Manitoba
Sustainable Development

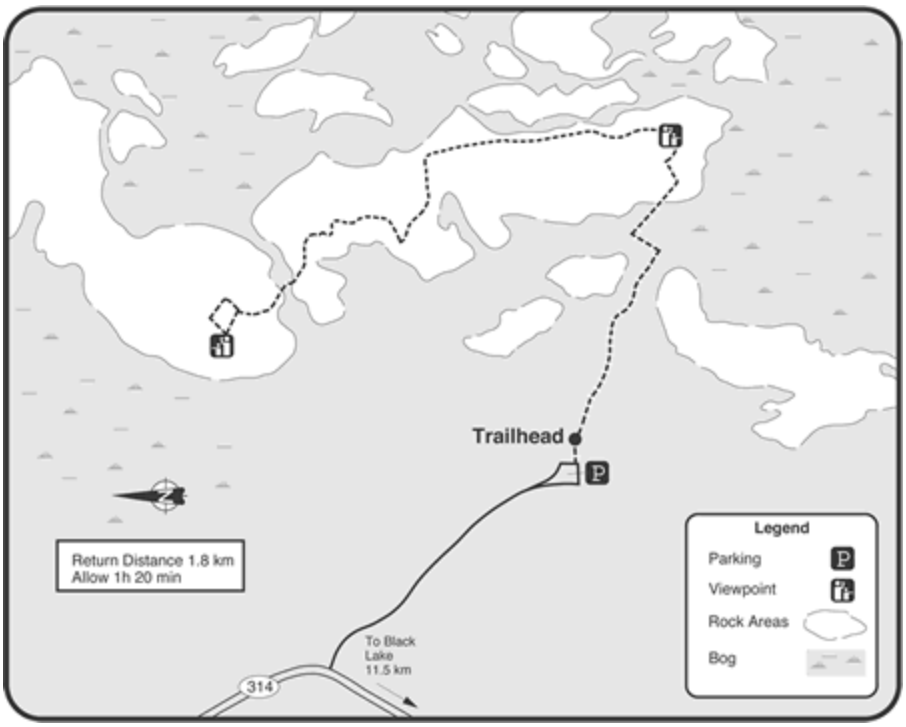
Eastern Parks

Nopiming Provincial Park

Trail Information

Along this trail you can explore two important aspects of Nopiming Provincial Park's natural history. You'll see first hand, the vigorous growth of a young forest after a major forest fire. And, you can examine rocks exposed by the fire, which reveal that ancient mountains once towered above here. Numbered posts at the sites correspond to numbered texts in this brochure.

- This is a moderately difficult hike leading to a magnificent 360-degree view which includes Tooth Lake. The trail surface is mainly bedrock with several short, steep inclines. Some stairs have been provided.
- Proper footwear is a must and hikers should be in reasonably good physical condition.
- Young children may have to be carried at a few places and should be supervised at all times.
- Please do your share to protect our park resources. Removing minerals without a permit in a park is unlawful and it deprives others of exciting discoveries. Here and anywhere else in the park, take only pictures and leave only footprints.
- Open fires are prohibited.



Introduction

On Labour Day, 1983 a "dormant" creature of the forest awoke from its slumber...lightning awakened fire. In a period of prolonged drought, the long weekend had record high temperatures and high winds. Conditions were ideal.

In the weeks that followed, what has come to be known as the Long Lake Fire, swept across here and burned an area of 25,420 ha (98 square miles).

Forest fires, except those caused by people, are a common and natural part of the boreal forest ecosystem found in the park. Although they destroy what they burn, fires are part of a forest's web of life, rejuvenating the forest and creating mosaics of new and old plant communities.

