BAT CAVE AND SINKHOLES

Among the most interesting geologic features of the park are Bat Cave and the other subterranean drainage features. We know that Bat Cave is more than 437 feet long, for it has been mapped that far and extends as a very low passage beyond that point. It is similar in form and origin to other solution caves formed in limestone, this limestone being of Ordovician age and belonging in the Whitewater Formation. Like most caves, the passages of Bat Cave are aligned along joints, that is, sets of fractures or cracks in the bedrock. Where joints intersect, greater solution may occur. This is illustrated in Bat Cave by the small domes at several angles in the passage. These are the only spots in the cave where a six-footer can stand erect.

Bat Cave apparently had several episodes in its formation. The first encompassed the time when the cave passage was dissolved within the bedrock. Later, probably during a glacial stage, the cave was nearly choked by mud, for parts of the main passage have flowstone-covered mud walls instead of rock walls. Although the mud has been cleared from much of the cave in later activity, insoluble chert remains behind, concentrated on the floor as sharp-edged gravel that does little for the comfort of your knees.

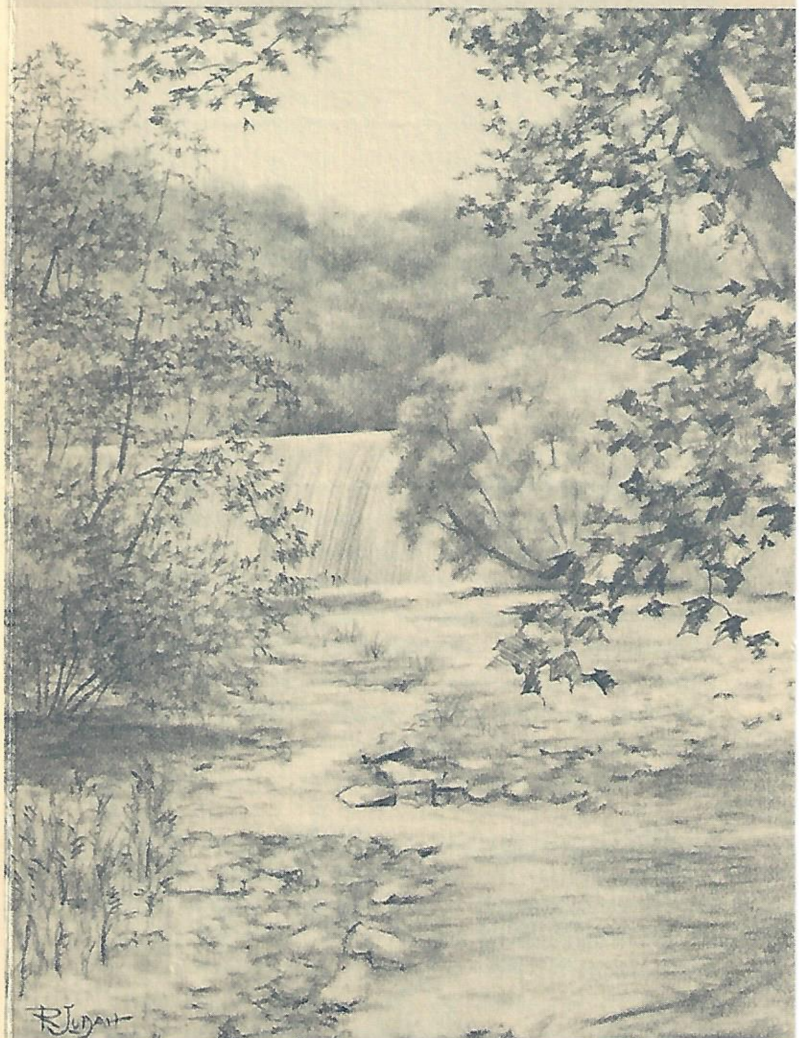
Numerous small sinkholes at the surface in the park further testify to the dissolving power of ground water. Much of the ground water is channeled into these depressions that are located commonly at the intersection of joints where initiation of infiltration and solution was most favorable. The initial openings gradually enlarged to form funnel-shaped depressions that start the water on its subterranean journey. Some of the water returns to the surface in the form of springs only a short distance below the sinkholes.

