Manitoba
Sustainable Development

Eastern Parks

Whiteshell Provincial Park

Falcon Creek Self-guiding Trail and Activities

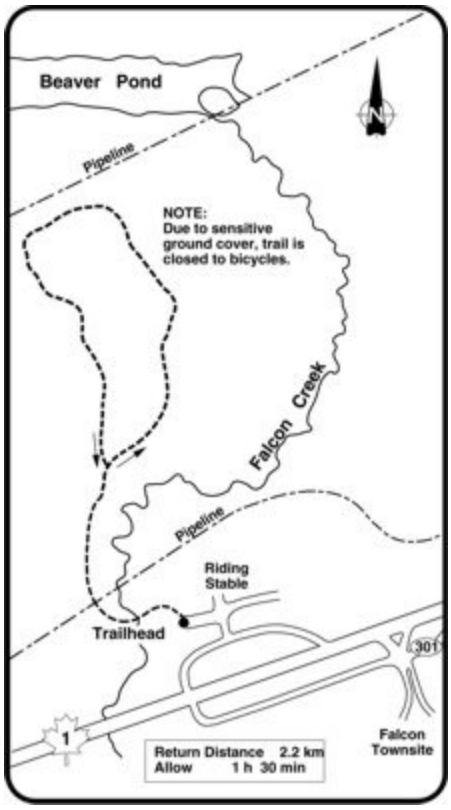
Before you start down the trail....

STOP - Before you start down the trail, bring along…

- Pencil
- Water
- Chocolate-coated candy bar with caramel and nougat like a Mars Bar (optional)

You may want to bring bug spray and a hat.

Introduction



Have you ever had a rock collection? Many of us are fascinated with rocks-their colours, shapes and textures. We imagine they are treasures with bits of gold, or fossils of ancient sea creatures, locked away in them. The rocks of the Whiteshell are treasures because they are so old. They have been on a great adventure around the world, and today they bear the scars of many fantastic events.

Welcome to the Falcon Creek Trail. Take this pamphlet, a pencil, water bottle and a candy bar (if you have one), and walk the trail. Read along at the numbered stops. It should take you about one and a half hours to walk the trail and do the activities. Be careful if the rocks are wet and slippery. We recommend you wear good walking shoes or hiking boots. Please supervise children at all times along the trail. Do your share to protect our park resources, take only pictures and leave only footprints.

---

1) Under the Ocean

Look around. Do you see any evidence of a volcano? Find a patch of bedrock rock-that dark green rock is called basalt (BA-salt). The basalt is made from cooled lava and ash from a volcano under an ocean-like the Atlantic or Pacific.

Ocean floors have mountains, valleys, canyons and even volcanoes. They also have something called a midocean ridge. The ridge is a mountain range with a large crevice running along the middle of it. The crevice is like a big crack in the floor where lava pushes up. The lava cools and becomes basalt rock. Volcanoes and mountains form at the ridges.

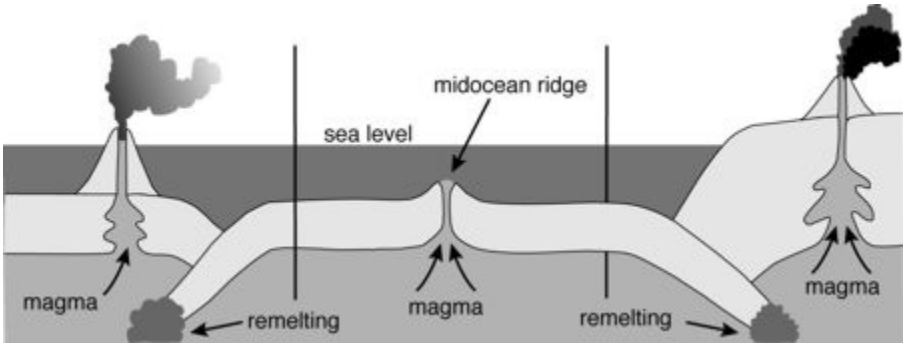


Figure 1: Midocean ridge. Adapted from *Project Earth Science: Geology,* National Science Teachers Association, by permission.

