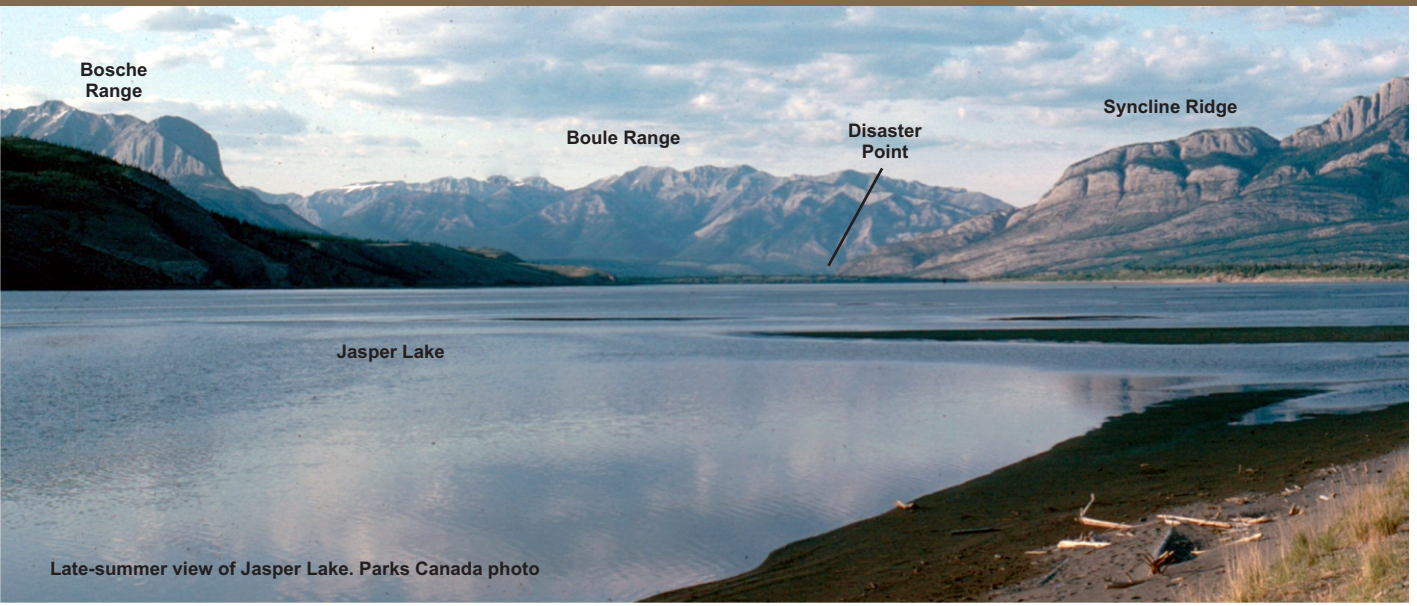


Late-summer view of Jasper Lake. Parks Canada photo

Location and directions:

Pull off Highway 16 at a small parking area 49 km west of Hinton or 30 km east of Jasper. There is no sign marking Jasper Lake, but if you're westbound watch for the bridge over the Rocky River. The pulloff is 6.7 km farther, on the left. Eastbound, watch for the bridge over the Athabasca River. The pulloff is 7.5 km farther, on the right. From the parking area, **carefully** cross the highway into the dunes beside the lakeshore. GPS coordinates: N53°05.440', W118°00.919'. Elevation: 1015 m above sea level

The mystery of Jasper Lake

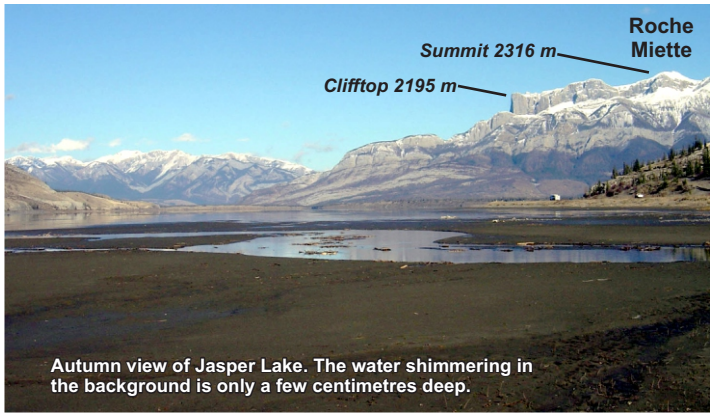
Jasper Lake is so shallow that it amounts to a moving sheet of water. You can actually see the flow from west to east as you stand by the shore, something that is not apparent in a normal, deeper lake. This is not so much a lake as a flood. It happens every year, all summer long.

