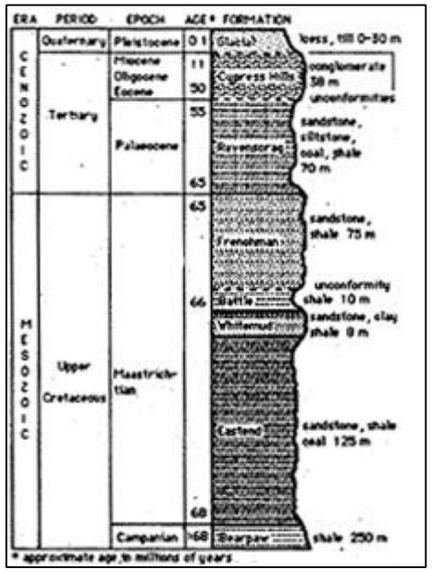
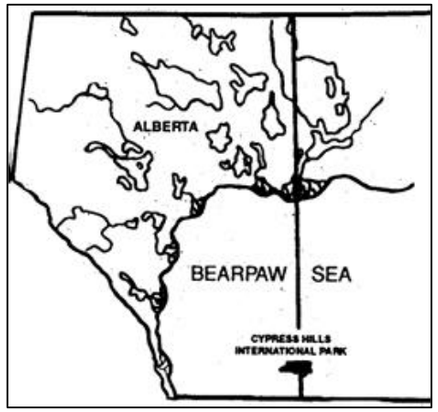


A High Plateau

The highest point in mainland Canada between Labrador and the Rocky Mountains, the Cypress Hills form a high plateau surrounded by a rolling upland. Climbing sharply from the north, the Cypress Hills reach their highest elevation (1466m) at Head of the Mountain, before gradually dropping back to the plains in the south. Formed by millions of years of sedimentary *deposition*, followed by millions of years of *erosion*, the Cypress Hills are known as an *erosional plateau*. Today, the Cypress Hills expose a unique cross-section of geological history found nowhere else in western Canada.

A Layer Cake

The Cypress Hills resemble a giant layer cake, composed of many layers of *sedimentary rocks.* Each layer, called a *formation*, formed at a different time under different conditions. The youngest formations are found higher in the hills. Sedimentary rocks are made from sediments which have been deposited by water, and then compressed and cemented into rock. The grain size of the rock indicates the environment in which the sediments were deposited. For instance, gravels are only deposited by fast moving streams, while fine clays are deposited in still water. Most formations are predominantly a single rock type, with thin *interbedded* layers of other rock types.



In the Beginning

The geological story of the Cypress Hills begins during the *Cretaceous* Period more than 70 million years ago, when most of southern Alberta was covered by the warm, shallow Bearpaw Sea. Large rivers from the west carried clay and silt which settled onto the sea floor. These sediments were compressed into a dark grey flaky *shale*, now called the *Bearpaw* Formation, which forms the base of the Cypress Hills.

Streams, Swamps &Sediment

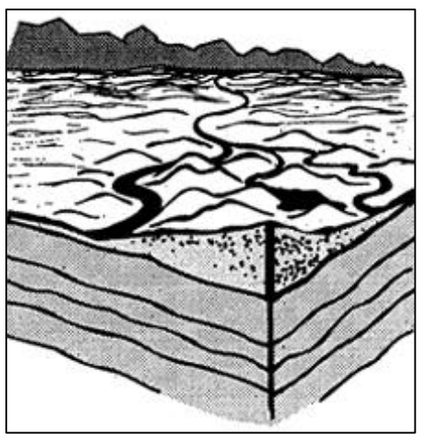
By about 68 million years ago the Bearpaw Sea had retreated to the east. The area became a forested, semi-tropical coastal region where deltas, rivers and swamps deposited mud and sand on top of the Bearpaw shale. Light grey and brown sandstones and interbedded dark grey shale originated in brackish fresh water, while thin coal layers formed from decayed vegetation in swamps. These rocks make up the thick *Eastend* Formation. As the sea receded, the thin *Whitemud* Formation, consisting of a fine, white clay with some interbedded sandstone and shale, was formed in still, fresh waters.

For a relatively short time, a brackish semi-marine environment returned, leaving behind the purple-grey shale of the thin Battle Formation. Active volcanoes far to the west also deposited layers of ash across the area at this time. The *Kneehills Tuff*, a 20 cm ash layer found in the Battle Formation, has been dated at 66 million years old. Later, deposition stopped in the area and some erosion took place, creating an *unconformity* in the geological record. Subsequently, large meandering rivers returned to the area, laying down sediments which formed the grey and brown sandstones and thin interbedded shale of the *Frenchman* Formation.

