

The following background information has been compiled to better understand the physical aspects of the watershed. These features are the foundation of the Euclid Creek Watershed; naturally shaping the stream over many, many years.

### Location of the Creek

The Euclid Creek is located 10 miles east of Downtown Cleveland. It drains 24 square miles and has 43 miles of stream segments. **See Figure 2.0.**

**Figure 2.0** Main Branches of Euclid Creek



### West Branch

The headwaters to the West Branch begin in Beachwood near Fairmount Boulevard and Cedar Road and in Pepper Pike near Belgrave Road. The creek then flows north through Lyndhurst and the eastern portion of South Euclid, to Euclid where it meets up with the East Branch in the Metroparks Euclid Creek Reservation.

### East Branch

The East Branch headwaters begin in Willoughby Hills near White Road and Highland Heights near Wilson Mills Road. This branch flows west along the Portage Escarpment to Euclid Creek Reservation. The majority of the East Branch is protected by

the steep topography as it runs through primarily private property to meet up with the West Branch. Approximately 55 acres of the East Branch Valley, west of Richmond Road, are owned by Cuyahoga County and the cities of Euclid and Richmond Heights.

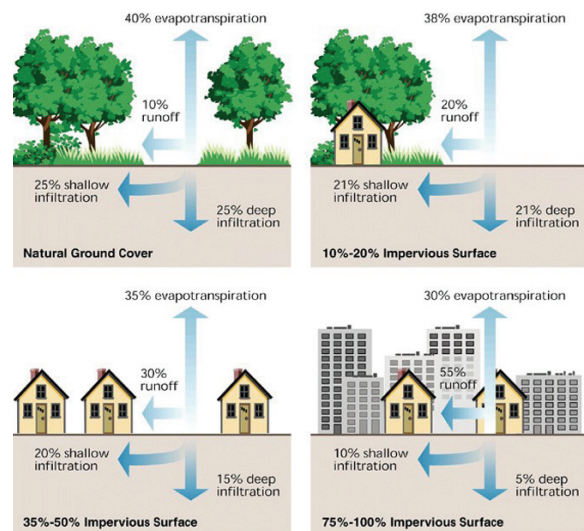
### Main Branch

The Main Branch flows from the Metroparks northward paralleling Dille and Nottingham Roads, through Wildwood Park, and empties into Lake Erie.

### Where Does The Water Come From?

The water entering into Euclid Creek comes from the land surrounding it (i.e., the watershed). When it rains, the water falling on the land does one of three things; 1) evaporates back in the atmosphere, 2) soaks into the ground and is taken up by the plants, or 3) runs off the land into the stream. **See Figure 2.1.**

**Figure 2.1** Water Runoff Model



*Water runoff increases as more hard surfaces are developed.*

**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG)

In an urbanized watershed, the majority of rainfall ends up running off the land. This is due to an extensive amount of hard surfaces, such as rooftops and parking lots. Runoff enters the stream in one of two ways: surface flow directly off the land, or via the storm sewers. Therefore, the surrounding land

use directly affects the quality and quantity of water entering a stream. As rainwater and snowmelt run across the land, they pick up pollutants, such as fertilizer, oil, sediment, etc. and deliver them directly to the stream.

### Groundwater

In addition to surface water, rain and snowmelt soak into the ground and eventually make their way to the stream, entering through the bed and banks. Groundwater flow is much slower than surface water flow because water absorbed into the groundwater reservoir is released gradually.

Because of the ground's slow absorption and release of water, the ground water system is a kind of regulator for flow in the stream. Flood peaks are lowered as water is absorbed into the ground. The water is then released over a period of hours, days, or weeks; long after the peak surface runoff has passed downstream. Some of the water from spring rains is released to the stream during the drier parts of the summer, maintaining flow in the stream, called base flow. This steady trickle during dry periods is critical to the health of the stream's aquatic environment.

### Climate<sup>1</sup>

No mountain ranges exist between Ohio and the polar regions. Because of this, no effective barrier prevents the southward spread of Arctic air from northern Canada. Similarly, warm tropical air masses move freely northward in the summer. Storm systems form along the boundary between major cold and warm air masses, and storm paths frequently cross the Ohio Valley and the Lower Great Lakes. The climate of Cuyahoga and Lake Counties is characterized by warm summers and cold winters, with average summer temperatures of 70 degrees Fahrenheit and average winter temperatures of 30 degrees Fahrenheit.

