# *Chapter 1. Natural History —The Wilderness that Greeted the First Settlers*

The land one sees today traveling through northern Ohio took millions of years to form. We can see evidence of tropical sea reefs on the Lake Erie Islands and deep ocean sediments here in the cliffs of the Black River. Ohio was just south of the equator at that time, some 350 million years ago, and over the millennia has migrated northward to its present position. Mountain building to the east eventually raised the sea floor from under the waves and erosion by streams, and later glacial ice, began to sculpture the land. At the same time plants and animals were evolving and began to populate the new land once the ice was gone. Thus, some 14,000 years ago as the last glacier receded into the Lake Erie basin, the first Native Americans arrived and began to utilize the natural resources that these natural processes had produced.

The natural history of Sheffield encompasses all those natural features and processes of the environment that greeted the Native Americans, and later the pioneers, when they first arrived in Sheffield. To be sure, the landscape was a magnificent wilderness to the settlers, but it needed to be "tamed" in order to support the newcomers.

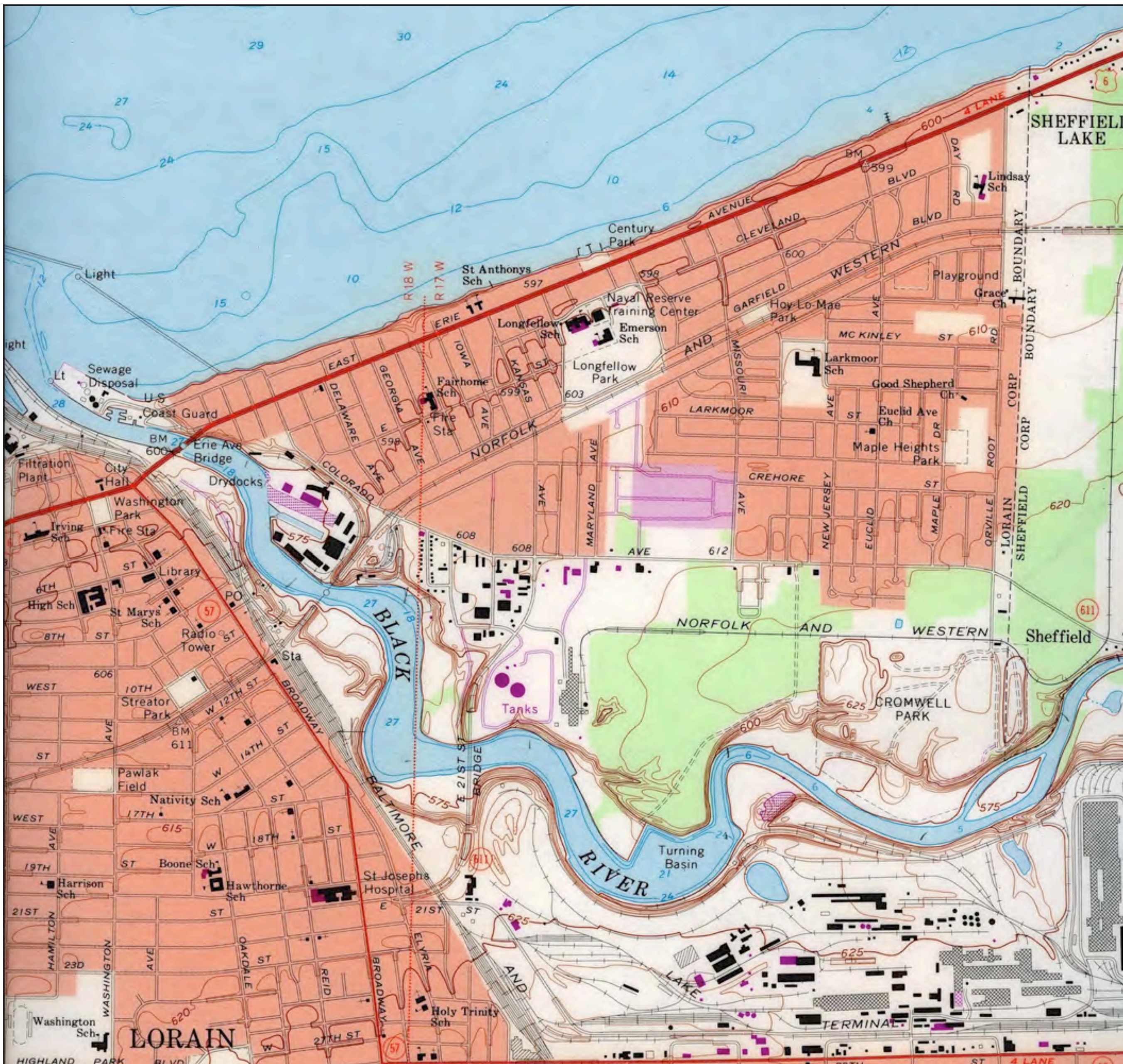
*Ice formation on the shale bluff of the Black River north of Garfield Bridge (2005).*

