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State Park Guide 7

GEOLOGIC STORY OF SPRING MILL STATE PARK

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY
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INTRODUCTION

Spring Mill State Park's historic impact ranging from the pioneer village to the space-age Grissom Memorial is matched by Indiana's heritage of nature that the park preserves. Caves, sinkholes, and many other features display classic geology, which, when fully understood, adds a new dimension of enjoyment to a park visit. How can caves be hollowed from seemingly solid rock? Why is so much of the surface of the park pockmarked by basinlike depressions?

The landforms of the park depend on two things: the kind of rock and such forces as running water and ground water (water in openings in the rock beneath the surface) that sculpture the rock. The layers of rock in the park were formed more than 300 million years ago during the geologic time interval known as the Mississippian Period. But weathering, mass wasting, and erosion by water, which still break down and move rock debris, have formed the present land surface within only the past few million years.

BEDROCK

The composition of the oldest rock in the park, the Salem Limestone, tells us that the deposits we now see as ledges of limestone exposed in various areas of the park accumulated at the bottom of the sea, for the Salem is made up dominantly of nearly sand-size fossils of sea-dwelling animals.

The Salem is world famous as a building stone. The park inn, the Empire State Building, and Indiana's state capitol are just a few examples of its use. In some places the upper part of this rock formation in particular is finer grained and less pure than the building stone. The entrances to Hamer and Donaldson Caves are in this less pure phase of the Salem. The Salem is being quarried for cement just a few miles from the park, and a small abandoned quarry is on the west bluff of Mill Creek between the dam and the park boundary near the limekilns used in the late 1800's for making cement.

Blind fish of Spring Mill Park caves

Overlying the Salem Limestone is a sequence of thinner bedded and less pure limestones that include some thin layers of shale and dolomite. These rocks are part of the St. Louis Limestone and indicate a change in conditions following deposition of the Salem. The thick deposits of gypsum mined from the St. Louis east of Shoals, Ind., indicate high concentrations of minerals in the sea, and this probably accounts for the scarcity of fossils in part of the formation. The higher and larger parts of the cave systems in Spring Mill Park are in the St. Louis Limestone, and the old gristmill is built of blocks of this rock. The formation is unusually well exposed above the entrance to Hamer Cave.

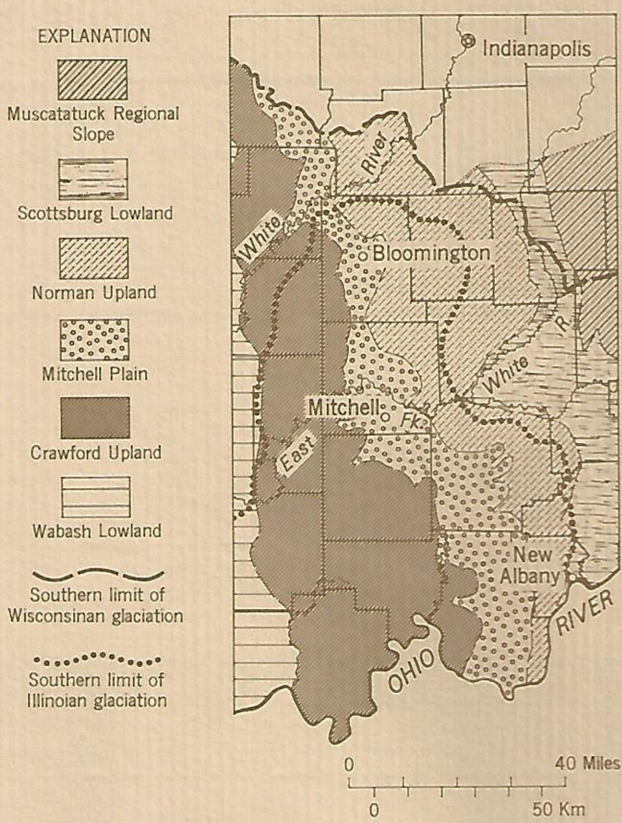
After many more hundreds of feet of sediment accumulated on top of the St. Louis Limestone, the area was uplifted, its rocks were tilted slightly toward the southwest, and erosion set in. During episodes of movement, intersecting systems of fractures called joints were formed in the rock, and they have exercised much control in the position of caves and sinkholes.