According to the NOAA Climate Diagnostics Center, precipitation for Cleveland, Ohio averages 36.6 inches

per year. Precipitation is generally well distributed throughout the year, with most occurring between April and September. There are, however, variations in the amount of rainfall throughout the watershed. At the lower elevations, near the lake, annual precipitation averages 36 to 38 inches while the higher elevations, at the headwaters, average 40 to 42 inches.

In spring, proximity to the lake prevents late freeze-outs, thereby extending the growing season. In winter it results in heavier snowfall over north-eastern Ohio. The average snowfall in the watershed varies from 60 to 70 inches near the lake to between 80 and 90 inches in the headwaters.

### Glacial History

Beginning 2 million years ago, glaciers advanced from the north. They enlarged existing river valleys to create the basins of the ancestral Great Lakes, gouging Lake Erie into the still rising edge of the Appalachian Mountains.

The present-day Euclid Creek is actually a fairly recent geologic phenomenon. It is the result of the advance and retreat of the last great glacial sheets which covered most of Ohio. These large Wisconsinian-era glaciers stretched south into Ohio from Canada around 24,000 years ago and made their final retreat about 12,000 years ago. **See Figure 2.2.**

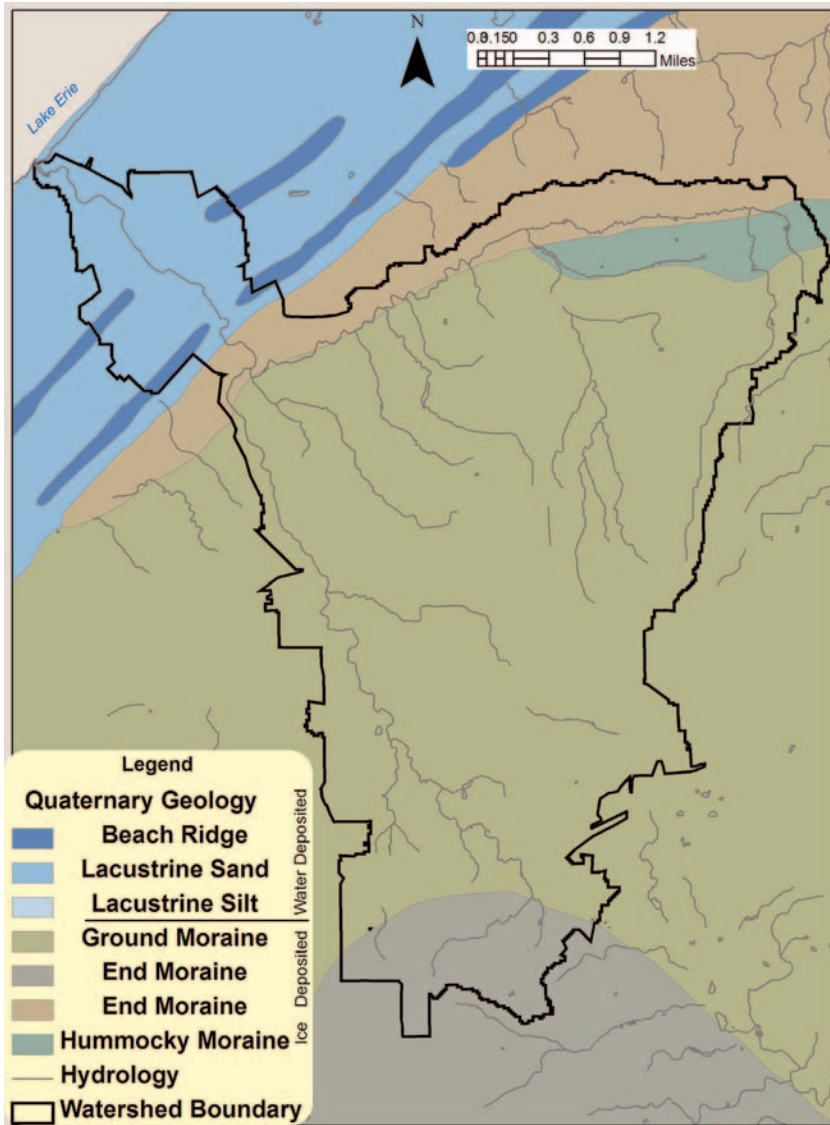
When the glaciers finally retreated, they left a layer of glacial till on the surface of the topographic plateau. The Defiance Moraine at the headwaters in Beachwood and the Euclid Moraine along the escarpment at Euclid Avenue are two examples within the watershed. As the glaciers continued to retreat, the ancestor of Lake Erie carved a series of cliffs into the edge of the plateau region.