## *TOPOGRAPHY*

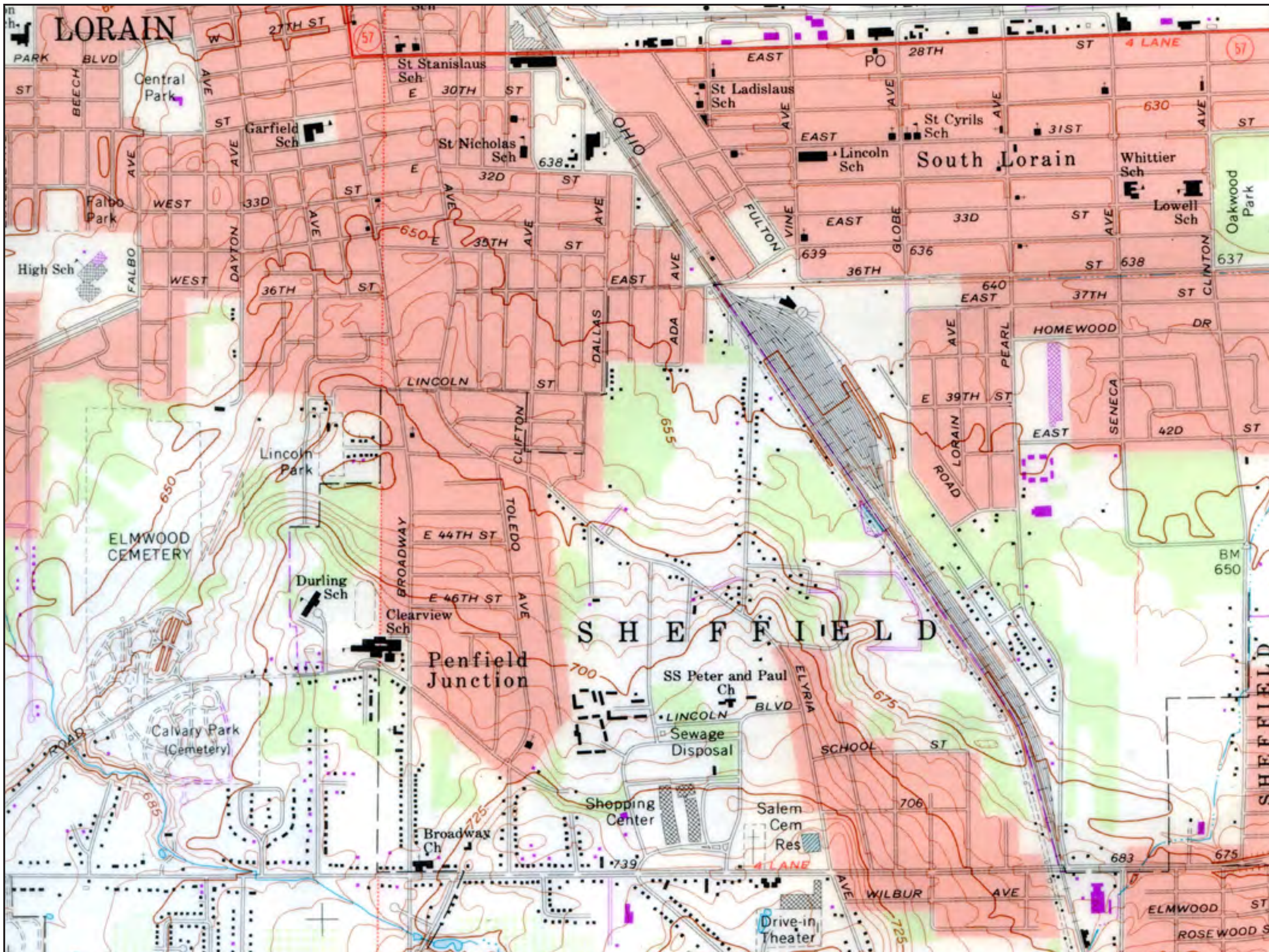
The topography of an area is the configuration of the land surface, including its relief [vertical differences in elevation of the land] and the position of its natural and man-made features. Elevations on topographic maps are usually expressed as contour lines connecting points of equal elevation. Information on the topography of Sheffield is contained on the Oberlin Topographic Quadrangle Map (15-minute series) published in 1903 and revised in 1943 (see page 18) and the more recent Avon and Lorain Quadrangles Topographic Maps (7.5-minute series) published in 1953 and revised in 1969, 1979, and 1994 by the U.S. Geological Survey (USGS). The Lorain County Auditor's office also periodically produced color aerial photographs of Sheffield that show contour elevations for the land surface.

### *Regional Physiography*

Physiography refers to the physical features or landforms of a region. Lorain County lies in what is known as the Central Lowlands Physiographic Province of North America and has two distinct sections: (1) Till Plains and (2) Lake Plains. Till refers to sediments deposited under a glacier; landforms created by these deposits are known as moraines. The Till Plains owes its topography to glaciation and consists of gently rolling ground moraines, bands of recessional end moraines, and glacial outwash-filled valleys. Glaciation also altered the course of most streams in the area. The Lake Plains consists of wide expanses of level or nearly level land interrupted only by sporadic sandy ridges that are remnants of glacial-lake beaches and by river valleys carved into ancient bedrock (Paleozoic Era).



