Location and directions:

From Jasper's east exit, take Highway 16 eastbound. After 1.5 km, turn right onto the Maligne Road and cross the Athabasca River. Keep left immediately (Jasper Park Lodge is to the right) and continue to the parking lots at kilometre 45. Walk downhill to the shore.

GPS coordinates: N52° 43.726', W117° 38.404'. Elevation 1670 m

Different rock, different mountains, different ecosystems

Anyone standing on the shore of Maligne Lake and enjoying the view could not help but notice how different the landscape looks on each side of the lake, especially the mountains near this end of the lake. To the left (east), the peaks are mainly gray, with big cliffs. To the right (west) the peaks are mainly brown, and they are gentler.

The reason is geological. A fault runs along the Maligne Valley. Named the **Pyramid Thrust** for Pyramid Mountain near Jasper, this major break divides mainly Paleozoic limestone and shale on the eastern side from older rock on the western side that is quite different: Proterozoic and Cambrian **gritstone** (a kind of coarse sandstone), **slate** (metamorphosed shale) and **quartzite** (very hard sandstone). Overall, the rock on the west side of fault is easier to erode than the rock on the east side.

The Pyramid Thrust continues south from Maligne Lake, but not down the middle of the lake. It is found to the right (west) of the big two-summitted peak, **Mt. Charlton** (3217 m) and **Mt. Unwin** (3268 m). They are both on the limestone-and-shale side of the fault.

Much of the landscape you see on the west side of the fault has been carved in gritstone and slate. The topography beside the lake is rolling and the summits are not very high. There are few cliffs. The slope exposure is to the northeast, so the sun hits the surface at a low angle, spreading its energy over a wide area. Lower sun angle means cooler soil. So the ecosystem on the right (west) side of the lake is cooler, with a thick forest of moisture-loving trees such as Engelmann spruce and subalpine fir. The snowpack is over a metre thick there in winter, attracting animals that can survive in deep snow—moose and caribou—while the wolves that would otherwise prey on them avoid snow that deep.

On the left (east) side, the rock resists erosion better and forms cliffs. The slopes face southwest, so the sun strikes at a high angle, practically straight-on. The energy is more concentrated, so the soil is warmer. More moisture evaporates, so the slopes are drier. The ecosystem here is thus grassier and more open, with drought-tolerant trees such as lodgepole pine.

This is good habitat for mountain goats. You may see them in open places at and above the treeline. Look for white dots on the green slopes.

The prevailing winds blow from the southwest. In winter the wind removes much of the snow, allowing mountain goats to reach the low-growing grasses and wildflowers they eat. Also, mountain goats need cliffs to climb where they can escape the grizzly bears, wolves and wolverines that prey on them. The geology on the east side of the fault provides **escape terrain** for them.