At the eastern end of the lake, the water squeezes between two intergrown **alluvial fans** (deposits of water-carried gravel) from the Rocky River and the Snake Indian River, which flow in from the valleys on either side. Lots of mountain rivers get constricted in this way, backing up a lake behind the pinch point. The flat lake bed covers an area of 13 square kilometres. The Athabasca River spreads over this large area year after year, regardless of its rate of flow. One would think that in some years the Athabasca would run strongly and erode its alluvial-fan dam, draining the shallow lake completely. In other years the Athabasca might run with significantly less water, while the Rocky River and the Snake Indian River continue to supply gravel to the pinch point, thereby raising the level of the lake.

In fact, the power of the Athabasca does increase and decrease enormously, even over the course of the day, because the river is fed by glacial meltwater whose volume increases and decreases unpredictably according to the weather. The Rocky and Snake Indian rivers can also swell greatly, and out of sync with the Athabasca, from thunderstorm runoff.

Yet Jasper Lake's annual cycle—shallow water body in summer, bare sand flat in winter—continues year after year, maintaining the lake's size and depth with incredible precision. And that's the mystery. What is regulating this? Is there some sort of balance in the rate of river flow, alluvial-fan deposition and alluvial-fan erosion? Or is something else at work, something very steady, such as gentle subsidence of the valley floor?

At present, we don't know.



Autumn view of Jasper Lake. The water shimmering in the background is only a few centimetres deep.

Sand dunes in the Canadian Rockies


Low dunes of wind-carried sand along Highway 16 by Jasper Lake

Every summer the water in the Athabasca River, and thus the water in Jasper Lake, is cloudy with sand and **silt** (particles smaller than sand grains but larger than clay particles). Much of the silt is **rock flour**, meaning tiny fragments of stone eroded by the glaciers upstream.

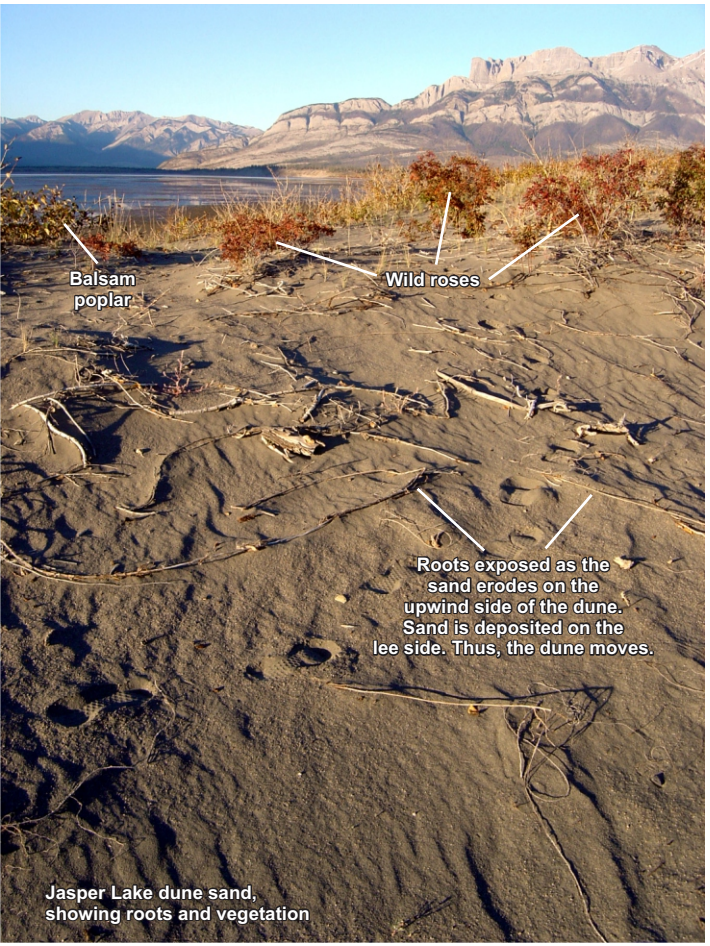
The flow of water through the lake is rapid enough to carry much of the rock-flour silt, but the sand is too heavy. It drops out. So do the larger particles of silt, those over a hundredth of a millimetre in diameter.

