rock and explosion-related debris. Metal-rich liquid separated from the melted rock, and sank to the crater floor, forming Sudbury's famous ores of nickel, copper, platinum and other metals.

Over the past 1.85 billion years, Sudbury's meteorite crater and its fill have been deformed by Earth forces and much of the crater has been eroded. What is left of it forms an oval-shaped structure 60 km long, 20 km wide and 10 km deep. Greater Sudbury city centre lies just south of what remains, and A.Y. Jackson Lookout overlies the layer of fall-back debris near the northern edge of the crater. The highway route from downtown Greater Sudbury to the lookout crosses the ancient crater.

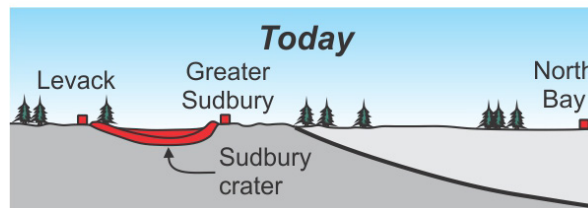
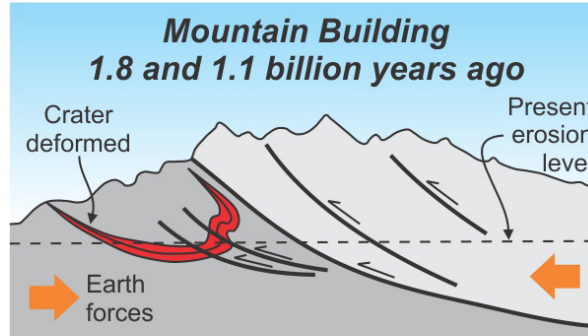
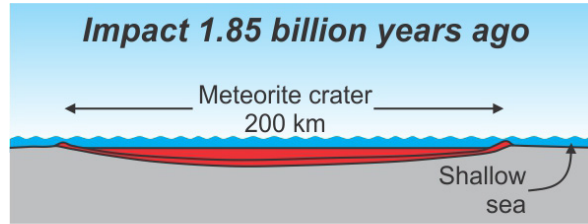


An artist's impression of a meteorite hitting a coastal area. *Courtesy of NASA.*
Image courtesy of NASA and artist Don Davis.

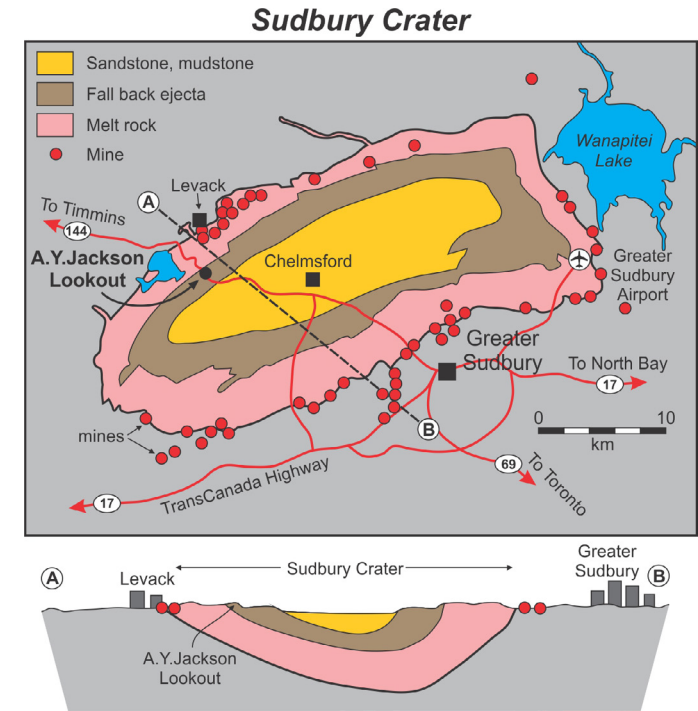
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A cartoon showing the origin of the Sudbury crater.



The original circular crater, some 200 km in diameter, has been squeezed by Earth forces and eroded, so that only a much smaller remnant of it remains today.



Map of the Sudbury impact crater with the location of A.Y. Jackson Lookout. The lookout lies on fall-back debris that partly filled the ancient crater. Mines extract ore from the margins of the crater and in cracks around and beneath the crater in older rocks. Lower figure shows subsurface cross-section along line A-B.

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Stop 1: A geological walking tour of Greater Sudbury's rocks

