GEOLOGY OF
KISER LAKE STATE PARK



Aerial photograph of Kiser Lake looking eastward over the dam and Ohio Route 235.

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Introduction

A paddler's paradise, Kiser Lake is a tranquil, human-made lake in the heart of Ohio's glaciated landscape. The lake sits within the Mosquito Creek Valley in northwestern Champaign County and is about three and a half miles north of St. Paris, Ohio. During the mid-1800s, a smaller, natural lake called Mosquito Lake was located at this same location and supported operations for a grist and lumber mill. The foundations of Kiser Lake State Park were laid in 1932 when John W. Kiser and his family donated several hundred acres of land in the Mosquito Creek Valley to the State of Ohio, with a dream to create a beautiful lake in the area. In 1939, an earthen dam was built, and Kiser Lake as we know it today was established. Today, this landscape includes Kiser Lake and its associated wetlands and fens that are home to many unique and rare species of plants. By understanding how the geologic history of this area influenced the creation of the lake and surrounding features, one might gain a deeper appreciation for the area's beauty.

Bedrock Geology

Long before there was a lake here, there was a sea. About 450–423 million years ago, during the Ordovician and Silurian Periods, present-day Kiser Lake was located just south of the Equator in a tropical environment. Sea levels were higher at this point in Earth's history, and this portion of North America was submerged beneath the warm, shallow waters of a tropical sea similar to the modern Bahamas. Limestone and dolostone, also known as *carbonate rocks,* developed here as calcium carbonate shell material accumulated on the seafloor. Over time, tectonic forces deepened this ocean basin and shifted it eastward. About 372–359 million years ago, during the Devonian Period, the Ohio Shale formed east of present-day Kiser Lake in the deeper, oxygen-poor waters of the Appalachian Basin. Meanwhile, the region surrounding present-day Kiser Lake would have been above sea level. Most sediment or rock deposited on top of the carbonate rocks in this region eroded away long ago. However, in Logan and Champaign Counties, an isolated area comprised of Devonian rocks has endured after hundreds of millions of years of erosion (fig. 1). It is called the Bellefontaine Outlier, an *outlier* being a body of younger bedrock surrounded entirely by older bedrock.

Weathering and erosion of the bedrock in this area lasted more than 350 million years and resulted in a deep, narrow gorge known as the Teays River Valley (fig. 1). Erosion in this gorge was so extensive that it cut through the Silurian carbonates into the deeper and older Ordovician bedrock. The Teays River had its headwaters in the Appalachian Mountains of North Carolina and was the primary stream for most of present-day Ohio, West Virginia, Kentucky, and Indiana. This ancient river valley and all of the other bedrock surrounding the Kiser Lake region is now buried beneath glacial sediments that can be nearly 800 feet thick.