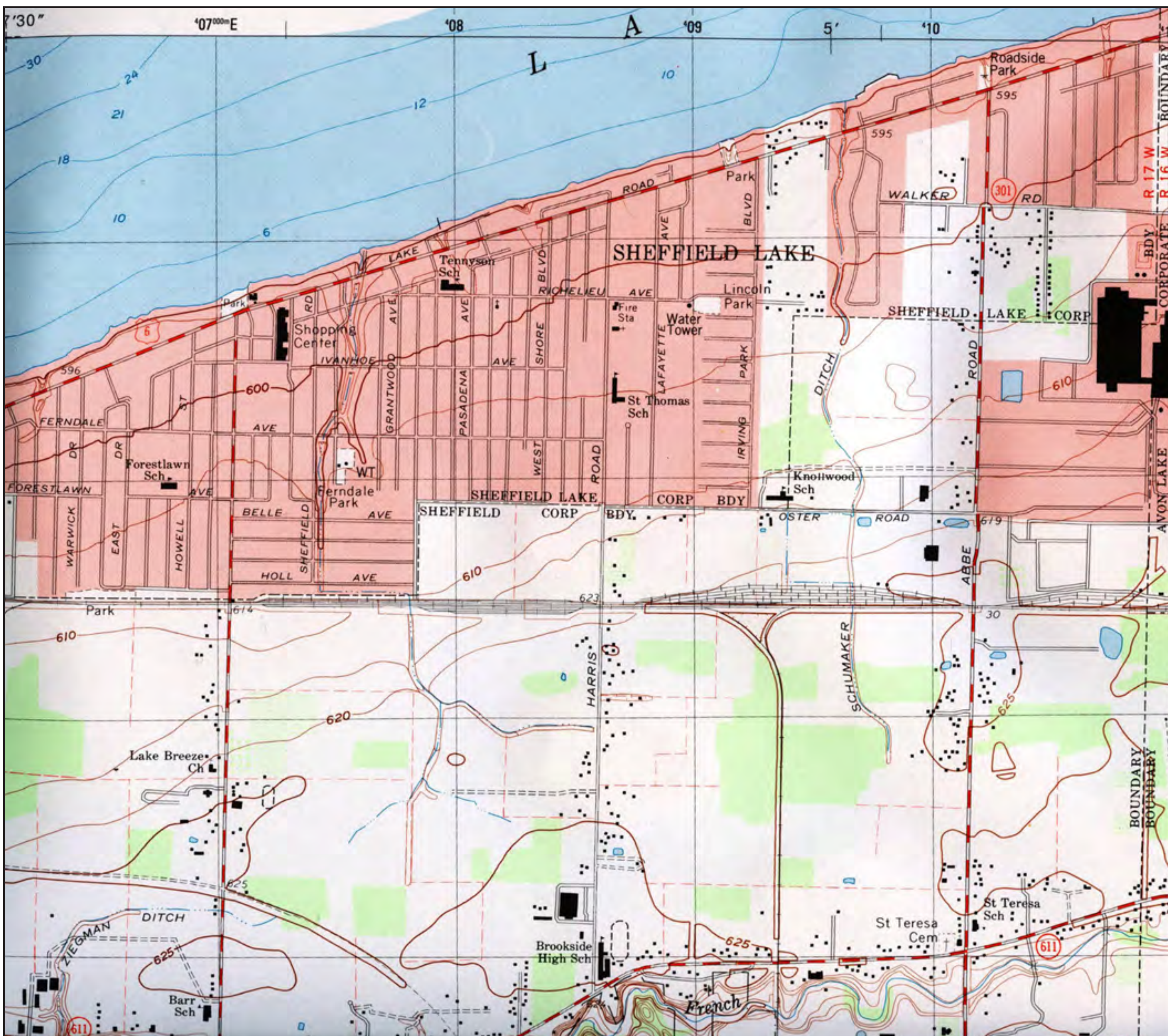

*Northwest quarter of original Sheffield Township (U.S. Geological Survey, Lorain Quadrangle Topographic Map, 1979).*