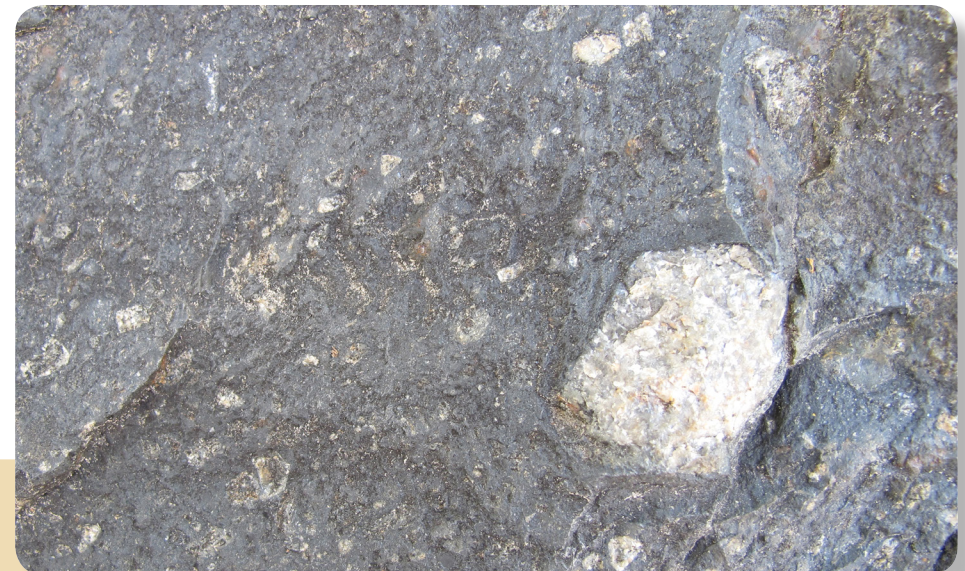
On display beside the parking area of the A.Y. Jackson Lookout are representative samples of rock types related to Sudbury's meteorite impact crater and its associated nickel-copper ores.

Fall-back debris from the ancient impact

Find the large sample of rock with a sign labeled "Onaping Formation". Look for the small pieces of rock within the sample. These are fragments of broken rock that were blasted out of the crater by the meteorite impact. Rock and dust that fell back onto melted rock on the crater floor were fused together as the hot rock cooled. This "fall-back" rock is well exposed in the High Falls area, so early geologists named the rock unit after the nearby Onaping River.



Stop 1: Large rock specimen is part of the geological walking tour at the parking area for the A.Y. Jackson Lookout.



Stop 1: Close-up of Onaping Formation. Large rock fragment is 2 cm in diameter.

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Melted rock in the crater

Nearby is a large grey rock on a pedestal labeled "Norite". If you look closely you will see that it is composed of intergrown crystals of light-coloured minerals (feldspar) and dark-coloured magnesium-iron-silicate minerals (pyroxene), giving the rock a salt-and-pepper texture. The intergrown crystals suggest that the rock formed by crystal growth from melted rock and it is therefore an igneous rock. Geologists refer to this specific rock type by the general term gabbro, or specific term norite. Scientists interpret that the meteorite impact melted 27 000 km³ of rocks. This liquid then cooled to form melt rock, including norite.

Metals from melted Earth

The remaining large blocks in the rock garden are rusty weathering with a metallic sheen. These are iron-rich nickel and copper ores from mines in the Greater Sudbury area, and are labeled footwall breccia, disseminated ore and massive high-grade ore. Look closely and you will see that the brown tarnish is a rusty coating that only partly obscures the sheen of underlying metallic minerals. The dominant mineral is pyrrhotite, a chemical combination of iron and sulphur. Though mined for their nickel, copper, platinum and other metal content, Greater Sudbury ores are largely made up of iron minerals.

Greater Sudbury's ores are not, as you might suspect, the melted remains of the meteorite. Instead, scientific studies show that the metals came from Earth rocks melted by the impact. Metals are present in trace amounts in all rocks. Because the impact melted vast volumes of rock, it allowed dispersed metals to collect as a separate metal-rich liquid that settled into depressions and cracks along the broken floor of the crater, and crystallized into the nickel-copper ores that have made Greater Sudbury famous.



Stop 1: Close-up of melted rock (norite) showing its salt-and-pepper texture.



Stop 1: Footwall breccia ore. Rusty-weathering ore fills ancient fractures in grey rock.

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Step 2: A.Y. Jackson Lookout

A short trail leads from the parking area to the lookout. From the platform there is a view of the Onaping River as it tumbles over the cascades of High Falls. The river drops more than 46 m in a series of waterfalls.

The A.Y. Jackson Lookout is named for a founding member of the “Group of Seven”. These renowned painters, starting in the 1920s, captured the beauty of northern Canada on canvas. In the spring of 1953, A.Y. Jackson came to the Onaping River to paint the landscape. His painting, entitled “Spring on the Onaping River”, hung at Sudbury Secondary School from 1955 until 1974, when it disappeared.

Step 3: At the bridge — on the rim of the eroded crater

From the lookout, the trail descends to the Onaping River at the base of the falls, and then climbs beside the river to the bridge. Broad areas of bare bedrock flank the river, scoured by spring floods during snow melt. If you look carefully, you will see that the bedrock is composed of rock fragments in a dark rock matrix. This rock is Onaping Formation, similar to the boulder on display in the parking lot, and is debris that was blasted into the atmosphere by the meteorite impact and that later settled back into the crater.

The trail leads to a bridge across the Onaping River above the falls. From the bridge there is a view down the falls. The river here tumbles down the north rim of the Sudbury Basin, a topographic feature that reflects the eroded remnants of the ancient meteorite crater. Melt and fall-back rocks around the crater edge that are resistant to erosion form the rim, while the softer sedimentary rocks that fill the centre of the ancient crater have eroded away to form the flat agricultural plain of “the Valley”. Highway 144 from Greater Sudbury city center to Levack crosses the entire ancient structure.



Step 2: View of High Falls from the A.Y. Jackson Lookout during spring flood.

Photo courtesy of J. Ireland.



A view across the eroded and deformed Sudbury crater along Highway 144 from the south rim to the north rim.

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