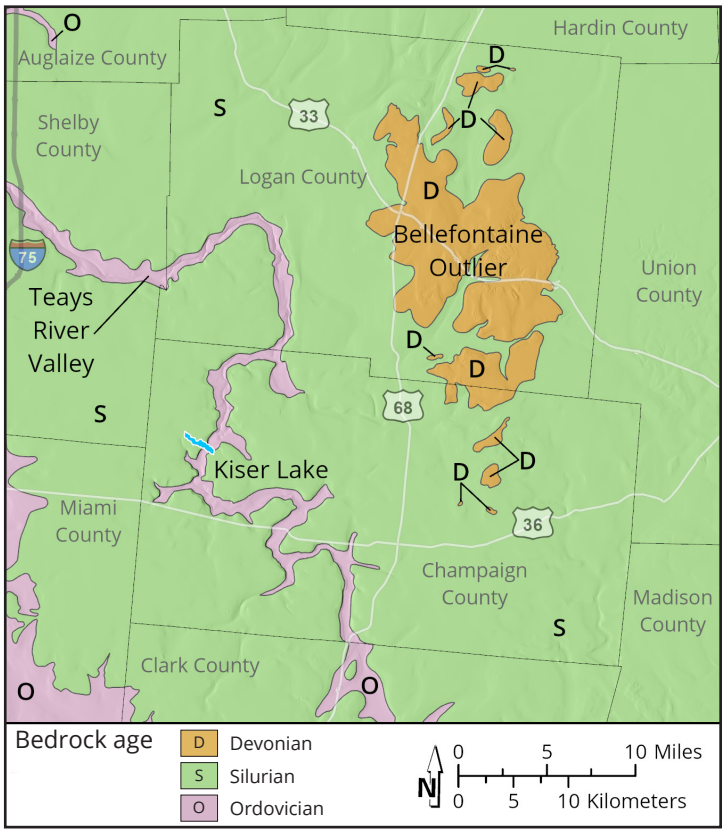


Figure 1. Regional bedrock geology map for the Kiser Lake region. The Teays River Valley cut a deep gorge through the Silurian bedrock and exposed the older, underlying Ordovician bedrock at the floor of the valley. The youngest bedrock in the region is found in the Devonian-age Bellefontaine Outlier.

Regional Glacial History

Hundreds of millions of years ensued between Ohio's tropical past and our more recent ice ages. Throughout this time, plate tectonics shifted North America into its present-day position about 40 degrees north of the Equator and lifted Ohio above sea level. The Ice Age, more formally known as the Pleistocene Epoch, lasted from 2.58 million years ago to 11,700 years ago. Ohio's landscape was affected by at least three glaciations during the Pleistocene. The most recent glaciation, known as the Wisconsin Glaciation, reached its peak around 27,000–24,000 years ago. During this time a lobe of ice, which was a part of the larger, nearly continent-wide Laurentide Ice Sheet, extended into Ohio. This ice lobe, called the Huron-Erie Lobe, flowed southwestward across the ancient landscape and was influenced in part by the preglacial topography it encountered.

The Bellefontaine Outlier was an impedance to glacial flow, causing the main lobe to split into two sublobes. The Miami Sublobe flowed to the west of the outlier and the Scioto Sublobe was positioned to the east. However, the two sublobes eventually overtopped the Bellefontaine Outlier and merged back together east of present-day Kiser Lake. This area where the Miami and Scioto Sublobes met is called an *interlobate area*. Interlobate areas are zones where glacial meltwater and blocks of detached melting ice chaotically deposit sediments between two lobes, resulting in more rugged topography compared to surrounding areas.

The topography surrounding Kiser Lake formed as the Miami Sublobe was retreating from its maximum, interlobate position. Flutes, a set of nearly straight ridges only a few feet high parallel to the direction of ice flow, were created north of Kiser Lake as ice moved through this area (see map, back page). Around 22,000 years ago, the Miami Sublobe paused over the location of present-day Kiser Lake and formed a ridge called the Farmersville Moraine. This ridge of glacial till, called an *end moraine,* marks the position of an ice margin with narrow ridge crests (fig. 2). The ice might have been relatively stable at the Farmersville Moraine for decades or centuries before it continued its retreat northward and broke apart.

When ice margins begin to break down, break apart, and become separated from the main glacier, blocks of detached ice deposit sediment and begin to melt, forming ponds. The resulting features, often referred to as *stagnant ice features,* became more common as the glacial ice retreated from the

Kiser Lake region, and the ice deposited glacial sediments into landforms called *kames,* which are preserved today around Kiser Lake. Kames are rounded knobs composed of sand and gravel that became trapped within and between blocks of ice. Three distinct kames are visible just west of the Mosquito Creek Trail that winds through Kiser Lake State Park and Kiser Lake Wetlands State Nature Preserve (fig. 3). The hill to the east of this trail is the Farmersville Moraine. Boulders are relatively common along the Mosquito Creek Trail between the kames and the Farmersville Moraine, which is further evidence for ice stagnation.