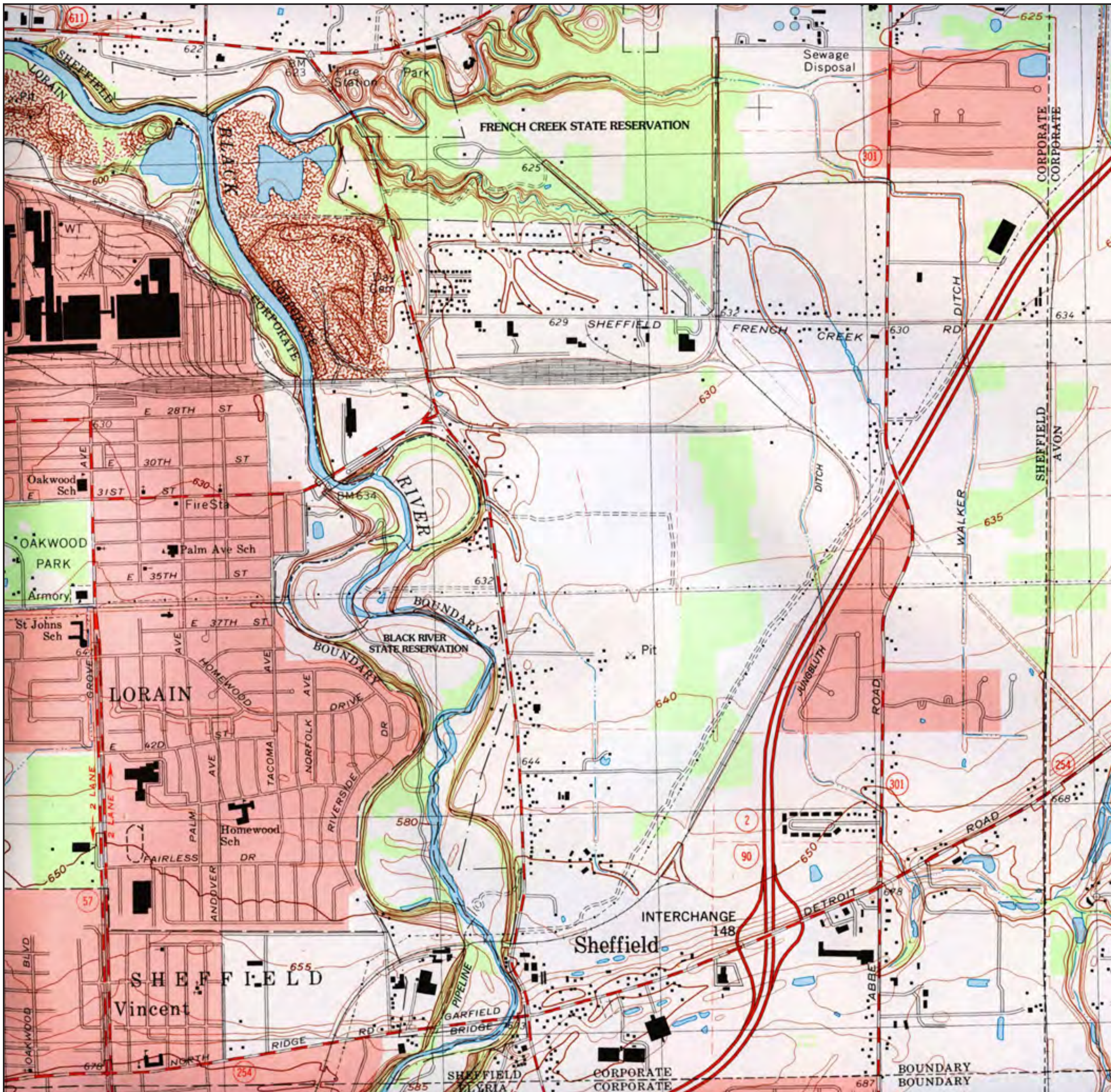

*Southwest quarter of original Sheffield Township (U.S. Geological Survey, Lorain Quadrangle Topographic Map, 1979).*

*Rolling Till Plain of southern Lorain County (1958).*

*Aerial view of the Lake Erie Plain at foot of Lake Breeze Road, Sheffield Lake, 2001 (City of Sheffield Lake).*




*Northeast quarter of original Sheffield Township (U.S. Geological Survey, Avon Quadrangle Topographic Map, 1994).*




*Southeast quarter of original Sheffield Township (U.S. Geological Survey, Avon Quadrangle Topographic Map, 1994).*

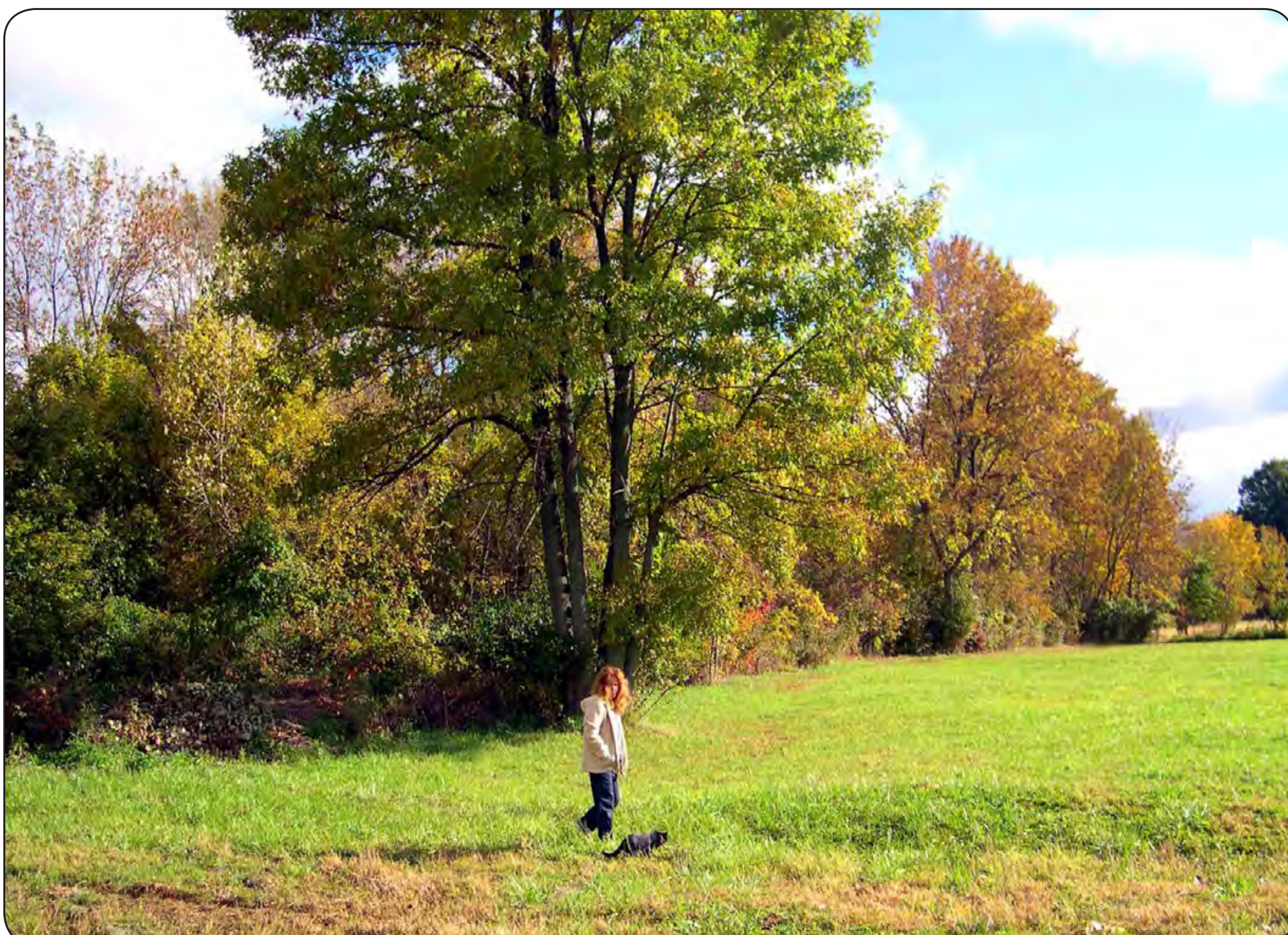
*North Ridge, an abandoned beach of glacial Lake Warren in Sheffield Village (2008).*