A few sinkholes can be found near the trail above Bat Cave. Others are on the hill just north of Falling Timber Creek across from the cave, and still others are on the hills on the west and east sides of Laughery Creek south of U.S. Highway 50. Another concentration of sinkholes is on the hill point overlooking the park entrance from U.S. Highway 50.

Carl B. Rexroad
Paleontologist

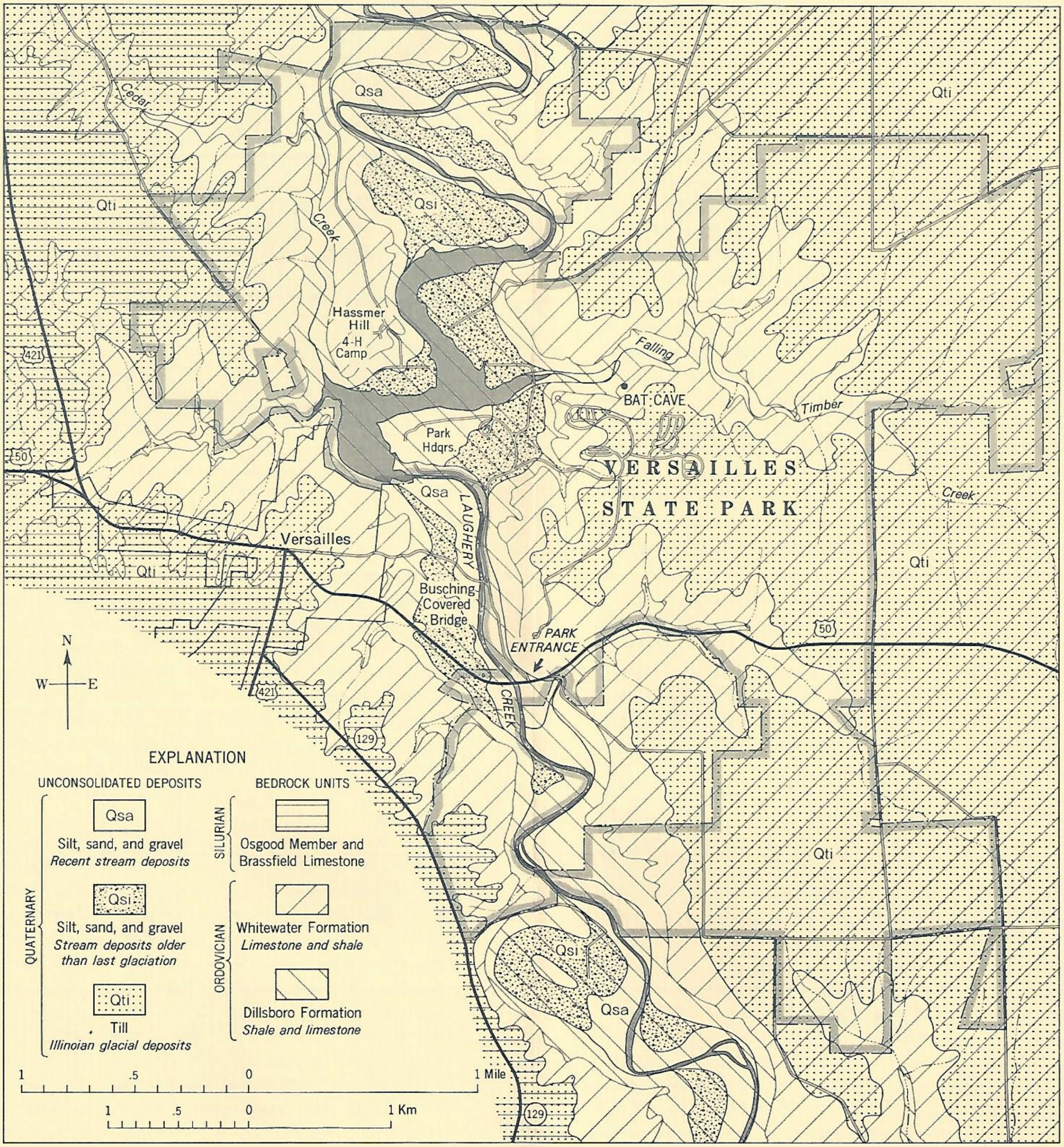
1977
State Park Guide 6

GEOLOGIC STORY OF VERSAILLES STATE PARK



STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY
611 NORTH WALNUT GROVE AVENUE - BLOOMINGTON, INDIANA 47401

PRICE 10¢



Qsa
Qti
Cedar
Creek
Qsi
Qti
Hassmer
Hill
4-H
Camp
421
Falling
BAT CAVE
Timber
50
Park
Hdqrs.
VERSAILLES
STATE PARK
Creek
Qsa
LAUGHERY
Versailles
Qti
Qti
Busching
Covered
Bridge
50
PARK
ENTRANCE
N
W
E
421
CREEK
129
Qti
Qsi
Qsa
129
EXPLANATION
UNCONSOLIDATED DEPOSITS
QUATERNARY
Qsa
Silt, sand, and gravel
Recent stream deposits
Qsi
Silt, sand, and gravel
Stream deposits older than last glaciation
Qti
Till
Illinoian glacial deposits
BEDROCK UNITS
SILURIAN
Osgood Member and Brassfield Limestone
ORDOVICIAN
Whitewater Formation
Limestone and shale
Dillsboro Formation
Shale and limestone
1 .5 0 1 Mile
1 .5 0 1 Km

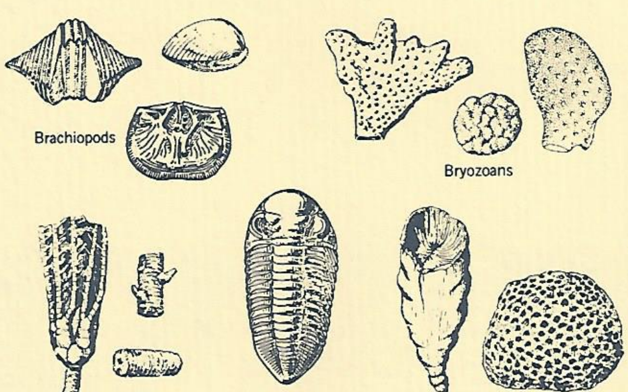
INTRODUCTION

Versailles State Park, dominated by the rugged cliff-lined valley of Laughery Creek, displays varied geologic features among its many attractions. Hiking and bridle trails leading through native forests pass by Bat Cave, wind among clusters of sinkholes, and climb across layers of fossiliferous rock, all attracting the attention of the geologist. Variety is enhanced because the park sits astride the boundary between two of southern Indiana's physiographic provinces. Understanding the natural features and geologic setting of the park will increase the pleasure of your park visit.