The ocean floor spreads apart at the crevice in the ridge. Look across the creek to the riding stables. Imagine the creek is the Mid-Atlantic Ridge in the middle of the Atlantic Ocean. The stables would be Europe and Africa. Where you are standing on this side of the creek is North America and South America. As lava pushes up where the creek is, it pushes the two sides away from each other. More and more lava pushes up and out and the continents move farther apart.

The basalt bedrock along the trail was formed under an ocean-by volcanoes and from cracks on the ocean floor. All this took place 2.5 billion years ago.

How old are these rocks? They are so old they were once an ocean floor.

Try this…

A syntu is a type of poem usually written about something in nature and has a simple five-line form.

Volcano
Tall grey cone
Strong and powerful
Silent while sleeping
Mountain
-*A Japanese Syntu*

Try writing your own syntu about rocks or the ocean, using these rules:

Line 1 - One word only
Line 2 - An observation about line 1, using only one sense (sight, touch, etc.)
Line 3 - A feeling, thought, or evaluation about line 1
Line 4 - An observation about line 1 (using a sense different from line 2)
Line 5 - A one-word meaning for line 1

*Used from *Project Earth Science: Geology.*

---

2) Wandering the World

If these rocks were formed under the ocean, how did they get here? It has been a long journey.

The Earth's crust is broken into plates or pieces, like the broken shell of a hardboiled egg. The plates are riding and sliding on the fluid mantle layer below.

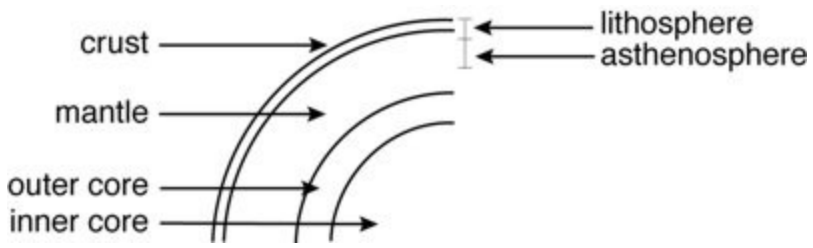


Figure 2: Cross section of Earth's crust, mantel, core. Adapted from *Project Earth Science: Geology*.

The plates were smaller and freewheeling in their younger days. Sometimes they collided with other pieces and became bigger, only to break apart later.

Have you ever noticed how South America and North America look like pieces of a puzzle that should fit with Africa? Scientists believe that 200 million years ago there was a mother continent called *Pangaea* (pan-GEE-uh) where most of the continental plates were joined.

All the plates including North America are still on the move-up to ten centimetres a year. We are moving west, away from the Mid-Atlantic Ridge. One day North America may bump into Asia.

How old are these rocks? They are so old they have drifted around the Earth's surface as a plate and crossed the equator several times.

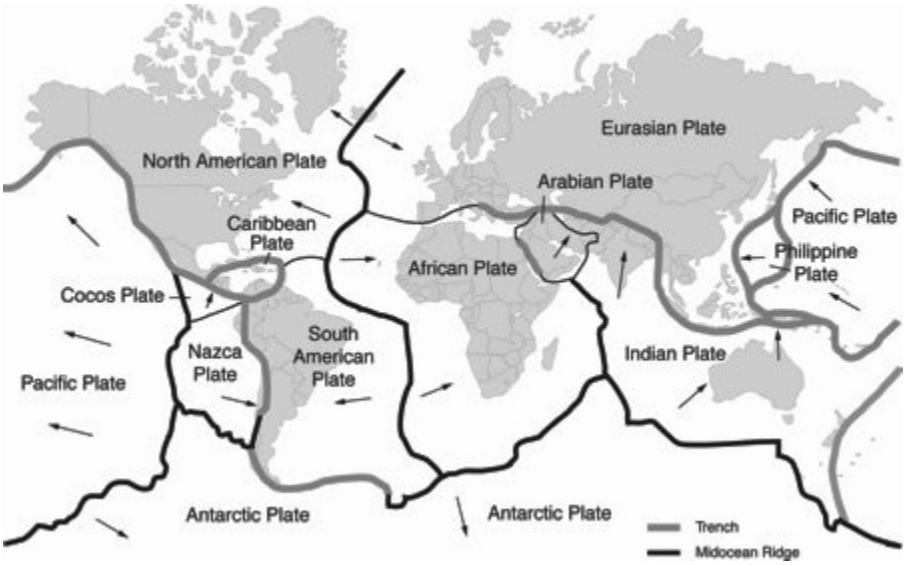


Figure 3: Today's major continental plates with their direction of motion.
Adapted from *Project Earth Science: Geology.*