### Topography

The Euclid Creek watershed is made up of three distinct topographical areas. Each of these regions is further described below. **See Figure 2.3.**

<sup>1</sup> NOAA Climate Diagnostics Center – ODNR Hydrologic Atlas

**Figure 2.2** Geological Formations



**SOURCE:** Ohio Department of Natural Resources, Ohio Department of Geological Survey, 1999

**The Lake Plain**

The mouth of Euclid Creek, as it empties into Lake Erie, is approximately 580 feet above sea level. The relatively flat land located between the lake and the escarpment is called the Lake Plain. This region is approximately two to three miles wide within the Euclid Creek Watershed. The land abruptly rises, forming a steep cliff. This cliff is fairly continuous, although it has been breached by stream valleys, such as Euclid Creek, that drain to Lake Erie.

The valley of Euclid Creek is deeply incised, the stream has cut down to the bedrock in the Lake Plain, through the Escarpment, and into the Plateau. Its valley is just over 1/4 mile wide with a maximum relief of 120 feet.

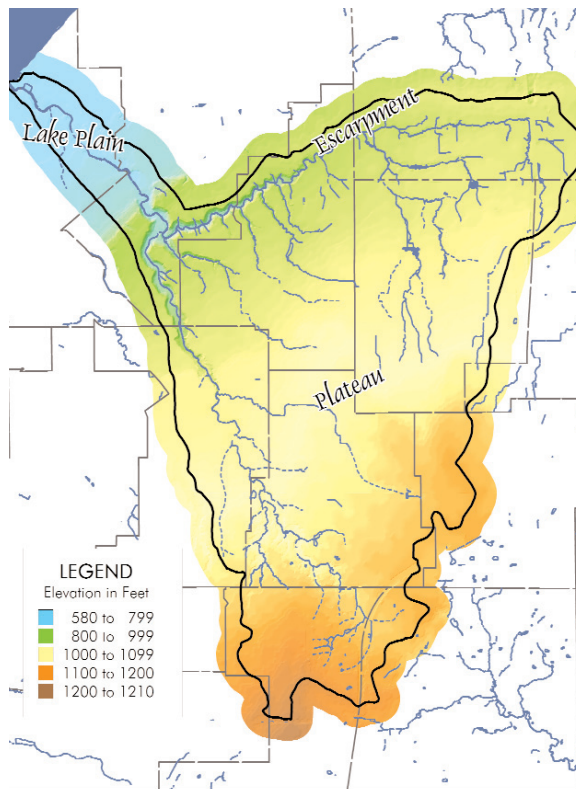
The East Branch of Euclid Creek flows north until it encounters the Euclid Moraine, at which point it abruptly turns west and southwest. It is likely that this pronounced stream diversion was a response to blockage that occurred due to a stagnant ice margin.

**The Escarpment**

The Portage Escarpment is the sloped transitional section of land that joins the Lake Plain with the higher grounds to the south and east. Just east of the Cuyahoga River Valley, the Escarpment rises rapidly from the Lake Plain at an elevation of about 700 feet and reaches over 1,100 feet in elevation at the Plateau. The escarpment consists of a patchy mantle of thin till or silty clay that is generally less than five feet thick, known as the Euclid Moraine. Due to a lack of glacial deposition and erosion, bedrock is exposed in many of the stream valleys.

**The Plateau**

The Plateau consists of the upper watershed, and the elevation ranges from about 1,000 feet to 1,250 feet. This area represents the northwest margin of the Appalachian Plateau. The highest hills on the Plateau are underlain by Sharon conglomerate. Elsewhere, the underlying formation is the shale of the Cuyahoga.

