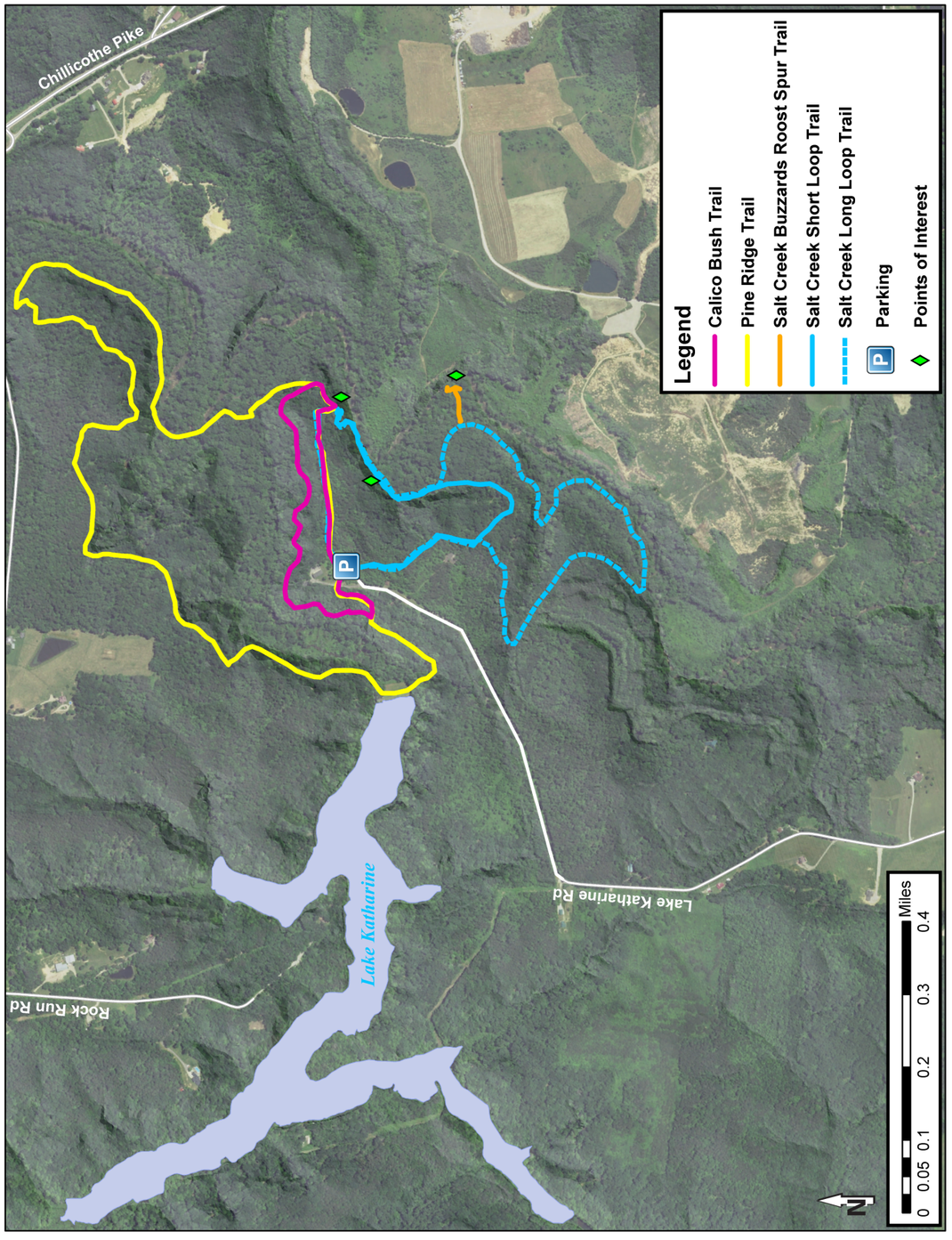

Lake Katharine State Nature Preserve trail map showing topography of the area and geologic sites discussed in the text.

GEOLOGY OF LAKE KATHARINE STATE NATURE PRESERVE

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Introduction

The geology of Lake Katharine State Nature Preserve reveals the story of active tectonic processes in Ohio during the early Pennsylvanian Period (318–311 million years ago [m.y.a.]). During this time, Ohio was near Earth's equator and was a vast coastal plain west of a large mountain range. This range, actively growing as part of the Alleghenian Orogeny, was simultaneously being eroded. The coarse-grained sandstones deposited from these mountains during this time are beautifully exposed within the preserve and elsewhere in Ohio and are known today as the Sharon conglomerate or Sharon sandstone.

The Sharon conglomerate has traits similar to the Black Hand Sandstone, which can be viewed in nearby Hocking Hills. The Black Hand is an older rock formation of Mississippian age (359–318 m.y.a.) and was deposited in an environment similar to the Sharon. That environment was one of high energy, producing large sediment loads and depositing prominent layers of milky-white and smooth quartzite pebbles as conglomerate zones within the formation. The Sharon is unique in that the two zones present within the state emanated from different source regions and are slightly different in age. The Sharon present at Lake Katharine originated from sources to the east and south. In northern Ohio, the Sharon was deposited by streams flowing southward from the Canadian Shield in the north.