Try this…

Take your candy bar and make a crack in the middle of the top with your fingernail. The chocolate coating represents the Earth's crust. Slowly pull the bar apart in the middle. The caramel and nougat inside represent the mantel the plates are riding on. The caramel is like the magma under the chocolate crust. Push the two pieces together again to see if the chocolate will build mountains or if one plate will slide under the other.

---

3) The Power of Ice

Volcanoes under the ocean, wandering the globe for billions of years-what is next for our ancient rocks? Ice, and lots of it.

This gigantic granite rock is an *erratic* (er-RAT-ik). We know this rock was moved here because it is made of granite, not basalt. Look closely-you can see mineral grains, and it is grey and pink, not dark green. Something very powerful moved this rock from a few kilometres north, where there are granite rocks. We know it didn't come from much further or it would be more rounded, less lumpy.

Massive *glaciers*, ice sheets several kilometres thick, have been scouring the Earth since the *Precambrian Era* 2.5 billion years ago. During each ice age glaciers have scraped and scratched and polished these rocks.

Figure 4: Extent of last ice sheet over North America. *Manitoba Conservation*

The last great glacier covered this area for more than fifty thousand years. It took five thousand years just to melt. That glacier left behind this massive piece of granite ten thousand years ago.

How old are these rocks? They are so old they have gone through at least 20 ice ages, each lasting thousands of years.

Try this…

It takes a lot of power to move a rock like this. Do you think you can move it? Try. Get everyone in your group to push hard and see if you can budge it.

As you are walking along the trail watch for more erratics-rounded rocks that are grey or pink.

---

4) Telltale Scars

Now that you are up on the rocks, get down and take a closer look at these old volcanic mountains. The rock here is fine grained-you cannot see the mineral crystals like you could in the erratic. Don't be fooled by the grey or green lichen growing on the rock.

These rocks are so old they have been metamorphosed-like a caterpillar in a cocoon they have been changed. At some point they were buried deep underground where heat and pressure changed them. Metamorphism, scoured by glaciers, wandering the world, and being blown from volcanoes-these rocks have been through a lot and they have the scars to show it.

How old are these rocks? They are so old they have no fossils in them because they formed before plants and animals existed.

Chattermark left by glacier as it moved from right to left. *Manitoba Conservation*

Try this…

See if you can find:

- *Fault lines* - a crack or several parallel cracks in the rock. The fractures are caused by movement deep underground-possibly the crust shifting or a meteorite striking Earth. Can you see how the rocks do not lineup on either side. They have shifted.

- *Polish* - a shiny part of rock polished by the glacier. A thin layer of water under the glacier was under great pressure, together with fine sand it polished the rock. Feel how smooth it is. After the glacier all the rock was like this but today most polish has worn away.

- *Striations* - scratches or grooves in the rock. Some striations are big, having been gouged out by large rocks, others are fine. Find an area where the rock is polished and put some water or saliva

on it-the fine lines you see are scratches from the glacier. Striations tell you which direction the glacier travelled.

- *Chattermarks* - a train of crescent-shaped gouges in the rock, caused by the heavy glacier dragging a rock over the surface. Find a small rock and rock it back and forth over the chattermarks to see how the glacier made them. Can you guess why they are called chattermarks?

---

5) Lowly Lichens

Not all the changes these rocks have been through are big earth-shattering events. Some are quietly going on under your feet. Slowly, bit by bit, these old mountains are being worn down by lichen.

Lichens produce acids that break down the rock. Some of the lichens have been working away at the rocks for a long time-lichens are among the oldest living things on Earth. A patch, ten centimetres across, of map lichen (the low crusty type) could be a thousand years old.

There are shrub lichens on the jack pine trees too.

