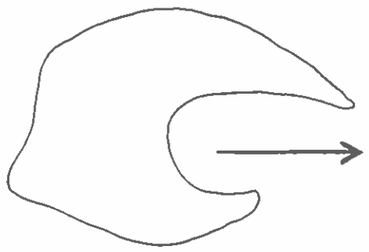
Coal Age Animals

Fossils found at Joggins provided some of the first evidence of early insects. One of these indicated that the coal swamps were home to giant dragonflies. Fossil fish scales are commonly found in the rocks along the Minas Basin. Small amphibians and primitive reptiles are found, although only rarely, fossilized inside the tree stumps at Joggins. But the most interesting type of animal fossil evidence in Nova Scotia is trackways. A trackway is a set of footprints showing part of the path of an ancient creature. At Joggins, trackways of a large many-legged Arthropod have been found. It may have looked like a giant (50cm) sowbug. You can view casts of these trackways at Mount Allison University, Sackville, N.B.

As early as 1841 geologist William Logan identified fossil vertebrate footprints in the beach sandstone at Horton Bluff, N.S. At that time fishes were the only vertebrates thought to have lived in the Coal Age, so Logan's vertebrate footprints were not widely accepted. Later, Sir John William Dawson and others discovered many trackways along the Minas Basin. In 1979 the Museum's attention was drawn to a set of exceptionally large fossil footprints near Horton Bluff. In the late summer of 1979 a team from the Museum cast this spectacular trackway in fibreglass to provide a permanent record.

There are 27 footprints along this 20m trackway, spaced about 1/3m long. There seem to be 2 toes on the front feet and 4 on the hind feet, some with claws. The fossil tracks are deep with raised edges, so either the animal was heavy or the mud very soft when it waddled by 350 million years ago. We can't say for sure what it looked like, because no bones of an amphibian large enough to have made those tracks have yet been found in Canada. We can speculate that it was something like a crocodile in appearance.

There are no huge dinosaur skeletons from the fossil-bearing rocks of Nova Scotia. Whole skeletons of any type or size are rare here. But these Horton Bluff footprints were made by a large, highly evolved animal that lived 100 million years before the dinosaurs. That makes them very important, and something of a mystery.



One footprint
1/3m

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Coal Age Fossils

"Coal Age" is a nickname for a part of the Earth's history called the Carboniferous Period. This period dates from about 280 million years ago to 350 million years ago. During the last part of the Carboniferous (280 to 310 million years ago), most of the great coal deposits of eastern North America were formed.

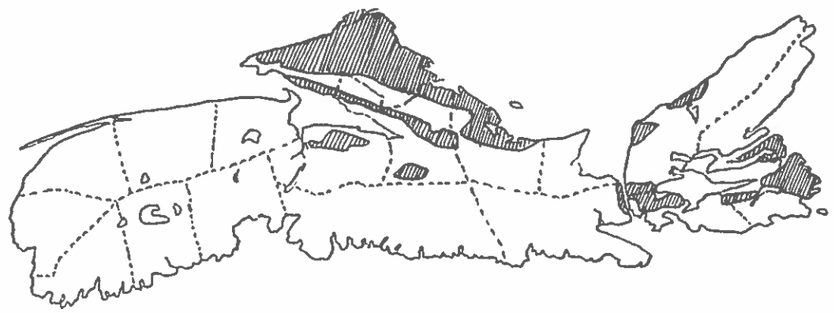
At that time Nova Scotia was a warm land close to the equator, with many flood plains and wide river deltas. Along the rivers and in swamps were dense growths of trees and leafy ferns. Giant insects buzzed about. Amphibians, both large and small, crawled and swam in the Coal Age, but there were no birds. Dinosaurs would not evolve for another 100 million years.

For you to find a fossil today, the ancient plant or animal must have been quickly buried and preserved after death. The fossil-bearing rock that then formed must not have been altered over the millions of years, and must now lie near the surface of the Earth. At Joggins, N.S., Coal Age streams carrying sediment from the Cobequid Mountains occasionally flooded the swamps and forests, burying trees and plants in mud and sand. This build-up of almost one kilometre of sediment kept pace with the sinking of the Earth's crust so the floodplain stayed about the same height above sea level. Pressure from that thick layer of sediment turned the mud and buried plants to stone. Millions of years later this fossil-bearing sedimentary rock was lifted up and tilted to expose the fossil tree stumps that have made Joggins world famous.

Sedimentary rocks on both sides of the Bay of Fundy are constantly eroded by the sea and the weather to expose fossils once hidden from view. Look for fossils on beaches, in the crumbling cliffs and along stream banks.