In the autumn Jasper Lake disappears, leaving the Athabasca River flowing in a narrow channel across the exposed lake bed, which has been coated with another layer of sand and silt. The wind blows from southwest to northeast in the winter, especially during **chinooks**, which are periods of warm, very strong winds. These winds move the sand along the lake bed in hops of a metre or so, a process known as **saltation**. Sand collects in places where the wind speed is less, and that is where we find dunes up to 20 m in height.


Sand and silt blowing along the bare lake bed in winter

Silt particles are small enough to be picked up by the wind and carried along, sometimes for great distances, even across oceans. The rock flour on the dry lake bed moves eastward in clouds of dust. Much of it leaves the national park, winding up in the foothills of the Rockies and on the plains farther east, where it enriches the soil and makes it limy (containing the mineral **calcite**, $CaCO_3$), because much of the rock flour is eroded limestone. Wind-deposited silt is known as **loess** ("loorse").

What can live among these dry, windy dunes?



Rapidly growing plants such as grasses, wild roses, willows, balsam poplars and aspens can keep ahead of the shifting sand. Their root systems seek the moisture deep in the sand. Western jumping mice, garter snakes and dung beetles prefer sandy habitat. Bighorn sheep eat the grass, and the wide-open space here gives them ample warning of approaching wolves. When threatened, the sheep run to the safety of nearby cliffs. In winter, their thick wool protects them from the wind.

Want to know more?

Consult these publications and websites:

• Gadd, Ben (2008) *Canadian Rockies Geology Road Tours*, pages 414 (more about Jasper Lake).

• —— (2009) *Handbook of the Canadian Rockies*, pages 176–182 (more about Rockies rivers, lakes and dunes) and 213–215 (chinooks).

Check out the GeoVistas brochure for nearby Disaster Point.

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

Please refer to this publication as:

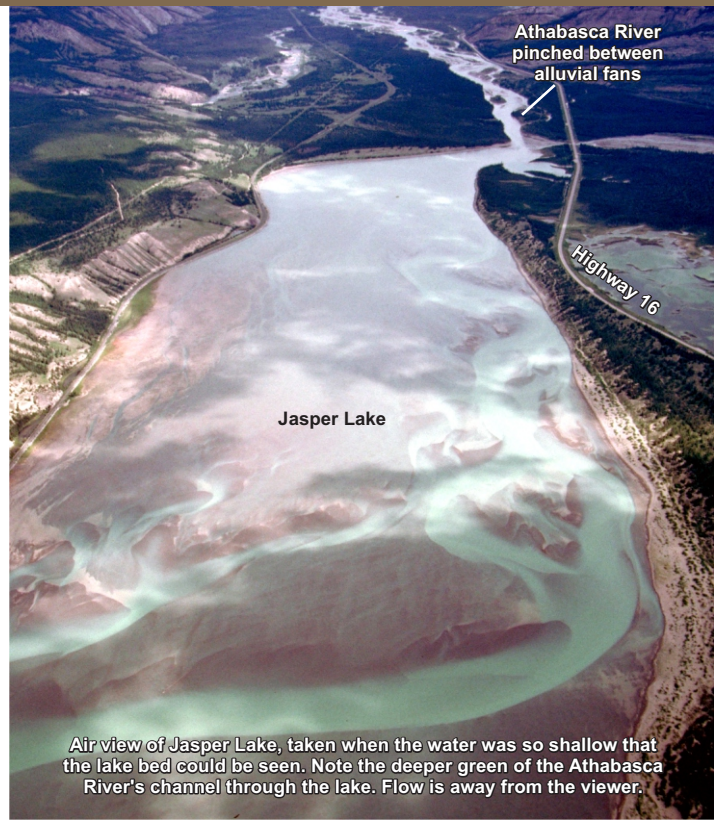
Gadd, B. (2011) *Jasper Lake GeoVistas Brochure*, published by the Canadian Federation of Earth Sciences.

Également offert en français

planetearth® Earth Sciences for Society
planèteterre Géosciences pour la société

Published in celebration of the International Year of Planet Earth, **www.earthsciencescanada.com**.

Special thanks to the Geological Survey of Canada, Canadian Geological Foundation, Parks Canada and the Friends of Jasper National Park for their support.



Air view of Jasper Lake, taken when the water was so shallow that the lake bed could be seen. Note the deeper green of the Athabasca River's channel through the lake. Flow is away from the viewer.

Jasper National Park
Jasper Lake

Dunes, dust and a geo-dilemma

Jasper Lake is a strange water body, 1.6 km wide, nearly 10 km long and only a metre deep. It has an annual cycle—full in summer, dry in winter—that we don't fully understand.

GeoVistas
Earth Science vignettes