How old are these rocks? They are so old they were once part of a great mountain range but have been worn down to their roots.

Try this…

Lichen List

Try to find at least one example of each of these types of lichen before the next stop. Remember not to pick any in the park-draw a picture instead.

- ***Crust Lichen*** - flat and hard it sometimes it looks like part of the rock. It often forms a circular colony and comes in different colours like grey, black, green, orange.
- number of colours or types found:
- colours:
- ***Leaf Lichen*** - small to large leaf or lobe. Small ones look like tiny lettuce leaves; large ones look like an oak leaf. The leaf can be curled with lighter colour on underside; green, yellow, grey, brown, black; brittle if dry. One type called rock tripe has been used for soup-but the acid can upset your stomach.
- number of colours or types found:
- colours:
- ***Club Lichen*** - little upright stems with clubs or cups on top. It is a few centimetres tall and some look like trumpets. One type is the red pixie-cup with a pale green stem and red top-also called British soldiers.

- number of colours or types found:
- colours:
- ***Shrub Lichen*** - round stems with many branches. Some look like miniature trees. Northern reindeer lichen is found here-it looks like pale green cauliflower. It is best not to touch as it can cause a rash.
- number of colours or types found:
- colours:

Which kind of lichen is most common?

---

6) Eureka !

Long after the volcanoes cooled and the rocks metamorphosed, something caused a fracture in the rock here. It might have been the meteorite at West Hawk or a shift in the plates that opened the fissure. When the crack opened magma from deep within the Earth pushed up to fill it. This smoky-white rock is quartz. It runs in a vein along the trail.

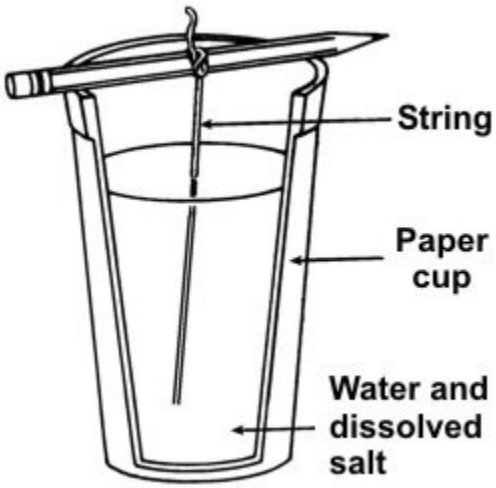
If you were a prospector you would be very happy to find this quartz vein. Gold is often found where there is quartz, especially if there are rusty-looking areas. Gold can be found with white quartz but it is more likely to be found with blue or grey quartz.

The Trans-Canada Pipeline runs parallel to the trail here. The rocks have been blasted to lay the pipeline. If you go down to have a look at the blasted rocks travel quietly and you may catch a glimpse of deer feeding along the pipeline.

How old are these rocks? They are so old they were old when the meteorite smashed into the Earth and formed West Hawk Lake 100 million years ago.

Try this…

Quartz crystals are six-sided and have a pyramid top. They are often sold for jewellery. You can try making salt crystals at home.



You will need:

- 250 ml (1 cup) of hot tap water
- 30 ml (2 tablespoons) of rock salt
- 15 cm (6 inches) of string
- 1 pencil

Add the rock salt to the hot water and stir until the salt is dissolved. Tie the string around the middle of the pencil and place the pencil on top of the cup

with the string in the water. Put it in a warm, sunny place and wait. Be patient, the crystals will take several days to grow. Examine the salt crystals' shape. They are cubic, with six faces.

---

7) Blowing Basalt Bubbles

Crouch down and look along the trail at the rock surface. Can you see outlines about thirty centimetres long, roughly diamond-shaped? The edges are dark and still have their glacial polish; the insides are more worn. These are pillows of basalt. This is the evidence that confirms the rock was formed under the ocean.

Imagine hot lava bubbling out of a volcano or midocean ridge and hitting cold water. The edge solidifies to rock quickly-becoming obsidian (ob-SID-ian) or volcanic glass. But the basalt inside the bubble is still red-hot lava and breaks through to form another bubble or pillow. More and more basalt pushes through, forming a pile of pillows. As the pillows cool they settle down on the pile with little space between them. That is what you are looking at-a pile of pillows.