Coal is formed from dead plants. Peat—that is, layers of plants growing on the remains of their predecessors—is an early stage of coal formation. As hundreds of metres of peat and sediment build up, heat and pressure turn the peat into coal. Plants may be fossilized as casts or molds in the rock, or as thin layers of carbon. The coal and shale of Cape Breton is rich in fossils, including some ferns found nowhere else in North America. Search for them in coal dumps, mine tailings and along the shore. Remember that permission is required from the mine.

Carboniferous areas of N.S.

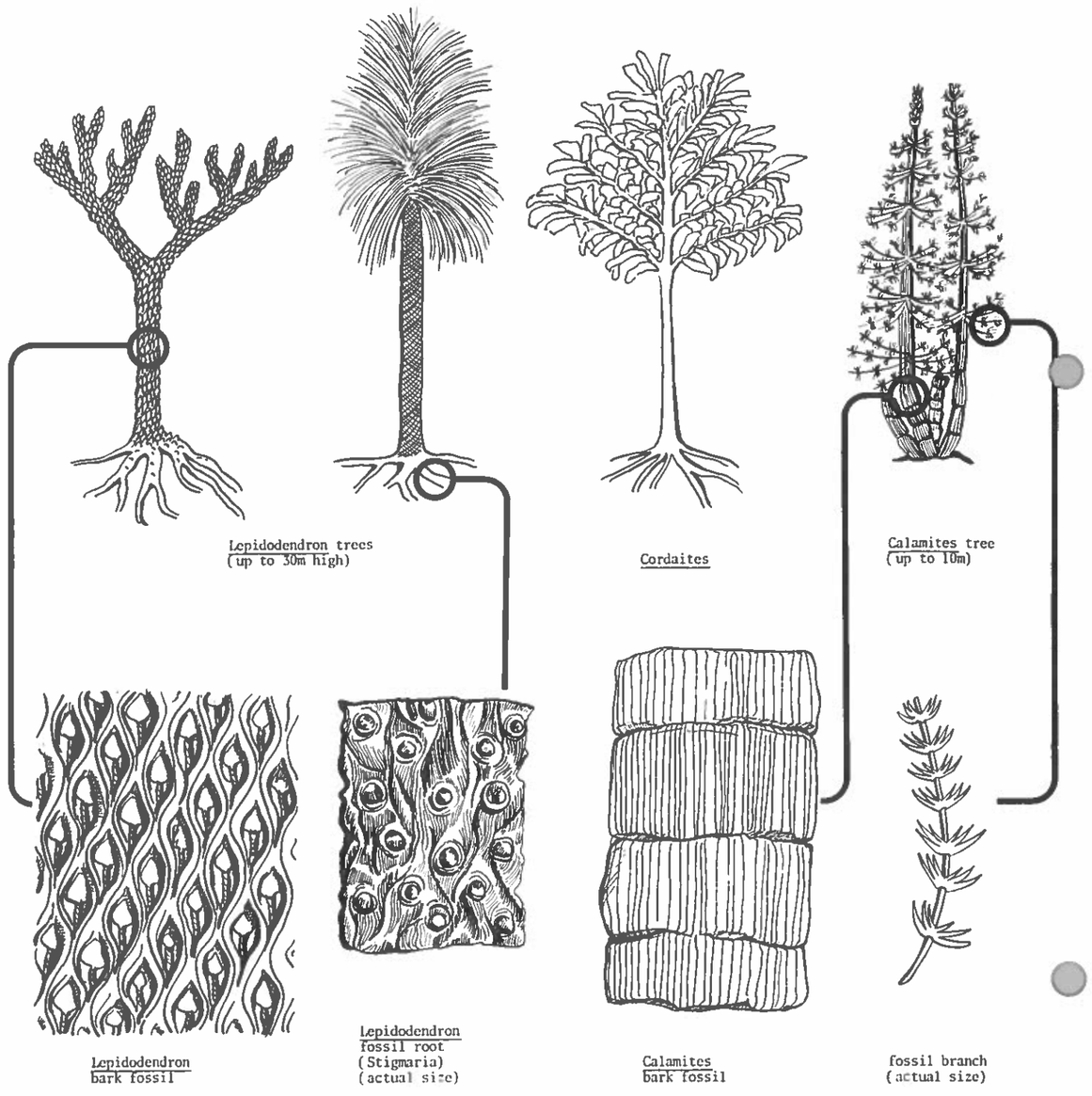


Coal Age Trees

Some Coal Age trees were probably over 30m high. Lycopods, or Scale Trees had scaly-looking bark that is often found fossilized. Their roots, with small round holes where the rootlets were once attached, are also common fossils, called Stigmaria. Lepidodendron and Sigillaria are two types of Scale Trees.

Calamites trees were straight and not as tall, perhaps 10m. They seem to have grown in dense stands, like bamboo. Calamites trunks were segmented and a circle of small branches grew at the joints. Parallel lines on the segments running up and down the tree make this an easy fossil to identify.