When the Labour Day fire removed vegetation in Nopiming, it revealed more of the park's rock foundation--the root of an ancient mountain chain, which billions of years ago, was like today's


2 Winnipeg Free Press, Tuesday, September 6, 1983 **

Fire forces evacuation

Winnipeg was hotter than Hell as temperature hits record 39°C

4 Winnipeg Free Press, Tuesday, September 6, 1983

Fires 'roar over' forest campers

Forest fires burning out of control

1,450 people forced to evacuate parks, reserves at Ontario border

Six massive fires burning parkland at Ontario border

Newspaper headlines from the time

Rockies. The rocks on this trail provide us with clues about events, deep in the Earth, when these mountains were formed and later, eroded.

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1. First Clues

The rock that you see here underlies the low ground overgrown with trees, bogs and lakes. It is mostly sedimentary rock. The light grey and brown stripes are tilted layers that were originally flat "beds" of sand and mud.

These sediments were deposited on a sea floor nearly 2.7 billion years ago. A few million years later they were buried deeply in the Earth's crust. They were changed to "hard-rock" by heat and pressure during continental collision that destroyed the ancient sea, and built mountains (Figure 1).

Look for curved grey and brown stripes, beds of rock that were bent in this slow, but powerful process.

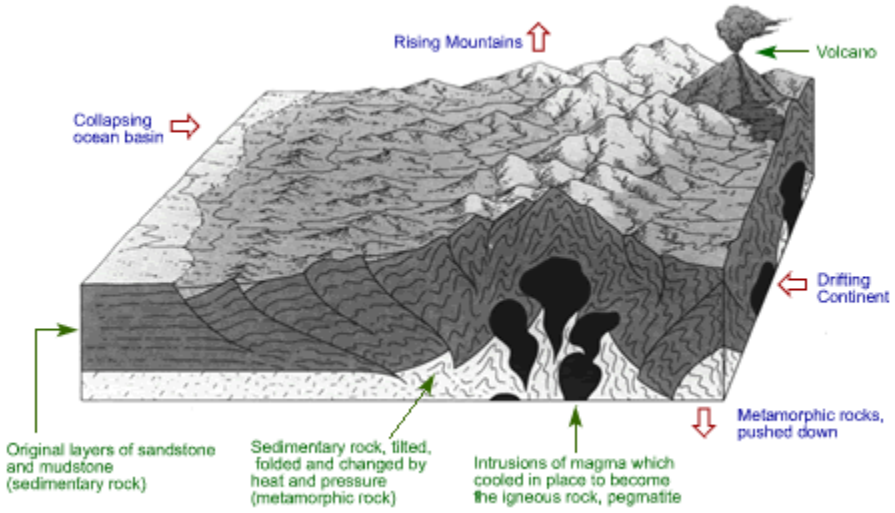

Figure 1: Mountain building

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2. Forest Rejuvenation, the Jack Pine

Jack pine is one of the first trees to appear after a burn. It is often called a fire adapted species because it requires extreme heat or fire to reproduce.

The curved cones remain closed until extreme heat opens them releasing small brown winged seeds that may germinate in the open sunlight. It can thus establish quickly on the charred landscape before its slower competitors can.

Closed jack pine cone, needles *J. Tallosi*

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3. "Liquid Rock"

The white rock is an igneous rock called "pegmatite" (pronounced, peg-ma-tight). It is similar to granite, but made of larger crystals of grey quartz, pale pink feldspar, glassy to brown flakes of mica (mike-uh) and black tourmaline (tour-ma-lean), a mineral containing silica, alumina and boron. Look for shiny crystal faces of pink feldspar that flash against sunlight when you move your head.

The pegmatite was once "magma," a hot liquid that had been melted from the Earth's crust. It was squeezed up, like toothpaste, between cooler sedimentary rocks where it crystallized and became solid again. (When magma reaches the surface in volcanos it is called "lava.")

Look for dark grey "islands" in the lighter pegmatite. These are broken pieces of sedimentary rock which were carried along in the liquid magma.

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4. Crowding

Each jack pine cone can scatter several dozen seeds. Where conditions are favourable, many take root. Seedlings grow into dense stands that resemble people standing in a crowded elevator.