Much of the Lake Plains was a swamp forest prior to settlement, but only few significant wetlands remain. The original 1815 configuration of Sheffield Township comprised about 23.7 square miles, primarily in the Lake Plains section.

The Ohio Geological Survey has further subdivided the physiographic regions of the state into districts. In Sheffield, there are two components to the Lake Plains: (1) Erie Lake Plain and (2) Berea Headlands.

***Erie Lake Plain.*** This district consists of a narrow band (5 to 10 miles wide) of the very low relief terrain bordering the Lake Erie shore from Huron in Erie County, Ohio to the Pennsylvania border. The Erie Lake Plain owes its origin to the glacial lakes that covered the area for about 2,000 years, ending about 12,000 years ago. The Erie Lake Plain terminates on the north at modern Lake Erie shoreline cliffs that rise to 20 feet high in Sheffield Lake and up to 80 feet high near Ashtabula. The mean elevation of Lake Erie is about 570 feet above sea level and the highest elevation of the Erie Lake Plain is 800 feet. Major streams, such as the Black River, flow to the lake in deep gorges cut into Late Devonian-age shales. A series of glacial lake beach ridges form a west to east belt across Lorain County at the southern edge of the Lake Plain. Geologically, Pleistocene-age lacustrine [lake-deposited] sand, silt, clay, and wave-planed till overlie Late Devonian-age shales and sandstones. The north boundary of this district is the Lake Erie shore and the south limit is the highest glacial lake ridge.

***Berea Headlands.*** This district, which extends from western Erie County, through Lorain County, and into eastern Cuyahoga County, consists of the Erie Lake Plain that is underlain by resistant Berea Sandstone. Several large sandstone headlands jut into the glacial-age lake basins in this sub-district, such as the northern projection of North Ridge starting in Sheffield and reaching its northernmost apex near the center of Avon. This sub-district also contains several streamlined “whalebacks” of Berea Sandstone 0.5 to 2.0 miles long and 20 to 35 feet high. These sizable mounds or hills have the general shape of a whale’s dorsal region and are generally elongated in a north-south direction. Other than these features, the land ranges gently from 670 to 800 feet in elevation with very low relief and is poorly drained, except for the well-drained sandy beach ridges of the glacial lakes. Geologically, the surface material is lacustrine [lake] deposits over thin, wave-planed clayey, medium-lime Wisconsinan-age till and underlain by resistant Berea Sandstone. The northern boundary is the Erie Lake Plain underlain by soft shale and the southern limit is the highest Pleistocene (ice age) lake.



*Level surface of the Lake Erie Plain in southern Sheffield Village (2008).*

*Berea Sandstone headlands forming an escarpment in eastern Erie County at the abandoned Baillie Stone Company quarry (2000).*