The pillows have been flattened and stretched over time. The edges, once volcanic glass, have been changed too. As you walk along the back half of the trail look for more pillow basalt.

How old are these rocks? They are so old they were old when the Rocky Mountains were formed.

Pillow Basalt

Try this…

At home get a bowl of milk (chocolate milk works well) and a straw. Slowly blow bubbles into the milk. See if you can get the bubbles to pile on top of each other. If the bubbles were full of lava instead of air they would be pillows of basalt.

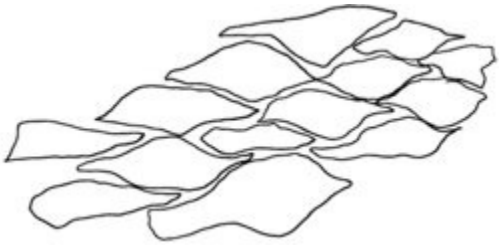


Figure 6: Look for pillow lava patterns like these (top view). *Manitoba Conservation*

---

8) A Quick Pit Stop

Can you see where a hole has been blasted in the rock (the tree is growing out of the middle of it)? A prospector couldn't resist digging a test pit to see if there was any gold at the end of the quartz vein. Alas, it was in vain. There was no gold, but it provided an avenue for the tree roots to become established.

---

9) Whaleback

When you are hiking along the rock outcrops do you ever pretend you are walking on the backs of dinosaurs or whales? Well, you just walked over a whaleback.

Turn around and look back down the trail. To the right of the trail the rock forms a smooth, rounded slope-that is the whale's head. To the left the rock slopes gently down, then it drops off into broken pieces-that is the whale's tail. The glacier sculpted the whaleback as it moved from right (NE) to left (SW).

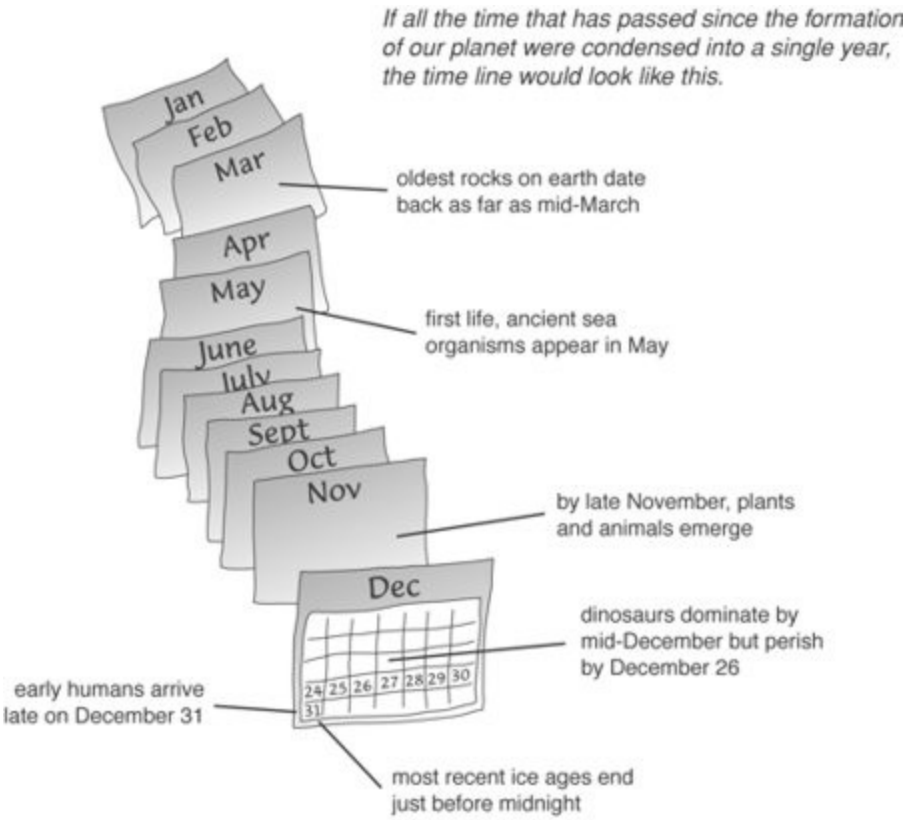


Figure 7: Whaleback formation. *Manitoba Conservation*

This is a great spot to see and feel the pillow basalt. There is also another indication of the volcanoes here. Look for pieces in the rock five to ten centimetres long, imbedded in the pillows. They are a different colour and texture. Those are what geologists call bombs or *pyroclasts* (pie-row-KLAST)-fragments of rock blown out of the volcano.