There are no Calamites or Scale Trees today, but smaller relatives have survived: the little horsetail Equisetum (also called scouring rush) is a Calamites descendant, and club mosses are modern-day Lycopods.



Lepidodendron trees (up to 30m high)

Cordaites

Calamites tree (up to 10m)

Lepidodendron bark fossil

Lepidodendron fossil root (Stigmaria) (actual size)

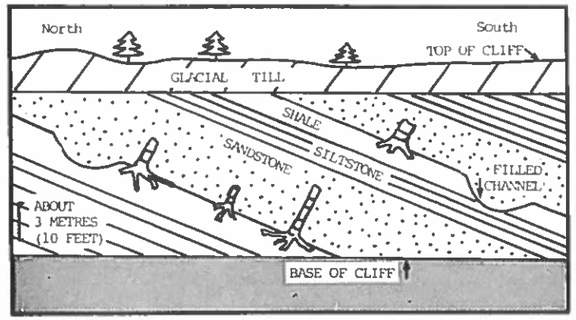
Calamites bark fossil

fossil branch (actual size)

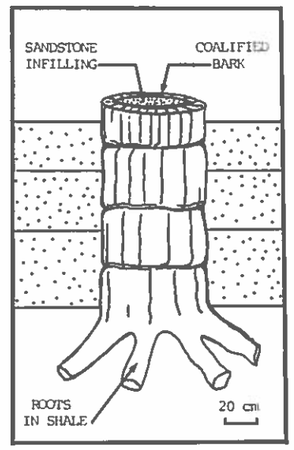
At Joggins, periodic floods brought sand and mud that would cover the bottom of a tree and kill it. The dead top was likely blown down by wind. Coarse sediment continued to pile up around the tree, eventually pouring in to fill the hollow stump. Sometimes at this stage small amphibians would fall into the stump and be buried. Slowly the thin layer of bark was changed to coal and the sand inside formed a sandstone fossil cast.

The beds at Joggins are tilted now. In some recent years more than thirty tree stumps have been visible in the cliffs; the erosion is so severe that any particular fossil tree is rarely visible for more than two years.

Joggins is a protected site. It is against the law to remove any material from the cliffs. You may collect fossils on the beach but only what you can carry in two hands. Fossils in the cliffs may have just appeared, and must be left for examination by paleontologists who frequently visit the site.



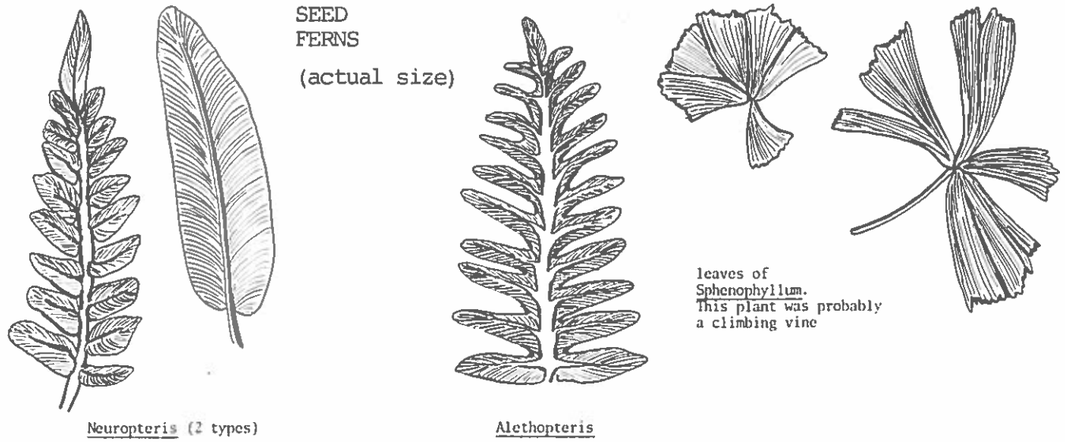
Cross-section of Joggins cliff today showing tilted beds and fossil tree stumps in sandstone.



Smaller Plants

The undergrowth of the coal swamps seems to have been mostly fern-like plants called Seed Ferns. Seed Fern leaves look very much like the leaves of modern ferns. The Museum collection also contains fossilized fiddleheads, the young stage of ferns.

Many species of ferns flourished during the Coal Age, and the fossil beds of Cape Breton have produced some unusual and especially well preserved fern fossils. For a detailed listing of Coal Age land plants, see the book Upper Carboniferous Fossil Flora of Nova Scotia, by E.L. Zodrow and K. McCandlish, published by the Nova Scotia Museum in 1980.



Neuropteris (2 types)

Alethopteris

leaves of Sphenophyllum. This plant was probably a climbing vine