### *Sheffield Topography*

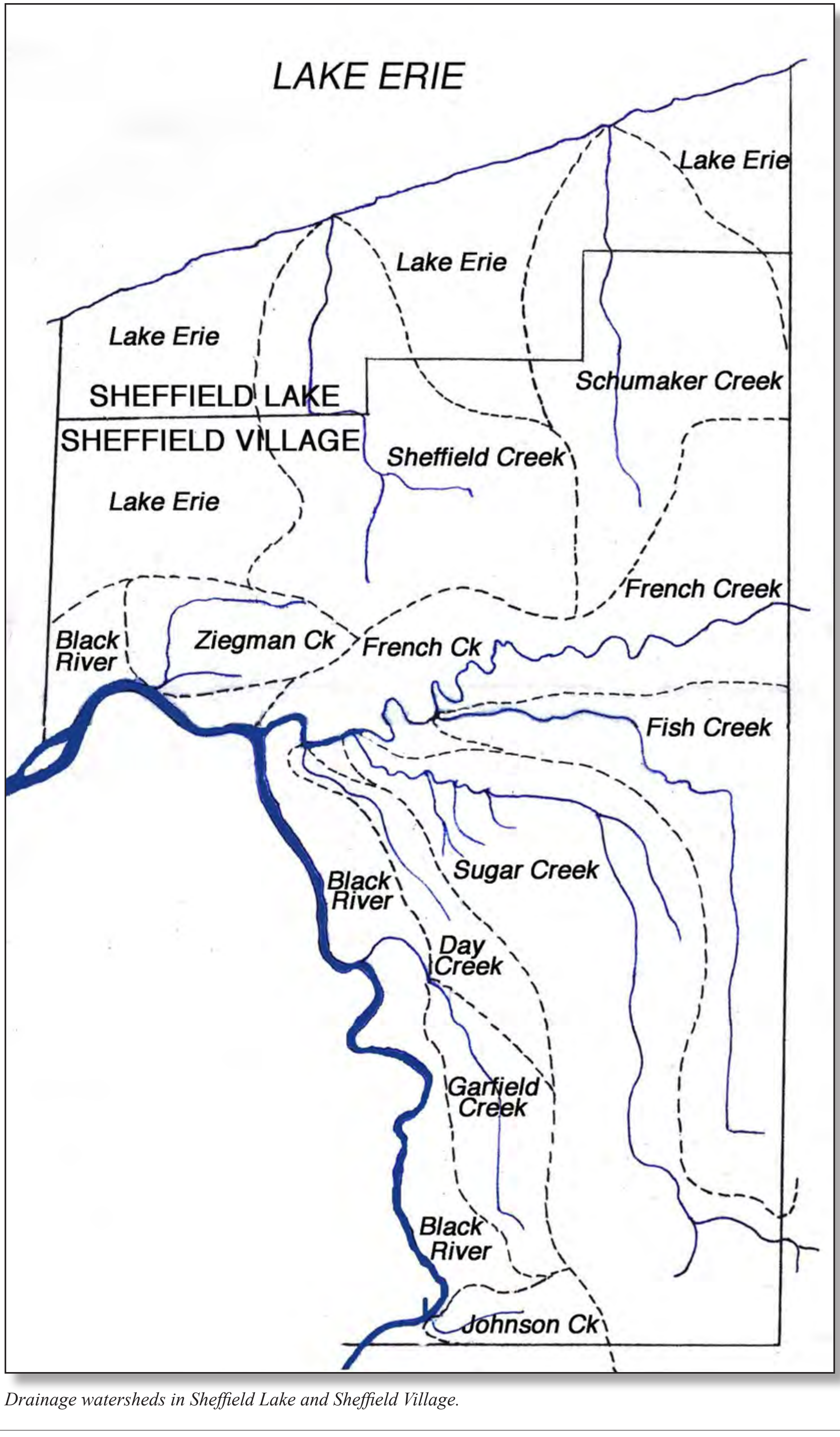
Sheffield has a relatively flat land surface, that slopes gently downward to the north toward Lake Erie, which is broken only by deep ravines of the Black River and its major tributary French Creek at the western and mid-northern margins of Sheffield Village, and by an ancient glacial-lake beach ridge (North Ridge) at the southern limits of Sheffield Village and Sheffield Township. Most of the Village (53.6%) is drained by French Creek and its tributaries: Sugar Creek (aka Jungbluth Ditch), Fish Creek (aka Walker Ditch), and Day Creek. West of the Sugar Creek watershed and west of the mouth of French Creek, several small streams and ditches flow directly into the mainstem of the Black River and account for 17.3% of the Village's drainage area. The remainder of the Village (29.1%), generally north of Colorado Avenue, drains directly to Lake Erie via small streams and ditches flowing northward through Sheffield Lake. Virtually all of Sheffield Lake drains directly to Lake Erie via these small waterways.

The highest elevations in Sheffield Village are found along the crest of North Ridge, generally ranging in elevation from 675 to 685 feet above sea level. The ridge traverses the southern portion of the Village from the Black River valley eastward to the City of Avon line. The ridge averages about 1,500 feet in width and is asymmetrical in shape, having a gentle slope or nearly flat surface to the south, as compared to its steeper north slope. From the crest of the ridge to its northern base, a vertical distance of about 30 feet and a horizontal distance of 250 feet, the north slope is equivalent to 630 feet per mile (ft/mi). At the base of the ridge, where the sandy beach deposits taper out against the silt and clay sediments of the former glacial lakes, a line of springs emerge from the ridge. Before early settlers drained them, swamps and marshes existed at this junction. In the past century, numerous farm ponds have been dug along the margins of the ridge to take advantage of these springs. From the base of the ridge, the land surface flattens northward to the very gentle slope of the Erie Lake Plain. Along Abbe Road from the base of North Ridge (elevation 655 feet) to the Sheffield Lake line, a distance of 4.0 miles, the land surface drops about 50 feet to an elevation of 605 feet at the northernmost portion of the Village. This equates to a surface gradient of only 12.5 ft/mi. From the highest elevation in the Village (690 feet—North Ridge at the Lorain County Community College campus), to the lowest elevation in the Village (565 feet—bed of the Black River near Bungart Island [aka Cromwell Island]), the total topographic relief (vertical distance from the highest to lowest point in a given area) is only 125 feet. If the stream valleys are excluded, the total relief of the land surface within the Village is only 85 feet. With a mean elevation of slightly more than 570 feet, Lake Erie lies about 60 feet below the average elevation of the Erie Lake Plain and 110 feet below North Ridge.

In Sheffield Township, North Ridge continues from the top of the westerly bluff of the Black River in a westerly direction along the southern border of the Township, at an elevation ranging from 575 to 585 feet above sea level, for about 1.7 miles then abruptly turns northeasterly for another 2.0 miles before passing out of the Township. The reason for the change in direction is related to the underlying bedrock. The southwestern corner [Penfield Junction area] of Sheffield Township is underlain by erosion-resistant Berea Sandstone, which creates the cusp-like northerly nose of one of the whalebacks.