**Figure 2.3** Elevation

*The elevation change from the headwaters of the Plateau to the mouth at the Lake Plain is approximately 600 feet.*

When the ice retreated, this diverted stream segment remained entrenched in the channel it now occupies.

### Soils<sup>2</sup>

The headwaters of the Euclid Creek collect water from the knolls and hillsides of Beachwood, Highland Heights, Pepper Pike, and Willoughby Hills. These hills were deposited as glacial till during the late Wisconsinan age. Over time, these soils became the present-day soils of Ellsworth silt loam, Darien silt loam, and associated Urban Land complexes. These soils, with the exception of the Urban Land complex, are very deep, moderately well to somewhat poorly drained, and have a permeability that ranges from slow to moderately slow. The Urban Land complex are mapped areas covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

As these upper headwaters converge, the larger streams flow over the gently rolling to nearly level plateau in Lyndhurst, Mayfield Heights, Richmond Heights, and South Euclid. Soils found in this area consist of Allis silt loam, Hornell silt loam, Mahoning silt loam, Mitiwanga silt loam, and associated Urban Land complexes. These soils are moderately deep, poorly to somewhat poorly drained, and have a permeability that ranges from very slow to slow.

The Main Branch of Euclid Creek cuts through valleys deposited by glacial ice or outwash and into sedimentary rock, such as sandstone, shale and siltstone. It runs through Euclid, Richmond Heights, and South Euclid. The mapped soils in these areas include Brecksville silt loam, Loudonville silt loam, Tioga loam, and associated Urban Land complexes. These soils are well drained and have a permeability that ranges from moderately slow (Brecksville silt loam) to moderately rapid (Tioga).

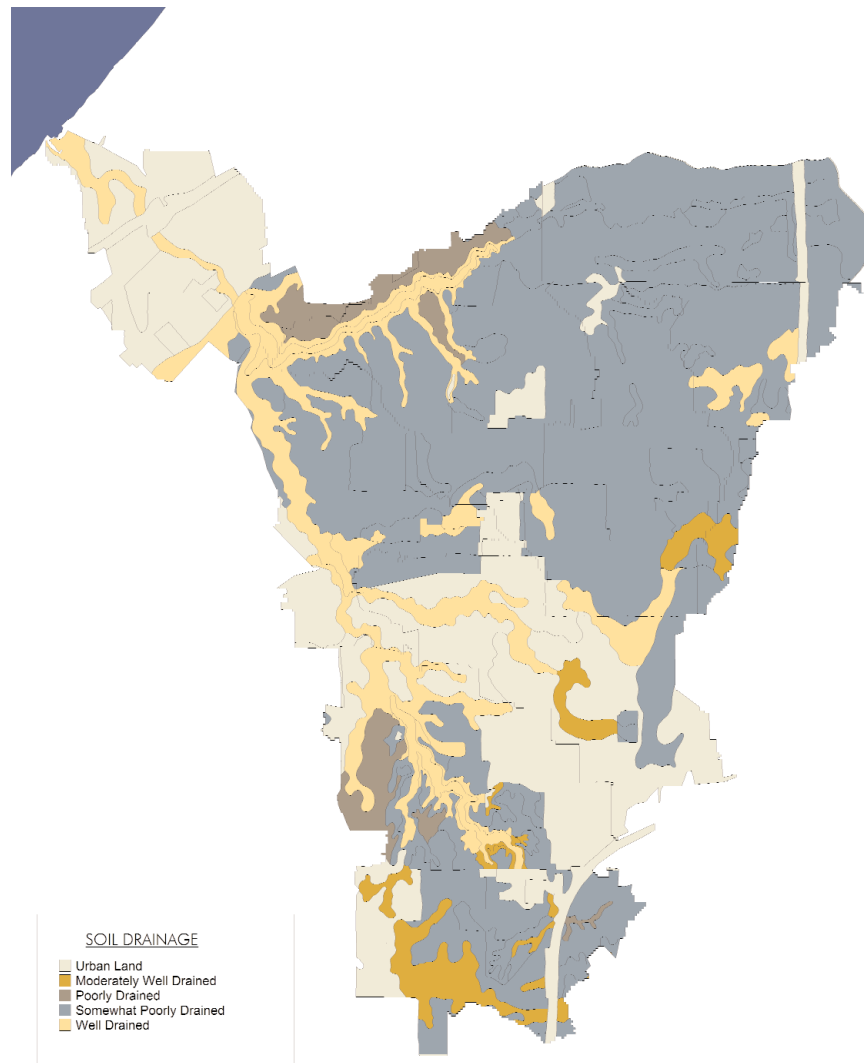
The majority of soils present within the Euclid Creek Watershed are characterized as slowly and/or poorly drained. **See Figure 2.4.** These types of soil pose problems for land use, development, and the natural stream system. Clayey soils inhibit water from soaking into the ground, causing more water to run off the land.