For a quick overview of the geology of the park, the map shows the age, location, and kinds of bedrock and glacial and stream deposits as well as the location of Laughery Creek and its tributaries. It shows that the oldest rocks in the park are of Ordovician age, which is an interval of time from about 500 to 440 million years ago. Geologic changes in the park have been continuous during the tremendously long time from then right up to the present, and the forces working throughout the past to alter the face of the earth are still in action.

BEDROCK AND FOSSILS

Fossils found in the park tell us that the oldest layers of bedrock here are of Ordovician age and that the youngest, which are found only toward the hilltops on the west bluff of Laughery Creek, are of Silurian age. Fossils, of course, represent life of the geologic past, either plant or animal life, preserved in many ways. Because life has been constantly changing while sedimentary deposits have been forming, successive rock units contain different fossils. These fossils, then, can be used for measuring geologic time. Fossils also tell us about the environment in which the animals or plants lived, whether on land or in the sea, in deep water or shallow, in a warm climate or a cold one.



Both Ordovician and Silurian rocks in the park contain fossils, but they are much more abundant in the former. Do your collecting outside the park, though, not inside where everything is protected. The most abundant fossils in the area are bryozoans, corals, brachiopods, and crinoids. Trilobites, snails, clams, cephalopods, and stromatoporoids are also present. Modern counterparts of many of these animals are restricted to the seas, and so their presence and the kind of rock in which they are found show that this park began at the bottom of an inland sea. Information from other areas shows that the Ordovician sea covering the park also covered most of the eastern United States from the Appalachian Mountains to Missouri and Iowa.