***Black River Valley.*** The East and West Branches of the Black River unite at the City of Elyria, then flow northward through Sheffield, to debouch into Lake Erie at Lorain. The East Branch has its source on the borders of an extensive marsh near Lodi in Medina County. A test boring near Lodi made to a depth of 210 feet failed to reach bedrock, indicating a pre-glacial valley now filled with glacial drift. From Lodi, the East Branch flows northward mainly through a drift-filled valley, although not strictly coincident with it. This old valley apparently once drained the headwaters of Killbuck Creek [now in the Ohio River drainage basin and flowing southward, but once a northward flowing stream], as indicated by a narrowing of its valley near Wooster. The West Branch has its headwaters in the Defiance end moraine near the Village of Nova in Ashland County and follows a northerly course, channeling a passage much of the way through shale and sandstone bedrock; its course is not coincident with pre-glacial drainage. At Elyria, waterfalls of nearly 40 feet in height occur on both branches as the river flows over the cataract created by the resistant Berea Sandstone Formation. The branches unite a short distance downstream from the falls and flow primarily in a post-glacial valley cut deeply into the Ohio Shale Formation to the river's mouth at Lake Erie.

The U.S. Geological Survey (USGS) operates a gaging station on the Black River located at Cascade Park in Elyria, 0.8 mile downstream of the confluence of the East and West Branches.




*Drainage watersheds in Sheffield Lake and Sheffield Village.*

At this point, the Black River has an upstream drainage basin of 396 square miles. At the station the river had an average annual flow of 336 cubic feet per second (cfs), and has an annual range between 130 and 534 cfs for the period 1944 to 1993. The highest mean daily flow of 249,000 cfs was recorded on January 22, 1959, while the lowest mean daily flow of less than 1 cfs was measured on October 5, 1944. An instantaneous peak flow of 517,000 cfs was recorded on July 6, 1969, following the record high rainfall of July 4 in the drainage basin. As a minimum, on October 10, 1956 the river had zero flow. The USGS also calculated the average annual runoff for the Black River drainage basin at 0.85 cfs for each square mile of the watershed. This runoff equates to a depth of 11.5 inches of water over the entire drainage basin per year.

Within Sheffield the Black River meanders northward in a deeply entrenched valley for about 3.3 miles to the confluence with French Creek, then turns abruptly westward for another 1.3 miles before passing into the City of Lorain. At the southern (upstream) limit of Sheffield, the valley is about 2,200 feet wide with walls of nearly vertical shale that are some 90 feet in height. As the valley progresses northward, it narrows at several locations to less than 700 feet before again broadening to over 2,000 feet. These narrows proved advantageous for bridge crossings such as the railroad trestle at the base of North Ridge, the highway and former interurban railway bridge at East 31st Street, and the steel mill railroad bridge south of French Creek. The final narrowing of the valley takes place at the western limit of Sheffield Village, abreast of Bungart Island.

When new outlets for the glacial-lake predecessors of Lake Erie were uncovered as the ice mass melted northward, the water level of the glacial lakes fell precipitously. For example, about 13,000 years ago the level dropped 50 feet from Lake Whittlesey [Center Ridge and Middle Ridge Roads] to Lake Warren [North Ridge and Detroit Road] and then 70 more feet to Lake Lundy [south of Walker Road], all in the relatively short time period of 600 years. About 12,000 years ago the Niagara River outlet was first uncovered and Early Lake Erie was formed, dropping the elevation over 220 feet [nearly 180 feet below the present level of Modern Lake Erie due to the depression of the outlet by the weight of the glacial ice; the outlet has since rebounded]. The consequence of these base level [lowest level to which erosion can progress] lowering events, was the dramatic and sudden rejuvenation of the Black River's downcutting ability. After Lake Whittlesey, the glacial-lake shorelines were all north of the resistant Berea Sandstone [Cascade Falls in Elyria] and the river valley bedrock was the more easily eroded Ohio Shale. Thus, in a sense "the bottom fell out" and the Black River was able to rapidly cut the deep, steep-sided valley that now courses through Sheffield.

In addition to French Creek, several small tributaries and ditches flow directly into the Black River along its east bank—Johnson, Garfield, and Ziegman Creeks. These small streams, as well as Day Creek that flows into French Creek near the confluence with the Black River, form waterfalls and rapids as they cross the high bluffs separating the Lake Plain from the Black River floodplain. On the west side of the river, the East 36th Street Ditch [once the boundary between South Lorain and Sheffield Township—dug in the 1890s to drain land being developed for steel mill employee housing] also falls over the shale bluff in a spectacular fashion during wet periods. The existence of these waterfalls indicates an older, and much more rapidly down-cut, main stem of the river as compared to the small tributaries. Most of the smaller tributaries were enhanced by the pioneers as they attempted to drain the once swampy forest to create farmlands.