### Geology (The Backbone of the Watershed)

The Euclid Creek Watershed offers a unique chance to observe the various layers of the Upper Devonian era rock formations which developed approximately 360 million years ago. Despite the young age of Euclid Creek, the river has downcut at a much faster rate than normal, revealing the shallow bedrock formations. The Euclid Creek Reservation of the Cleveland Metroparks offers the opportunity to see all of the various layers of this era in a rather short distance. **See Figure 2.5.**

<sup>2</sup>Soil Survey of Cuyahoga County, 1980 – Quaternary Geology of Ohio, 1999

**Figure 2.4** Soil Drainage



*Natural Drainage within the watershed is very limited due to soil type.*

**SOURCE:** USDA Soil Survey of Cuyahoga County, 1980; USDA Soil Survey of Lake County, 1991

These bedrock formations consist of (from bottom to top):

**The Chagrin Formation**

This formation consists of primarily grey shale, with numerous siltstone beds of thin reddish-color rock layers interspersed throughout. The red color of the siltstone beds indicates high iron content, which results when the iron oxidizes. This layer does not contain a large quantity of fossils. It is believed that low dissolved oxygen content (anaerobic environment) is the reason for the lack of fossils within this formation.

<sup>3</sup>The Doan Brook Handbook, Laura Gooch – Joe Hannibal, Cleveland Museum of Natural History

**Cleveland Formation**

At the Welsh Woods Picnic Area, within the Euclid Creek Reservation of the Metroparks, the boundary between the smooth Chagrin Formation and the blocky Cleveland Formation is quite noticeable. A thin layer of pyrite separates these two layers.

**Folds and Faults**

Another exceptional feature of the Euclid Creek is the series of folds and faults that occur along the stream channel. Visible from the streambank are several joints, or breaks in the rock, that often control the stream channel. Also easily identified are stream anticlines, or upwardly flexed layers of rock (folds). These stream anticlines generally form where shale is the predominant layer exposed in the streambed.

As more and more of the top layers are eroded away by the stream, the pressure

pushing down on the shale becomes less and the pressure from the sides becomes greater. As a result, the wet shales swell and begin to move upward. As this stress becomes greater, a thrust fault (low angle fault) is produced. These processes of folding and faulting often create deeper pools of water within the stream.

**Bedford Formation<sup>3</sup>**

The soft sediment formation of the Bedford Formation can be observed at the Quarry Picnic Area within the Euclid Creek Reservation of the Metroparks. Soft-sediment deformations,

round bulb-like structures that form near the bottom of the rock, are abundant in this area. This portion of the reservation, which was once a working quarry, was the longest running quarry in the Cleveland area. At the height of production, as many as five quarries were extracting Euclid Bluestone, a very fine-grained siltstone, found in abundance throughout this region. This stone was quite a desirable material because it was more dense than the typical Berea Sandstone. The east branch of the Euclid Creek has similar features, except at these higher elevations the Mississippian Era formations can be observed. The most distinct features include the black Orangeville shales and the red shale, which are present directly south of the Metroparks Reservation.

North of the Metroparks Euclid Creek Reservation is an area referred to as Mt. Baldy, where a collection of deep water marine sponge fossils have been discovered. Examination of these fossils will help to identify how long ago this area was covered by

water. It will also provide an indication of the type of environmental conditions that once existed within the ancient lake.