How old are these rocks? They are so old they were old when the dinosaurs walked the Earth.

Try this…

Pillow Rubbing

Put this page of the pamphlet over the edge of a pillow. Rub the pencil over the edge to get an impression of the pillow basalt to keep as a souvenir. Can you see how the edges that were once volcanic glass leave a smoother impression?

---

10) Island Shore

Don't trip over the round rocks scattered across the trail. Notice their colour and shape-they are erratics like the giant rock at Stop 3. Erratics are rocks transported by a glacier. They are a different kind of rock (granite) than the bedrock (basalt) of an area. They are rounded from tumbling.

This collection of erratics might have been part of a little beach here eight thousand years ago. When the last glacier melted, Lake Agassiz formed and covered most of Manitoba. It took a long time to drain away and as it did, it stayed at different levels for a while. Each level is marked by beach ridges around the province-like the hills you climb on the way from Winnipeg to the Whiteshell.

The higher rocks at the last stop might have been an island poking out of Lake Agassiz and this was its little beach. The water lapping at the shore of the island would round the rocks and wash away any finer sands.

How old are these rocks? They are so old they were once part of a continent connected to Europe and Africa.

Try this…

Write a *syntu* about an erratic, as described at Site #1.

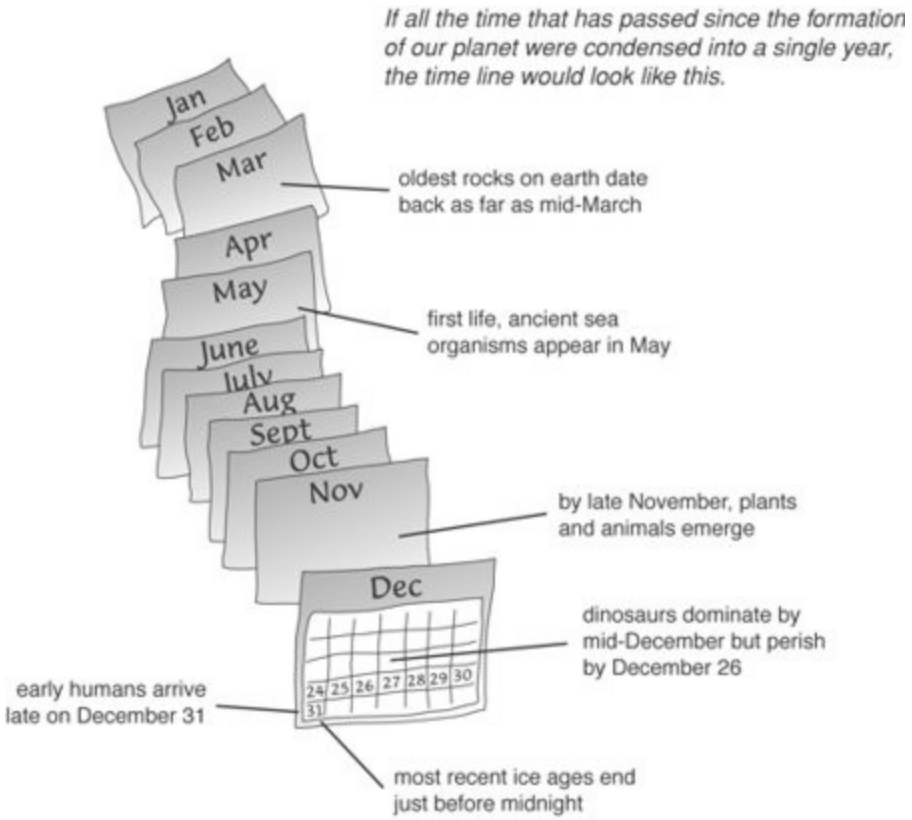
---

11) Geological Calendar

Have a seat on the rock.