Kiser Lake has another unique glacial feature, a fully preserved meltwater system (fig. 4). *Glacial outwash,* sand-and-gravel sediment carried away from a glacier by meltwater, was deposited southeast of the Farmersville Moraine in the Mosquito Creek Valley (see map, back page). Glacial meltwater can originate both within and beneath the ice sheet and flow to the margin through channels in and below the ice. Long, sinuous ridges of sand and gravel, called *eskers,* mark where these channels once existed. A small esker exists south of Kiser Lake and connects to a glacial outwash fan, which was the transition zone between outwash coming from within the glacier merging into exposed glacial meltwater streams (see map, back page). This outwash fan is pitted, meaning there is a series of dimpled impressions on the ground surface caused by blocks of ice that were rafted away from the main ice sheet by this meltwater. Usually, erosion during glacial retreat destroys these glacial landforms but the ice margin at the Farmersville Moraine stagnated, minimizing erosion and preserving these landforms.

The Post-Glacial Geology of Kiser Lake

Before Kiser Lake was constructed, this area of the Mosquito Creek Valley was covered in a prairie fen environment known as the Mosquito Lake Bog. The fen was fed by springs with alkaline water—high in pH due to the carbonate minerals in the rocks—which helped create organic-rich soils that are preserved there today. This fen formed at the headwaters of Mosquito Creek and Nettle Creek, two names that might indicate the inhospitable environment that Mosquito Lake Bog presented to humans. Remnants of this fen surrounding Kiser Lake are still fed by alkaline groundwater springs today. This cool, alkaline water creates the right environment for rare and endangered plants to thrive, including shrubby cinquefoil, Kalm's lobelia, grass of parnassus, fringed gentian, big bluestem, queen-of-the-prairie, Ohio goldenrod, and poison sumac. Some minor deposits of *marl,* a crumbly white calcium-carbonate deposit, can be found actively precipitating from some of the springs in the prairie fen. The groundwater that feeds these springs in the prairie fen wetlands are high in dissolved carbonate minerals sourced from the local bedrock.

Further Reading

Norris, T.A., 2019, Ice age in Ohio—Evidence below our feet: Columbus, Ohio Department of Natural Resources, Division of Geological Survey GeoFacts 33, 2 p.

Norris, T.A., Nash, T.A., Valachovics, T.R., Parrick, B.D., and Swisher, A.R., 2024, Bedrock topography of Champaign County, Ohio: Columbus, Ohio Department of Natural Resources, Division of Geological Survey, BG-4C-CHP, map scale 1:62,500.

Quinn, M.J., and Goldthwait, R.P., 1979, Glacial Geology of Champaign County, Ohio: Columbus, Ohio Department of Natural Resources, Division of Geological Survey Report of Investigations No. 111, 17 p., 1 pl.

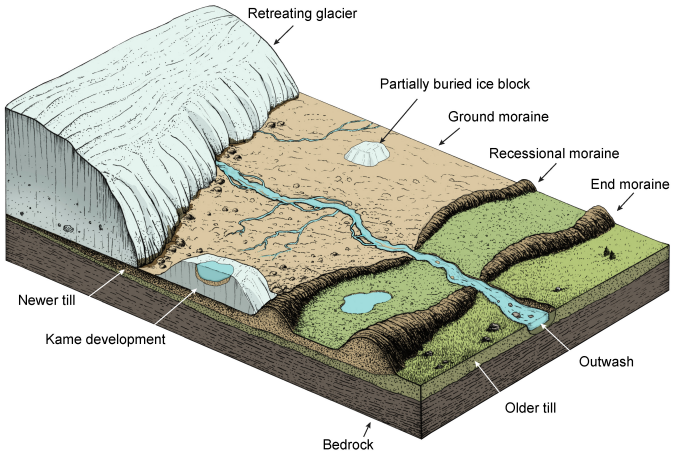


Figure 2. Block diagram showing an idealized ice margin and associated landscape features like those seen at present-day Kiser Lake. Blocks of ice detached from the stagnant ice margin, resulting in kame and kettle landforms. Modified from original illustration by Madison Perry.