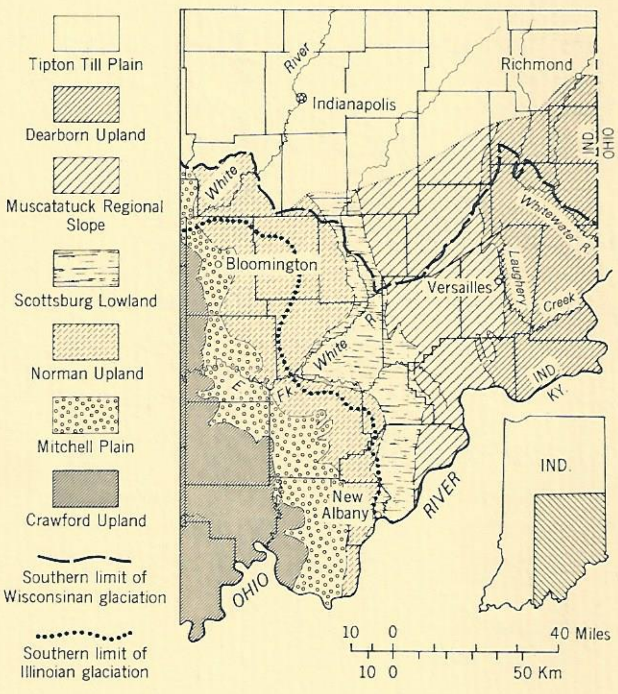
FORMING THE LANDSCAPE

After many layers of younger rock were deposited on top of the Ordovician and Silurian strata during several succeeding geologic periods, the land was permanently freed of the inland seas. Then stream erosion combined with weathering and mass wasting to reduce southern Indiana and adjoining parts of Kentucky and Ohio to a nearly flat low-lying surface. Only a few million years ago still more uplift gave added downcutting power to the streams, and great amounts of rock were stripped away in uneven fashion to produce the major landforms of southern Indiana shown on the physiographic diagram.

Note that Laughery Creek through part of its course follows the boundary between the rugged Dearborn Upland on the east and the much flatter Muscatatuck Regional Slope on the west. The Dearborn Upland, with much of its land in slope, coincides generally with the extent of Ordovician rocks, which are relatively easy to erode because they contain large amounts of shale. On the other hand, the thick limestone and dolomite sequence of Silurian and Devonian age underlying the Muscatatuck Regional Slope is relatively resistant to erosion. Much of the land remains as flat upland surface regionally sloping to the southwest in the same direction the rocks are tilted.

This is also the general landscape that would have met the eye before the glaciers of the Ice Age spread over Indiana. Except for the arrangement of drainage, it was a scene for southern Indiana not too different from the present. Southern Indiana was not deeply buried by glacial debris, particularly in comparison with the Tipton Till Plain. to the north (physiographic diagram). Till, a mixture of all sorts of rock debris from boulders to sand and clay dumped directly by the glaciers, is the only glacial deposit found in the park, where it forms a relatively thin veneer on the hills (geologic map).

Because of the ice and its deposits, however, the regional drainage patterns were markedly rearranged. Before the Ice Age a major river flowed northward east of the park and near the present course of the Ohio River, which did not exist then. The lower northeastward-flowing reaches of Laughery Creek must have been a tributary of this river. Although we know that the glaciers advancing across Indiana blocked the northward-flowing streams and thus ultimately caused the formation of the Ohio River, the problem of why Laughery



Passage in Bat Cave

Creek has segments that are at such odd angles to each other is still unsolved. The headwaters flow northward and then swing eastward; the middle segment flows southward through the park; and the downstream portion flows northeastward to the Ohio River.

We know, nevertheless, that the stream has several cycles of activity related to the ebb and flow of the repeated intervals of continental glaciation. This is recognized mainly by the alluvial terraces (Qsi) found along its course as shown on the geologic map. The stream in its latest meanderings on earlier valley fill has gradually eroded downward to establish its own course on bedrock.

Note the knob on which park headquarters sits and the knob in the valley just south of the park. At each knob, an earlier loop of the stream, or a meander, was cut off when the stream eroded a short cut across the neck of the meander, or else the neck at least was worn below the knob. Because of the changes in the eroding power of the stream related to the many changes in glacial conditions, the old channel was mostly filled in. In the process Laughery Creek was diverted back to the looping course around the park headquarters hill but not back around the southern hill where the half circle of fill (Qsi on the geologic map) shows the abandoned course.