Through competition for available food and light, and because jack pine cannot grow in the shade, only a few of the young trees will reach maturity. By seeding many, natural process ensures that enough will survive to form a new forest.

Plentiful cones on young trees attract red squirrels which, in turn, attract predators like the fisher and the coyote.

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5. Metamorphic Rock

The original rock has been changed by heat, deep in the Earth, like potter's clay "fired" to become china. Sedimentary mudstone was recrystallized or "metamorphosed" to brown mica schist.

Some of the tiny new crystals, formed during the change, were sillimanite (sill-i-mah-night), which can be grown in a laboratory at 550º C and at high pressure. Its presence here indicates that the rocks had been pushed down to a depth of 12 km during mountain building.

Look for white lenses, a few millimetres thick: they contain sillimanite fibres. You'll have to get down and close to see them.

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6. Pegmatite ill

This is the main boundary between the grey sedimentary rock and pale pink pegmatite. Pegmatite is very hard and makes up the entire hill that you will climb on the trail ahead.

A strip of the grey rock in the pegmatite contains 1-cm long brownish grey andalusite (and-a-lu-sight) crystals, right next to a black vein of tourmaline. The andalusite is an "indicator" mineral like sillimanite at Site 5. It is formed at lower pressure, a possible clue to the uplift, and erosion that finally destroyed the mountains.

About 10 m ahead and to your left, some pegmatite became layered as pulses of the molten rock and hot fluid were squeezed upward to form a large "intrusion" (see Figure 1). Look for alternating light and darker patterns resembling waves. The pegmatite contains up to 50 cm long

crystals of pink feldspar, intergrown with grey quartz crystals, mica flakes and black tourmaline crystals, up to 5 cm long.

The Bog

This bog dramatically illustrates the way fires can change growing conditions for plants. Before the burn this was a black spruce bog with close-growing trees that barely allowed any light to reach the ground layer. Now, only burned tree remnants stand in a bog that is fully open to sunlight, allowing different plants to flourish. Eventually, black spruce and tamarack will become dominant again and shade the ground.

Ice Sculptors

Look below at the smooth surfaces of rocks that the glacier sculpted and polished about 13,000 years ago when Manitoba was covered by ice. This ice was more than 2 km high. Advancing glaciers of past ice ages gouged out and removed the softer sedimentary rocks which once enclosed this pegmatite hill and the others nearby.

In what direction was the glacier moving? Look for scratch marks or shallow grooves on the rock surface, during your hike. Some are up to 10 cm wide.

Contours of the remaining rock determine today's topography, drainage patterns and vegetation communities. Depressions are characterized by lakes and bogs. Pockets of sand/clay provide ideal growing conditions for trees. On rock outcrops, only the hardiest plants can gain a foothold. In this way, the ancient geology controls the present landscape. Weathering rock is the source of soil minerals, essential for plants to take root and to obtain nutrients.

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8. Islands of Jack Pine

Jack pine are a hardy tree species, able to take root in harsh environments such as this mostly bare, rock outcrop. Small islands of jack pine become established in cracks, on ledges ...wherever there are sufficient amounts of soil and moisture.

If jack pine can send their tap root down to obtain adequate nourishment, moisture and anchorage, they will grow into full-sized trees. If their roots are blocked by solid rock and nourishment is limited, they will be stunted, and only reach a maximum height of 2 to 3 m.

9. Trembling Aspen

Trembling aspen are post-burn pioneers, growing mainly in areas where there is plenty of soil, like down below. New trees sprout from the surviving roots of burned, older trees. They establish quickly in the open sunlight and on soil, which was fertilized from the ash of past fires.

Although aspen produce large quantities of seeds, they most often reproduce by sucker growth from the roots of previous trees. Each is therefore a clone of its predecessor. Members of a clone come into leaf or turn yellow at the same time each year. Such a group may be the clone of a single tree that started from a seed several hundred years ago.

Young aspen and shrubs attract snowshoe hare, white-tailed deer and moose, along with their predators--lynx, coyote and wolf.