Billions, millions, thousands-those are big numbers and long times to imagine. Try this to understand geological time. Scientists estimate the Earth is 4.6 billion years old. If 4.6 billion years were compressed into one year then these rocks would have formed in mid-March. The first life, ancient sea organisms, arrived in May. In late November plants and animals showed up. Dinosaurs were stomping around on the rocks in mid-December and disappeared the day after Christmas. Early humans showed up for the party on New Year's Eve and the last ice age ended just before the stroke of midnight.

How old are these rocks? Your turn. They are so old ...



Try this…

See if you can find the following on this last rock outcrop.

Chattermarks	
Glacial polish	
Striations	
Quartz vein	
Pillow basalt	

Bomb	
Erratic	
Fault	
Whaleback	

---

12) Conclusion

The rocks of the Whiteshell, both basalt and granite, have been on a fantastic journey through time. They have been shaped, changed and remade by some of the Earth's most dramatic natural processes. Not all events are spectacular like volcanoes and glaciers. Some like lichens are slow and constant. Many of them are going on today-the North American plate is moving closer to Asia every year. The rocks on the trail are slowly eroding and washing down to low spots, forming soil that provides nutrients for plants which in turn becomes food for animals. Bits of the rocks are washing down into this creek and out into Falcon Lake.

The rocks of the Whiteshell are some of the first rocks to form on Earth. They are treasures that show us the immensity of time and the constancy of change.

Glossary of Terms

Basalt: a fine-grained igneous rock, dark grey or green to black, contains no quartz

Erratic: an ice-transported boulder that does not derive from bedrock near its present site

Glacier: a large, long-lasting mass of ice, formed on land by the compaction and recrystallization of snow, which moves because of its own weight

Granite: a coarse-grained igneous rock composed mostly of feldspars and quartz; white, grey, pink or red

Lava: magma that reaches the Earth's surface

Magma: molten rock under the Earth's surface

Metamorphism: transformation of a rock into a different type of rock as a result of high temperature, high pressure, or both, but without the rock melting in the process

Midocean ridge: a giant mountain range that lies under the ocean and extends around the world (like the seams on a baseball), a large crack several kilometres wide runs along the crest of the ridge

Obsidian: volcanic glass, one of the few rocks that is not composed of minerals

Pangaea: a super-continent believed to have been the precursor to the current land masses found around the planet, occurred about 200 million years ago

Precambrian Era: a vast amount of time in earth's history that ended 570 million years ago

Pyroclast: fragment of rock formed by volcanic explosion

Syntu: a type of poem usually written about something in nature and has a simple five-line form

---

Further Information

- Visit West Hawk Museum's geology displays at the campground office.
- You can find introductory guidebooks for rocks and minerals at most bookstores and libraries.
- Erickson, Jon. Plate Tectonics: Unraveling the Mysteries of the Earth, rev. edition. New York, NY: Checkmark Books, 2001.
- Johnson, Linda et al. Plants of the Western Boreal Forest and Aspen Parkland. Edmonton: Lone Pine Publishing and the Canadian Forest Service, 1995. A good guidebook for the area and includes a section on lichen.
- Roberts, David C. Peterson Field Guide: Geology of Eastern North America. New York, NY: Houghton Mifflin Company, 1996.
- Zim, Herbert S., and Shaffer, Paul R. Rocks and Minerals: a Guide to Familiar Gems, Ores and Rocks. New York, NY: Golden Press, 1957.
- On the Web, search for sites under keywords like, plate+tectonics and midocean+ridge.

Acknowledgements

Parks and Protected Spaces is grateful for permission to use the Syntu poem and activity, and to adapt several illustrations from Project Earth Science: Geology, copyright 2001, NSTA Press,

National Science Teachers Association, Arlington Virginia. The geological calendar is adapted from an illustration by Irene Guidici Ehret in Discover Nature in the Rocks, Stackpole Books, 1997. Used with permission of Stackpole Books. As well, Manitoba Geological Survey contributed to the development of this publication.