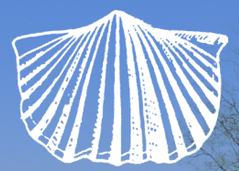
CLIFFS, GORGES, AND WATERFALLS

Clifty Falls State Park in Jefferson County, Indiana, is home to 1,519 acres of rugged, cliff-lined gorges and waterfalls. The distinctive landscape of Clifty Falls and the many other falls in the park is a legacy of the Pleistocene Ice Age glaciers that began 2.6 million years ago. Glacial drainage influenced the erosion of Clifty Canyon to expose the 444- to 359- million-year-old rocks that line the gorge. Today, waterfalls continue to erode the canyon and shape the landscape.

Horn Coral



Brachiopod

Bryozoan

Ancient Life

Fossils in the park strata reflect life in the geologic past. Brachiopods, horn corals, and bryozoans are among the most common fossils in the park. Fossil collecting in the park is prohibited, however. Please take nothing but photographs, leave nothing but footprints!

Hoffman Falls

The four main waterfalls of Clifty Falls State Park occur at the surface, or contact, that separates the soft limey shales of the Dillsboro Formation from the overlying limestone beds of the Saluda Member. At Hoffman Falls, water sprays down to the stony beds 78 feet below.

Tunnel Falls

Water from Deans Branch cascades over a limestone ledge before entering Clifty Creek Canyon 83 feet below, making Tunnel Falls the tallest waterfall in the park. An abandoned railway tunnel is located to the south of the falls.

Photos provided by the Ind. Dept. of Natural Resources and the Indiana Geological & Water Survey.

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Power of Erosion

The Southern Hills and Lowlands region is noted for its beautiful hills and valleys–a landscape created by erosion. The limestone and shale walls of Clifty Canyon were carved back when glacial meltwater drained south towards the present-day Ohio River. The canyon ranges from 120 to 300 feet in depth and features waterfalls and a rugged hiking terrain.

THE GEOLOGIC STORY

of Clifty Falls State Park

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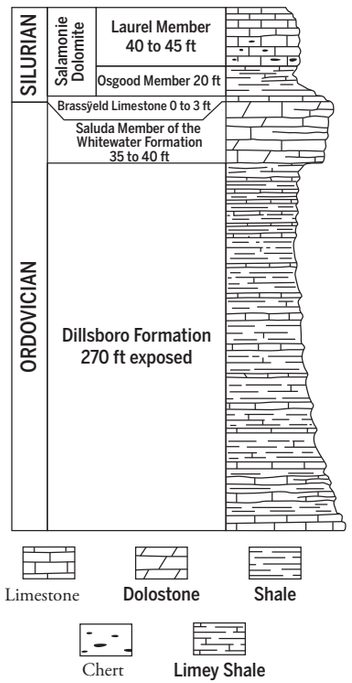
Origin of the Rocks

The rock layers exposed in the falls and cliffs of Clifty Falls State Park were formed layer by layer long before they were sculpted into the rugged terrain seen today. The story of these rocks begins 444–359 million years ago, when Indiana was covered by a shallow sea. The carbonates and shales of Clifty Falls tell the story of a shifting ocean in the southern hemisphere.

Rocks at Madison accumulated during the Ordovician (older) and Silurian periods. During this time, inflows of muddy water pulsed into the intracontinental sea and were deposited in the rock record as shale. Beds of fossiliferous limestone are interlayered in these shale deposits; when the seas cleared, animal life flourished on the bottom of the limy sea. The sequence of shale and limestone, formed through environmental shifts in the ocean, is called the Dillsboro Formation and can be found in the lowest slopes of the park.



Overlying the Dillsboro is the Saluda Member, also of late Ordovician age. The Saluda is composed of thick beds of limestone and dolostone with ripple marks and mud cracks. These sedimentary features indicate that deposition took place in a very shallow sea. The rock beds in this unit are thicker than other rocks in the park, making them more resistant to weathering. The Saluda forms the crest of Clifty Falls, Little Clifty Falls, Tunnel Falls, and Hoffman Falls, as well as the overhangs along some of the lower set of cliffs within the canyon.

After the Ordovician rocks were deposited, a temporary drop in sea level caused erosion and weathering. As the seas rose again, more clay and limy mud was deposited. These Silurian-age shales and limestone, which overlie the Ordovician formations, are exposed in the uppermost set of cliffs along Clifty Canyon. At the southern end of the park, the Brassfield Limestone appears in outcrop; but at the northern end, the Brassfield is absent due to erosion, and the Salamonie Dolomite rests directly on the Saluda Member. The uppermost member of the Salamonie Dolomite is exposed in the canyon and forms the uppermost set of cliffs.