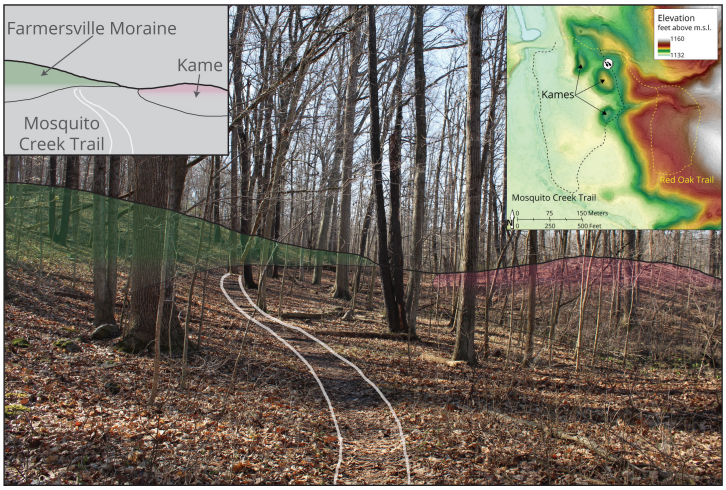


Figure 3. Photograph of the Farmersville Moraine (shaded green) and kames (shaded red) looking south along the Mosquito Creek Trail (outlined in white), detailed in the inset image in the top left. The vantage point and orientation for the photograph is marked with the feet symbol on the inset map in the top right. The maximum vertical relief for this area is about 30 feet and is shown with a digital elevation model basemap inset in the top right.

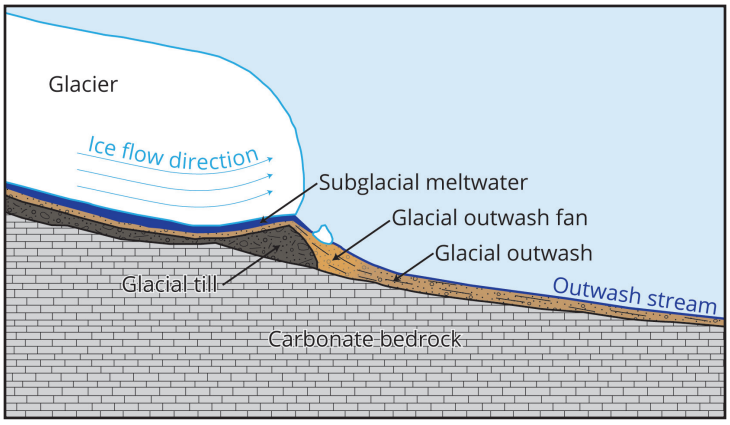
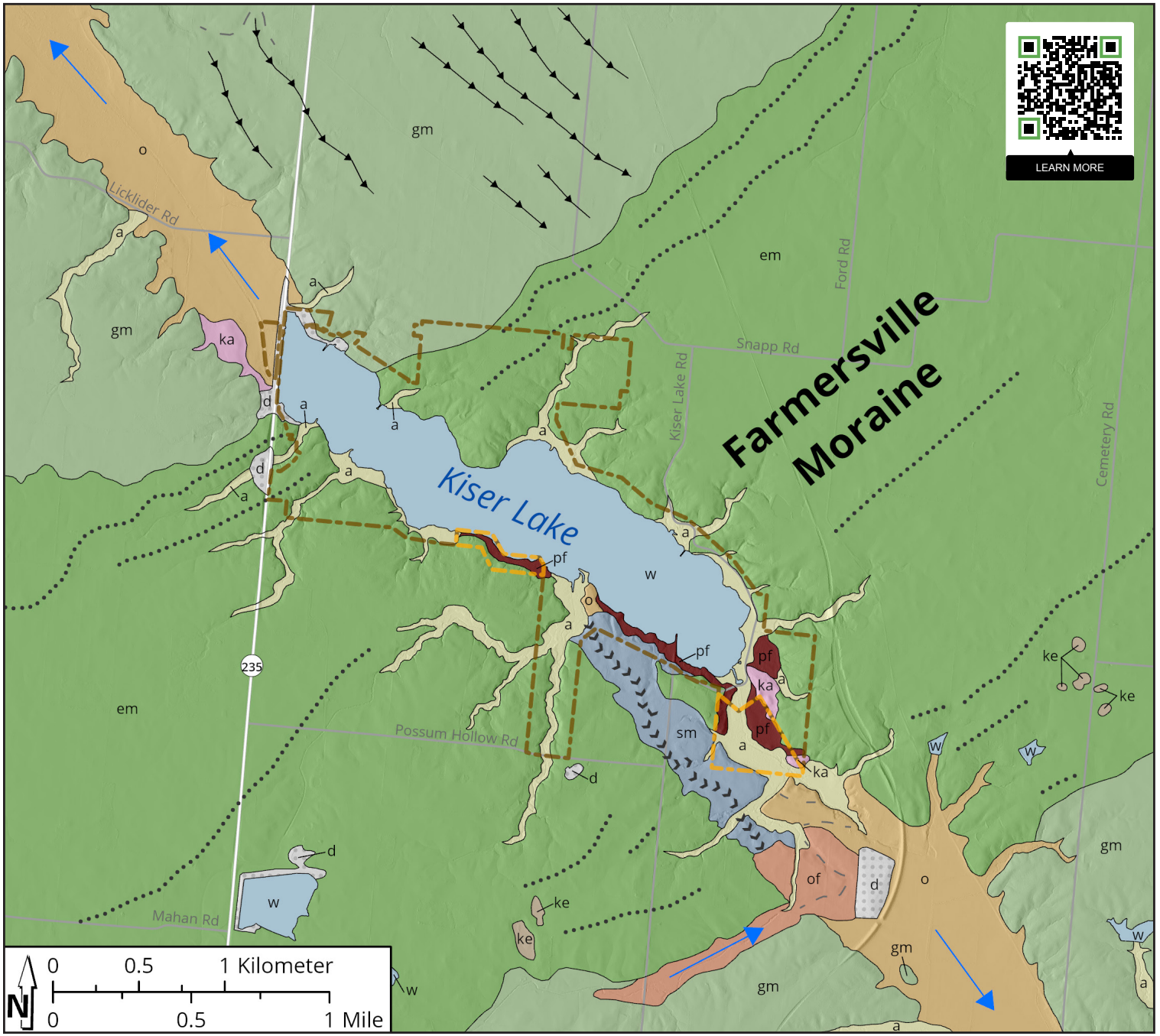
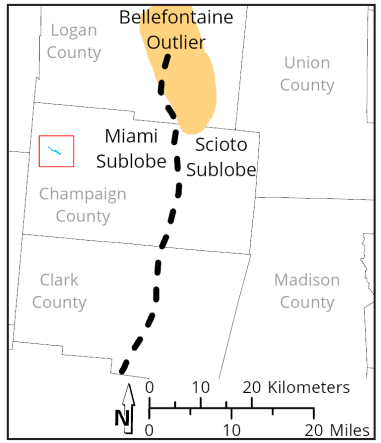