Aspen leaves *J. Tallosi*

10. King of the Mountain

You've reached the top, congratulations! From here the trail continues to the right in a 120-metre loop around the summit, providing several spectacular views. Due to steep slopes, children should be kept close to parents or guardians at all times. When you return to this marker, follow the same trail you came on, to return to the parking lot.

11. Sheep-shaped Rock

Southeastward, Flintstone Lake is visible in the distance.

Below, is the best view of the glacier's handiwork in sculpting the rock. The similar shape of several rock hills shows that the ice flowed from the northeast to the southwest (left to right). Northeast slopes became gently curved as ice and debris carved the landscape. Southwest slopes became steeper, angular faces where huge blocks were plucked off by the ice. These angular blocks in turn, carved the slopes of the hills down-ice and were crushed and ground into rounded glacial boulders and rock flour that make up much of the soil. See Figure 2.

The technical term for a landform sculpted in this manner is *roche moutonée* (rosh moo-tone-ay) which has been translated from French as "sheep-shaped rock" and "sheep's back."

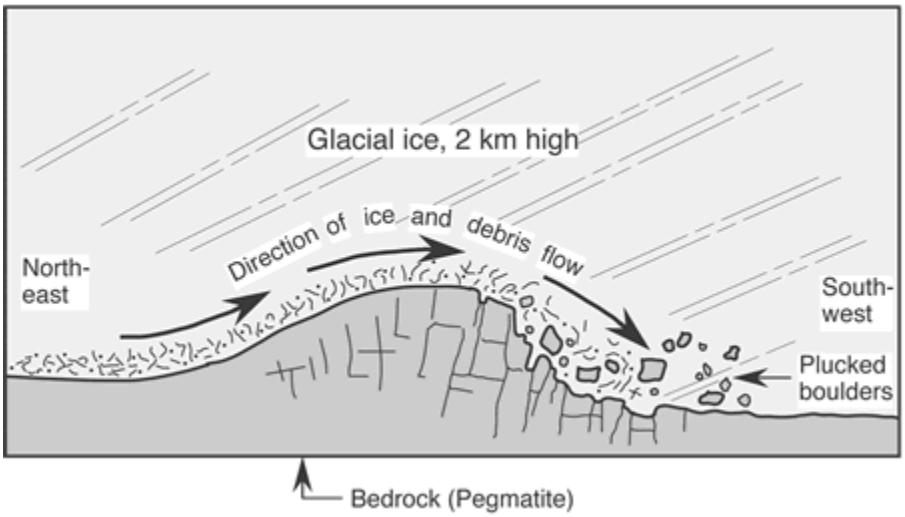

Figure 2: *Roche moutonée*

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12. Rock Eaters

Northward, in the distance, are patches of black spruce, spared by the 1983 fire.

On the rock you'll find colonies of green, paint-like lichen (lie-ken) and the leafy, black lichen, called rock tripe. They are the only plants able to grow in this harsh environment of bare, windswept rock. Lichen extract minerals from the rock they are attached to, thereby eating away the remainder of the mountains.

Please take care not to walk on these delicate plants; when dry, they are as brittle as potato chips and are easily destroyed.

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13. Vanished Mountains

Westward is the breathtaking view of Tooth Lake. Above its southwestern shore are other white outcrops of the same type of pegmatite as you are standing on.

In nearby clefts you can observe the very slow process of nature trying to establish small pockets of soil in which plants can get a foothold. Progress has been slow since the Ice Age. Some depressions hold no more than murky, nutrient-rich water which erodes minerals from the bedrock, grain by grain. In others, mosses and a few grasses can grow; in places where sufficient soil has built up, there are stunted jack pine and aspen.

This is how mountains are eroded over millions of years.

Where did the mountains go? They became Hecla's limestone cliffs, the sand at Grand Beach, shales that form the core of Manitoba's western uplands, rocks that bear dinosaur bones in Alberta, layers that form the peaks of younger mountains--the Rockies. In short, they became the mineral grains that, along with eroded materials from other Precambrian mountains, form all the clays, soils and boulders spread out across western Canada, and the lifeforms that rely on them, directly or indirectly, for nourishment....