Paleogeography

The base of the Sharon is the erosional contact between earlier Mississippian-age rocks and younger Pennsylvanian-age rocks. Several million years' worth of Mississippian-age rocks are missing or eroded at this contact, which can be seen along Rock Run Creek from the Buzzard Roost spur trail within the preserve. Zones of coarse-grained and rounded silica stones can also be seen in the formation. These stones are remnants of the core of an older mountain range east of ancestral Ohio and were rounded in streams and deposited as sandbars (fig. 1).

The landmass that later was to become Ohio was located near Earth's equator during the Early Pennsylvanian Period (fig. 2). Its vast coastal plain was being infilled rapidly with coarse sediments washing down from the Alleghenian mountains to the east (fig. 2). Ohio was covered in a vast extent of braided streams and lowlands, infilled by a large amount of sediments. As the sands were being eroded and deposited, this basin began to subside (sink). Also, the mountains to the east were rising faster than they were being eroded. This gradient between basin and source rock steepened over time, increasing the erosion rate, which caused the basin to be filled with the thick deposits of sandstone we see today. The Sharon is approximately 49–260 ft (15–80 m) thick and reveals a tapestry of changing environmental deposition, direction, and rates, as seen in the extensive cross-bedding features throughout the preserve (fig. 3).

Figure 1. Conglomerate "lens" of coarse grained and rounded silica quartz rocks eroded from the Alleghenian mountains to the east of Ohio during the early Pennsylvanian Period. Pocket knife is 3.5" long.

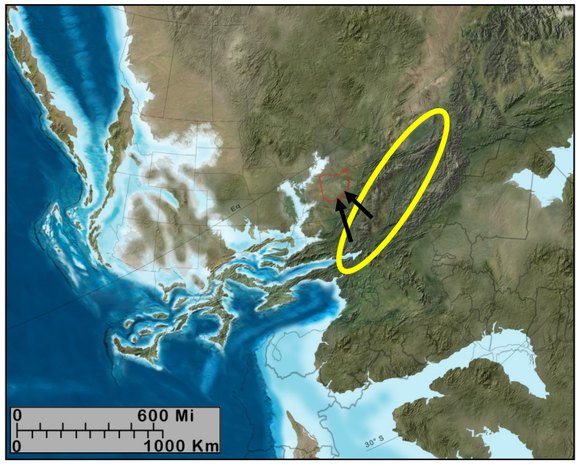

Figure 2. The general location of Ohio (outlined in red) during the Early Pennsylvanian Period. The Alleghenian mountains lie to the east (yellow oval). Also indicated is the approximate flow direction of Sharon sandstone deposition from the eastern Alleghenian mountains into Ohio. Base map credit: Key Time Slices of North America, ©2013 Colorado Plateau Geosystems, Inc.

Figure 3. Beautiful example of distinctive cross-bedding and conglomeratic "lenses" seen throughout the preserve.

Bedrock Geology

The Sharon sandstone is a massive, fine- to coarse- grained, high-silica–bearing and light-gray sandstone with "lenses" of conglomerate, especially prominent in the southern extent of the formation, such as in Jackson County. It is part of the lower Allegheny and Pottsville Groups of rocks, underlain by the Logan Formation, and resting atop an unconformity of these Middle Mississippian-age rocks. This contact can be seen from the Buzzard Roost Spur Trail off the Salt Creek Trail's Long Loop when the water level is low. The thickness of the formation is variable owing to the unconformity and erosion surface. Silica content can exceed 99 percent. The formation was heavily quarried for glass manufacturing and is also used as fracture sand in the oil-and-gas industry.

Glacial Geology

Lake Katharine State Nature Preserve lies just south of the boundary of glaciation in Ohio. However, evidence of the glacial period in Ohio is depicted by the presence of thin lacustrine deposits in the Jackson area. These deposits appear to be from the ancient Teays River, whose imprint on the modern landscape lies west-southwest of Lake Katharine. The ancient Marietta River was a tributary that flowed through present-day Jackson and connects to the abandoned Teays River. Lacustrine deposits may also be remnants of the ancient Lake Tight, formed from the damming of the Teays river by the advancing glaciers.

Modern Landscape and Importance

Today, Lake Katherine State Nature Preserve has encapsulated this ancient landscape beautifully, enshrining it in the well-exposed cliffs and ledges. Hikers can get an up-close and personal view of the rocks along many of the trails throughout the preserve. Gorgeously preserved exposures of cross-bedding detail changing drainage patterns throughout the duration of deposition. Thin and thickly bedded, coarse lenses of conglomeratic silica stones, rounded by eons of movement from mountain to coastal plain, are remnants of bygone sandbars.

The modern terrain is an example of inverted topography. The rocks exposed within the preserve, the high terrain such as cliffs, ledges, ridges, and hills, were initially deposited at the lowest position of the ancient environment, such as valley floors and river bottoms. Additional layers were then deposited on top of the Sharon, such as shales and siltstones. Over time, erosive processes wore away these softer overlying layers, and streams down-cut through the rock, leaving the Sharon exposed as the high ground. As Rock Run Creek continues this process through underlying layers, older rocks of the Mississippian Period will be exposed in time. Another feature of the process of erosion can be seen in the form of detached slump blocks (fig. 4) and shelter caves.

Figure 4. Slump block detached from the main cliff (to the right and out of picture) along the Salt Creek Trail.

Further Reading

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Cover image: *Geologists examine an exposure of Sharon sandstone/conglomerate along the Salt Creek Trail at Lake Katharine State Nature Preserve.*