Figure 4. Conceptual cross section depicting the connection between the deposition of sand and gravel (outwash) both below and in front of a glacier. Sand and gravel deposited in subglacial meltwater channels can be preserved as sinuous ridge landforms called eskers after glacial retreat. Glacial outwash fans are constructed where subglacial meltwater flows out from the glacial margins and into outwash stream systems on the surface. At a stagnant ice margin, blocks of ice can become detached from the ice sheet and become buried, either wholly or partially, in the sand-and-gravel sediment of the outwash fan. This ice can be insulated by the sediment and melt slowly, eventually resulting in a depression on the land surface.

GLACIAL GEOLOGIC MAP OF THE KISER LAKE REGION, CchampaIGN COUNTY, OHIO





Age

- Holocene
- Pleistocene
  - Water-deposited
  - Ice-deposited

Map Units

- w — Water
- d — Disturbed
- a — Alluvium
- pf — Prairie fen
- ka — Kame
- ke — Kettle
- of — Outwash fan
- o — Outwash
- sm — Subglacial meltwater
- em — End moraine
- gm — Ground moraine

Map Symbols

- Meltwater pathway
- Esker
- Channel
- Moraine crest
- Fluting
- State routes
- County roads

State Lands

- Kiser Lake SP
- Kiser Lake Wetlands SNP

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