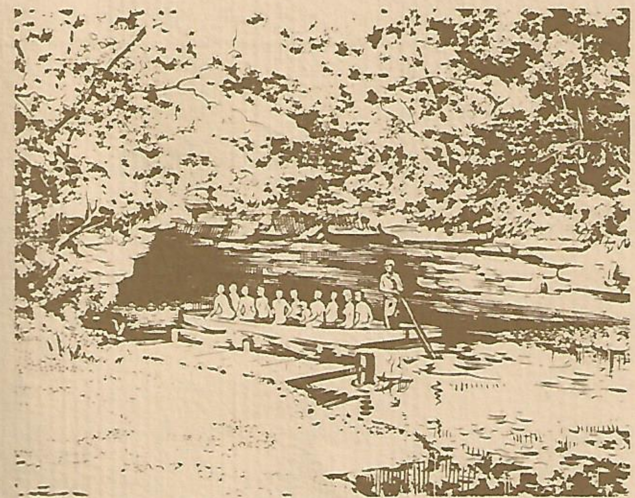
THE MITCHELL PLAIN, SINKHOLES, AND CAVES

Erosion gradually removed much of the rock overlying the Mississippian limestones and reduced much of Indiana to a nearly flat low-lying surface. Only a few million years ago still more uplift gave added energy for erosion that stripped away great masses of rock down to the thick limestone sequence that now forms a rolling upland karst surface. Karst is topography characterized by a profusion of depressions called sinkholes and by other features that result from dissolving or solution of the bedrock, so that much of the surface drainage then goes underground through sinkholes into cavern passages. Spring Mill is centrally located in, and is typical of, the karst region that is named the Mitchell Plain because of its excellent development in the Mitchell area. The extent of this feature in Indiana is shown on the physiographic diagram.

Rainwater, which is slightly acidic, sinks into the ground. It follows cracks and other openings in the rocks and tends to flow most rapidly along intersections of joints where the most solution of rock takes place. Ultimately, an open network is formed in the rock as the solvent action enlarges the openings. As the vertical openings enlarge below the surface, the overlying mantle and soil under the influence of gravity gradually creep toward the openings to be carried away. A depression formed by this process is termed a sinkhole. Almost all sinkholes in the park are in the St. Louis Limestone. Some parts of caves are also vertical, although many caves result from dissolving of more nearly level passages. Caves may also be enlarged by collapse of rock from the ceiling.

The sinkholes on the Mitchell Plain number more than 100 per square mile in parts of the park and reach a known maximum of 1,023 in a square mile near




Upper Twin Cave and boat excursion

Mitchell. Some of the water that goes into the sinkholes and underground later emerges in springs like those near the camping area. (See map.) In a karst area spring water commonly flows as a surface stream for only a short distance before again disappearing underground in a special kind of sinkhole called a swallow hole. This is true of water from two of the springs shown on the map.

DONALDSON CAVE SYSTEM AND HAMER CAVE

Of the named caves in the park, Donaldson Cave, along with its upstream segmented parts, and Hamer Cave are the two major caves. It is even possible that they once were parts of a single system. That is, both emerge in steep-walled valleys that, at least near the caves, were obviously formed by the collapse and dissolving of the cave roof. Some geologists believe that this collapse started below the junction of Hamer and Donaldson Branches of Mill Creek and that as the cave collapse worked farther and farther back, weathering and surface erosion further widened and smoothed out the valleys where the lake and Spring Mill village are located.

Solution enlargement and collapse have occurred not only at the mouths of the caves but also for the Donaldson Cave system at two points upstream, perhaps where sinkholes were directly above the cave, thereby exposing the cave stream to view and forming new entrances to the cave. These collapse areas, Bronson