About 65 million years ago the dinosaurs became extinct, marking the end of the Cretaceous Period and the beginning of the *Tertiary* Period. During the *Palaeocene* Epoch, rivers and swamps continued to deposit sediments in the are, forming the sandstone, siltstone, coal and shale of the *Ravenscrag* Formation. Beginning about 55 million years ago major mountain building to the west formed the Rocky Mountains. Large rivers eroded the new mountains and deposited gravel and cobbles across the western plains, which a semi-arid environment had turned into a broad savanna. The uplift of the Sweetgrass Hills, around 50 million years ago, caused other rivers to carry the cobbles and gravel across the Cypress Hills area during the late *Eocene*, early *Oligocene*, and *Miocene* Epochs. The gravel and cobbles formed a conglomerate rock, called the *Cypress Hills* Formation – now the uppermost sedimentary layer which caps the Cypress Hills.

Divide & Erode

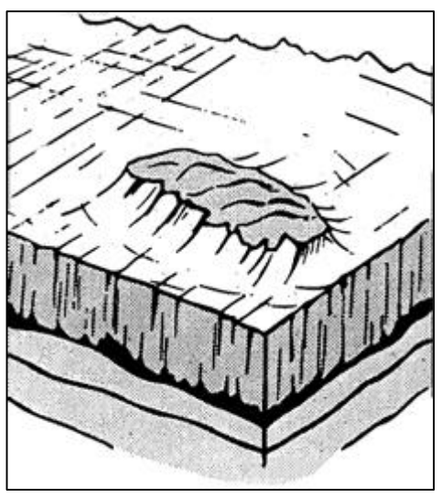
Over time, geological processes slightly elevated the Cypress Hills region. The sedimentary layers remained nearly horizontal, but the area became a *drainage divide*. For millions of years, large rivers originating in the mountains were forced to flow around this divide, lowering the surrounding land and isolating the Cypress Hills as a high plateau. Resistant to erosion, the hard conglomerate cap protected the softer rocks of the underlying



formations, ensuring that the area remained a flat-topped upland. Even before the Ice Age, the Cypress Hills had essentially developed their present form.

The Ice Age

As the climate cooled during the *Pleistocene* Epoch, huge continental ice sheets crept south. Glaciers flowed around the Cypress Hills plateau but never completely engulfed it. The top 100 meters of the plateau was left an island, called a *nunatak*, above the surrounding ice. The surrounding land and the lower portions of the hills were sculpted and eroded by the ice sheets. As the ice sheet finally began to melt about 15 000 years ago, large amounts of *till* – a mixture of silt, sand and gravel – was dumped into the plains and the flanks of the hills. High winds swept across the bleak landscape; blanketing the top of the unglaciated plateau with thick deposits of silt called loess. Meltwater coursed between the plateau and the retreating ice, carving out the valleys which now dissect many parts of the Cypress Hills.



The Changing Hills

By 10,000 years ago, the ice age was over. The last of the major geological processes playing a part in the formation of the Cypress Hills had ended, but even to this day, the hills continue to change. Erosion from streams and sudden thunderstorms deepens the coulees and ravines, while slumping and landslides wear away at the edges of the Cypress Hills.

Fossils

Throughout the geological history of the Cypress Hills, living creatures have flourished in the area. Some are now preserved as fossils. Marine mollusks – ammonites and baculites – occur in the Bearpaw Formation, while *Triceratops* and other fossils from the age of dinosaurs are occasionally found in the Frenchman Formation. The eastern portion of the Cypress Hills Formation contains abundant fossils of many strange and extinct mammals, including titanotheres, camels and sabre-toothed cats. A reminder that collecting fossils and rocks in a provincial park is prohibited.

Coal, Clay & Cobbles

Many of the formations of the Cypress Hills contain resources of economic importance. Although of poor commercial quality, the coal seams of the Eastend Formation were mined for local use in the early part of the century. The Whitemud formation is the most important source of ceramic clay in Western Canada, supporting the local pottery, pipe, brick and clay industries for many years. The large cobbles of the Cypress Hills Formation were once used for grinding phosphate in the manufacture of fertilizer. Gravel deposits were also mined for construction purposes. Mining, no longer permitted in the park, once played an important role in the development of the area.

For More Information

Many geological features are visible throughout Cypress Hills Interprovincial Park. Staff would be happy to direct you to these sites. For more information, drop by one of the Visitor Centres, or write to:

Cypress Hills Interprovincial Park

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Elkwater, AB.	Maple Creek, Sk.
T0J 1C0	S0N 1N0
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Text: Michael Klassen, Alberta Parks
Illustrations: Keli Polock, Alberta Parks

GEOLOGY

Cypress Hills Interprovincial Park

Rising more than 600 meters above the surrounding prairies, the Cypress Hills are a striking geological anomaly on the flat plains. Unlike the Rocky Mountains, these hills do not owe their existence to the faulting and folding of a geological uplift. Read this fact sheet to discover the unique geological history of the Cypress Hills

Fact Sheet