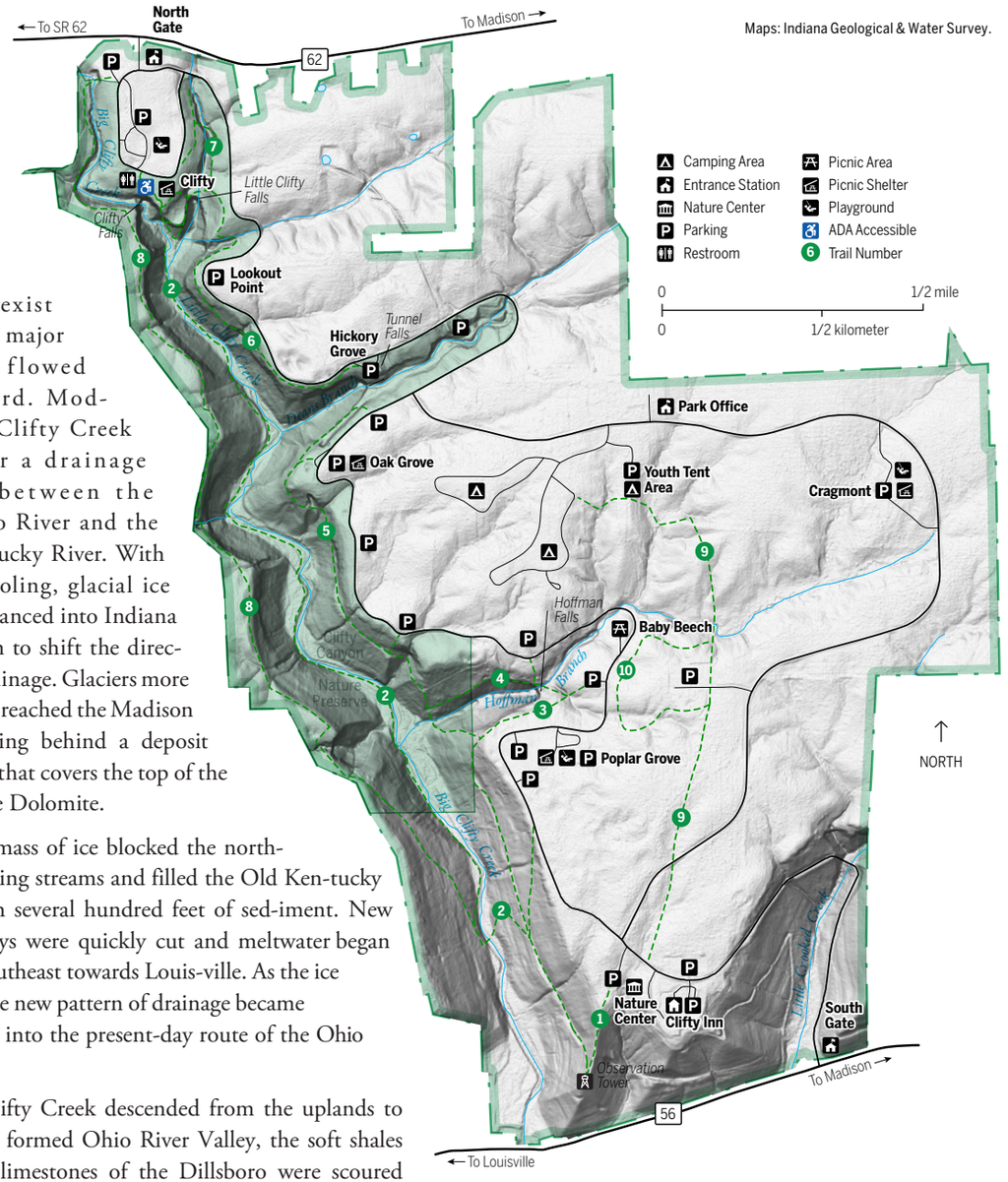
Fossils

Fossils represent life in the geologic past. Because life was constantly changing in the shifting paleoenvironments, different rock units throughout the park contain different types of fossils. All of the strata in the park contain fossils, but they are most abundant in the Dillsboro Formation. The most plentiful and noticeable fossils in the park are bryozoans, corals, brachiopods, and crinoids. Snails, clams, trilobites, and cephalopods can also be observed. Fossil collecting in the park is prohibited, however. Please take nothing but photographs, leave nothing but footprints!

Carving the Canyon and Waterfalls

The rugged, cliff-lined gorge and cascading waterfalls are the primary attractions of Clifty Falls State Park. While the rocks that make up these cliffs are millions of years old, the present topography is far younger. After tectonic shifts that moved Indiana to its present-day location, weathering and mass wasting began to sculpt the land.

During the Pleistocene Epoch (2.6 million–12,000 years ago), the drainage of streams and rivers was much different than today. The Ohio River Valley did not exist here and major streams flowed northward. Modern-day Clifty Creek was near a drainage divide between the Old Ohio River and the Old Kentucky River. With global cooling, glacial ice sheets advanced into Indiana and began to shift the direction of drainage. Glaciers more than once reached the Madison area, leaving behind a deposit called till that covers the top of the Salamonie Dolomite.



Maps: Indiana Geological & Water Survey.

The vast mass of ice blocked the northward-flowing streams and filled the Old Ken-tucky River with several hundred feet of sed-iment. New river valleys were quickly cut and meltwater began to flow southeast towards Louis-ville. As the ice melted, the new pattern of drainage became integrated into the present-day route of the Ohio River.

As Big Clifty Creek descended from the uplands to the newly formed Ohio River Valley, the soft shales and thin limestones of the Dillsboro were scoured from under the Saluda Member to form a waterfall. Despite its small size, Big Clifty Creek has a great deal of eroding power in a short distance. The falls progressively eroded back from the Ohio River to their present location. Weathering and mass wasting continue to widen Clifty Canyon by removing rocks and soil from the valley walls and transporting it down to the Ohio River. Today, the terrain of Clifty Falls State Park continues to be shaped by geologic processes.