EXPLANATION

St. Louis Limestone

Salem Limestone

Sp — Spring or rise

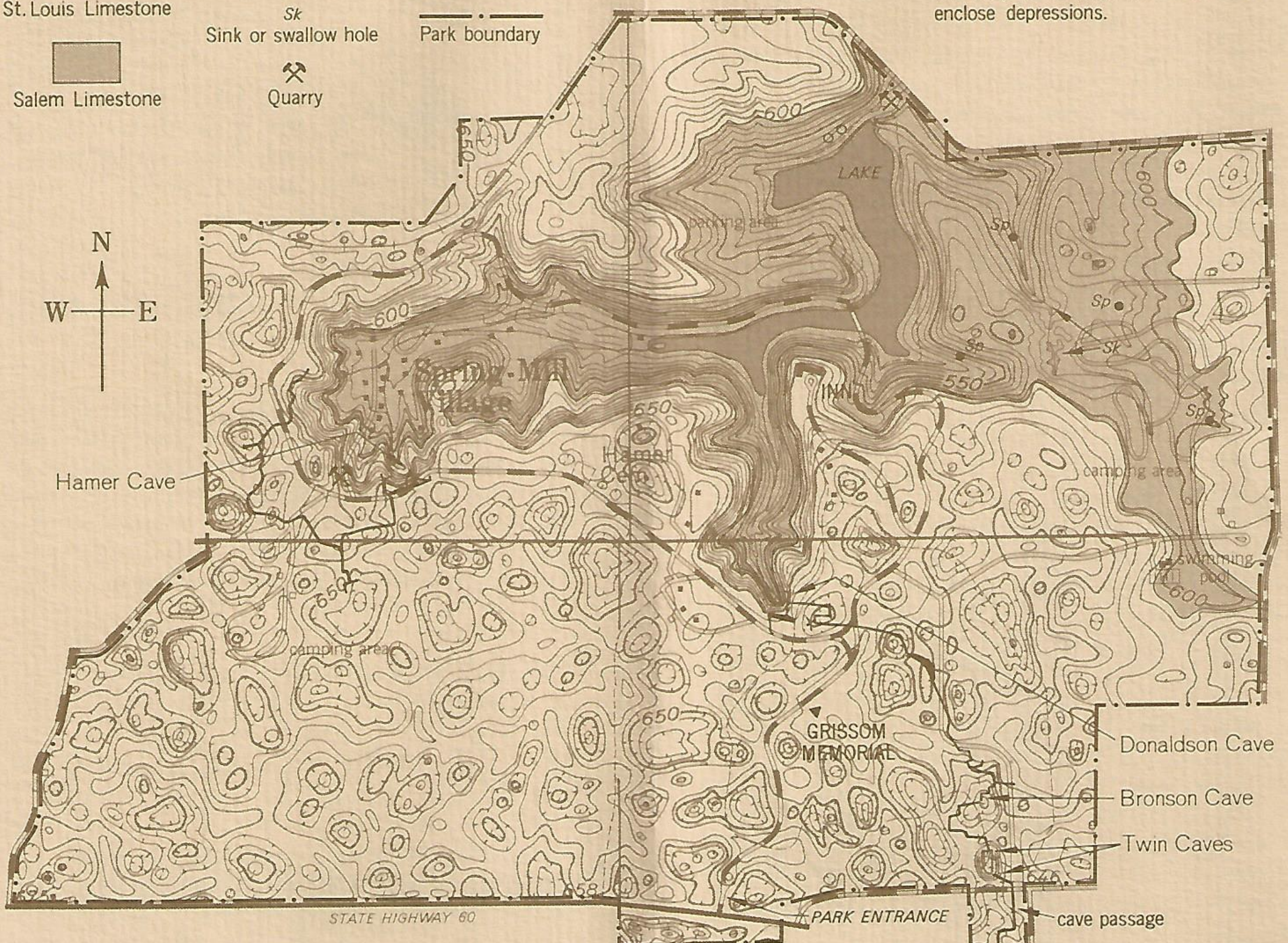
Sk — Sink or swallow hole

Quarry

Lime kiln

Park boundary

Topographic *contour lines* connect points of equal elevation. The vertical distance between lines, the *contour interval*, on this map is 10 feet. Hachured lines enclose depressions.



Base modified from U. S. Geological Survey 7½′ Mitchell topographic quadrangle map, 1960.

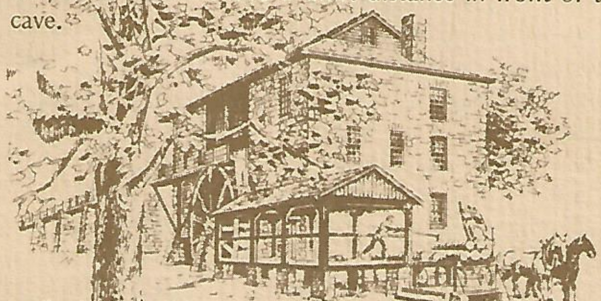
1000 0 3000 Feet

500 0 500 Meters

TOPOGRAPHIC MAP OF SPRING MILL STATE PARK, LAWRENCE COUNTY, INDIANA

Cave and Twin Caves, are called karst windows, a term derived from the Twin Caves as the primary example. The map shows how these features fit along the single cave stream that makes its final exit from a stygian world at the mouth of Donaldson Cave.

A boat ride in Upper Twin Cave provides convincing evidence of how wet caves can be. It also shows that not all caves are profusely ornamented by stalactites, stalagmites, and other cave deposits. Even to a geologist, one of the most fascinating things about this trip is seeing the blind, nearly white fish that have adapted to a life in total darkness. At the turn of the century they were studied in Donaldson Cave by Prof. Carl Eigenmann of Indiana University. His holding basins can still be seen inside and a short distance in front of the cave.



Both Donaldson and Hamer Caves are intimately related to the history of the park, and indeed the Indians left a record of their presence at Donaldson, which earlier was named Shawnee Cave. Both caves served as a source of water to power mills, and even today the aqueduct from Hamer Cave provides water for the restored mill in the village. A flume from the mouth of Donaldson Cave fed Isaac Fife's gristmill, which was later run as a sawmill and wool-carding mill by James C. Lynn. Some saltpeter was taken from the caves, mostly from Donaldson, for manufacturing gunpowder, and villagers butchered meat and also cooled perishable food in the caves. Thus, history and geology merge in Spring Mill State Park.

Carl B. Rexroad, Paleontologist
Lois Mittino Gray, Park Naturalist

Cover Art – Entrance to Donaldson Cave

Park caves except for the two dry side passages of Donaldson Cave are not to be explored without a park guide.