*One rock layer has been pushed or thrust over the lower layers of rock, a common feature of the faults present in Euclid Creek.*

**SOURCE:** Cleveland Museum of Natural History



*Euclid Bluestone Quarry, May 1916.*

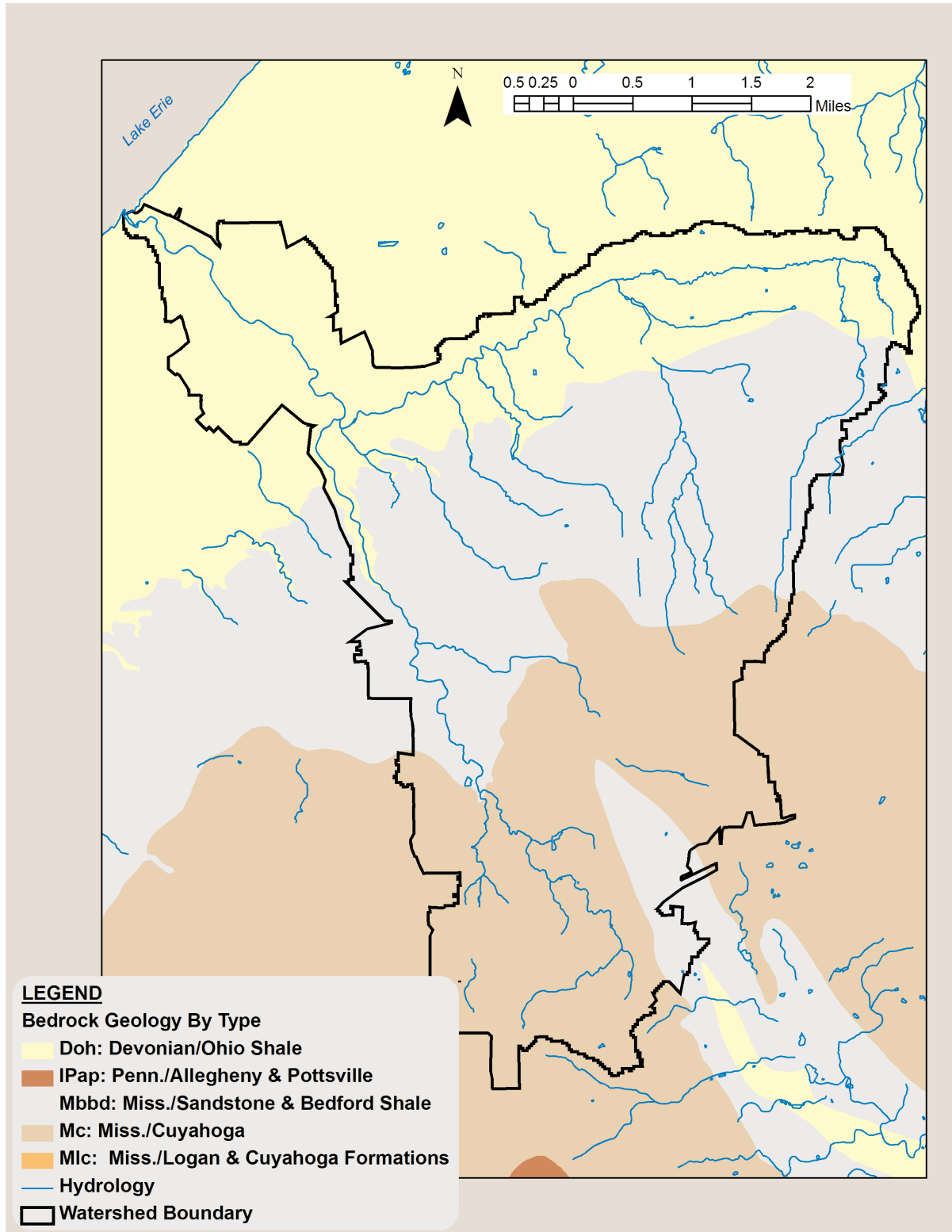
**SOURCE:** Case Western Reserve University



*Quarry of Bedford shale at Bluestone: red shale above, blue shale midway, and bluestone at base.*

**SOURCE:** Case Western Reserve University

Figure 2.5 Bedrock Topography



SOURCE: Ohio Department of Natural Resources, Ohio Division of Geological Survey, 1999