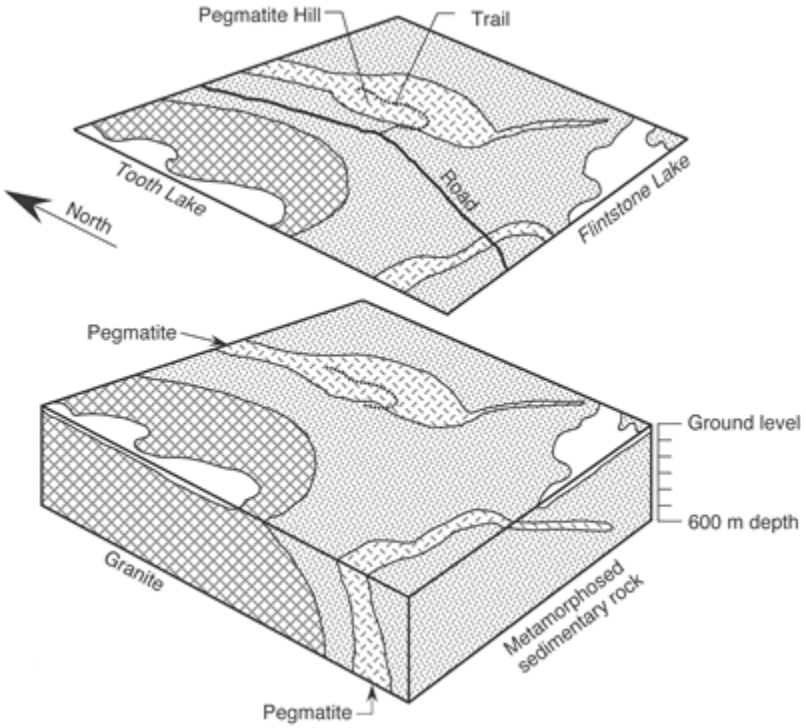

Figure 3: Top, geological map with reference points; bottom, block diagram showing the rock foundation between Tooth and Flintstone Lake, down to a depth of 600 m. The surface is profoundly eroded, with only low rock hills remaining. *Courtesy of Herman Zwanzig*

Conclusion

This landscape is the product of two intertwined processes which are dynamic and on-going. Regeneration of a forest after a fire, can be observed in a single lifetime. Formation and erosion of mountains requires a different time scale.

If the Earth's age of 4.6 billion years was compressed into a single calendar year beginning January 1, this pegmatite hill came into place as hot magma, about April 15, the Rocky Mountains uplifted in the evening of December 26 and the last Ice Age ended December 31, about 30 seconds before midnight. A human lifetime and the regeneration of a forest would elapse in the last tenth of a second before midnight.

Mineral crystals are to geological formations as wildflowers are to plant communities, both tell us a great deal about their respective environments, both recent and ancient. The presence of fireweed in a charred landscape tells us that the seeds of a new forest are taking root; tourmaline crystals in rock tell us about mountains that were here at one time, and in a sense, are still beneath our feet wherever we walk on the Prairies.

In popular Western culture, plant resources are regarded as living, organic and renewable while mineral resources are defined as inorganic, non-living and non-renewable. We depend on using both types of resources to maintain life and must do so with wisdom. Many Aboriginal cultures teach us that rock is also alive.

Further Reading

You can discover more about rocks, minerals and mountain building, in books that are available in libraries and book stores. Two of these are:

Chesterman, Charles W. and Lowe, Kurt E. *The Audobon Society Field Guide to North American Rocks and Minerals.* Random House of Canada; Toronto, 1979.

Zim, Herbert S. and Shaffer, Paul R. *Rocks and Minerals; A Guide to Familiar Minerals, Gems, Ores and Rocks.* Golden Press; New York, 1957.

Acknowledgements

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