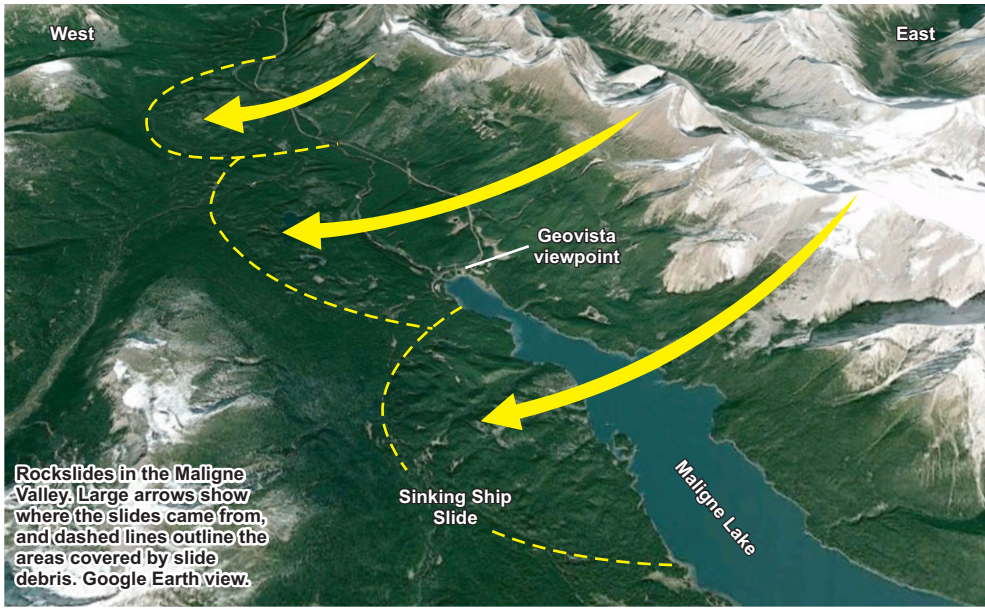
The moraine that wasn't

As the road approaches Maligne Lake, it climbs 40 m onto lumpy terrain underlain by bouldery rubble from large rockslides. These slides occurred many thousands of years ago, so the enormous debris heaps are well vegetated, but a road-cut through the material displays many small fragments of reddish-brown Triassic siltstone. In the meadows just beyond, you can see boulders of gray Carboniferous limestone.

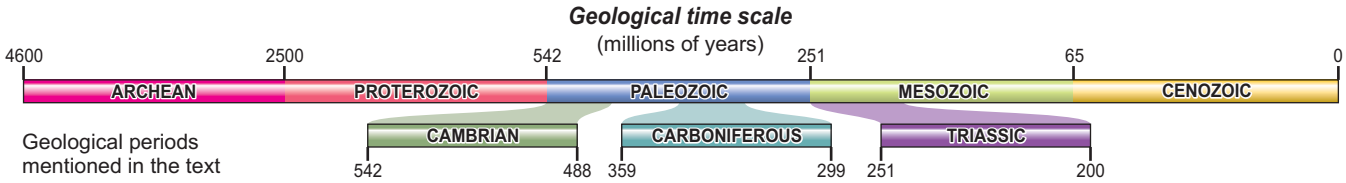
Once thought to be **moraines**—mud and stones deposited by a glacier—we now know these landforms for what they are. The slide heaps reach all the way across the valley. They must have raised the level of Maligne Lake 30–40 m and made the lake quite a bit longer than it was before the slides.

The parts of these rock units that did not slide are found intact on mountains along the east side of the valley, so we know where the slides came from. The layers angle down toward the valley floor. When ice-age glaciers widened the valley, cutting into the sloping layers and steepening the valley walls, the lower edges of the layers were no longer supported. Large slides were inevitable.

The biggest here is called the **Sinking Ship Slide** and totals about 500 million cubic metres of fallen rock. This is the second-largest measured slide heap in the Canadian Rockies.



Rockslides in the Maligne Valley. Large arrows show where the slides came from, and dashed lines outline the areas covered by slide debris. Google Earth view.



Cutting Maligne Lake in half

Twelve kilometres up the lake, cruise boats full of sightseers pass through **Samson Narrows**. (See the cover photo.) At this place, two streams flow into the lake from opposite sides. Each carries sand and gravel eroded from the surrounding peaks.

The two **deltas** thus produced are growing. The space between them is now less than 100 m across, and it must be closing rapidly, in geological terms.

When will the two deltas join? Without doing a proper study, we can't be sure. But enjoy an unimpeded trip down the lake while you may.

Maligne Lake is not, as you may read or hear, the "second-largest glacially fed lake in the world." This is misinformation that refuses to go away. There are many lakes, including a number in British Columbia, that are larger and also receive water from melting glacial ice.

Want to know more?

Consult these publications and websites:

• Gadd, Ben (2008) *Canadian Rockies Geology Road Tours*, pages 18, 19, 64–67, 434–438 (gritstone and slate) and 21 (quartzite), 36 (types of faults).

• —— (2009) *Handbook of the Canadian Rockies*, pages 55 (limestone), 62 (more about gritstone and slate), 73 (sandstone and quartzite), 164 and 165 (rockslides).

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) *Maligne Lake GeoVistas Brochure*, published by the Canadian Federation of Earth Sciences.

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Maligne Lake from the air. View is from southeast to northwest.

Jasper National Park
Maligne Lake

Rockslides, moose and mountain goats

Pronounced "Muh-LEEN," this is the longest natural lake in the Canadian Rockies (22 km) and the third-deepest (97 m). Were it not for a local disaster many thousands of years ago, Maligne Lake would be considerably shorter. Currently, though, Mother Nature is doing her best to cut the lake in half.

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