*Cascade Falls on the west branch of the Black River (2007).*

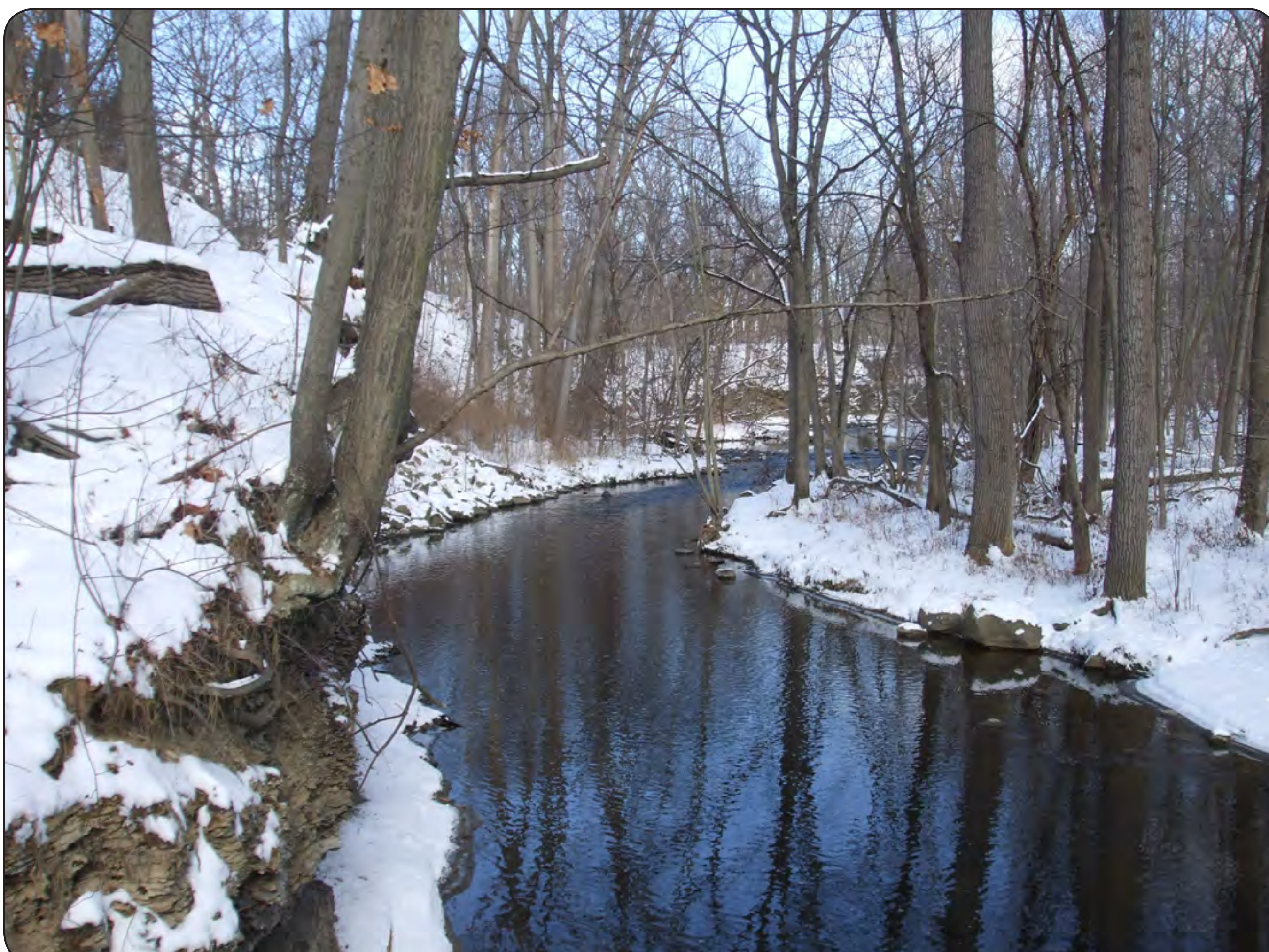
The Black River floodplain within Sheffield ranges from nearly absent to 200 feet wide at the narrows to over 2,000 feet wide south of Kinney Point [0.6 miles north of Elyria line] and at the French Creek confluence. Along its course, the Black River channel typically ranges from 50 to 200 feet wide, generally increasing in width downstream. The elevation of the valley's top crest decreases downstream from 675 feet at the southern limit of Sheffield to 620 feet at Bungart Island. Likewise, the valley depth decreases downstream from 90 feet to 50 feet for the same reach of the river.

The gradient of the Black River within Sheffield is 4.3 ft/mi. The lower 5 to 6 miles of the Black River, including the mouth of French Creek, is considered an estuary of Lake Erie, in that this portion of the river is slack water being controlled by the level of Lake Erie except during times of upstream flooding.

***French Creek Watershed.*** French Creek is the largest tributary of the Black River with a drainage area of 38.3 square miles, a stream length 14.8 miles, and an average stream gradient of 14.4 ft/mi. The confluence of French Creek and the Black River is located southwest of the intersection of Colorado Avenue and East River Road in Sheffield Village, approximately 5 miles upstream from Lake Erie.

French Creek enters Sheffield Village from the City of Avon, a short distance west of Miller Road, and flows westerly just south of Colorado Avenue (SR 611) a distance of 3.9 miles to its mouth at the Black River, about 0.7 mile west of the East River Road bridge. The Lorain County Metro Parks' Steel Mill Trail provides an excellent vista of the confluence of these streams from a footbridge over French Creek. The valley of this stream is also entrenched in shale bedrock [Ohio Shale Formation—Devonian Age] and has a width of approximately 600 feet throughout most of its course in Sheffield. The depth of the valley ranges from less than 15 feet at the Avon line to about 45 feet at the confluence, yielding a stream gradient of 10.8 ft/mi.

Along with its tributaries, Sugar, Fish, and Day Creeks, the French Creek watershed is 5.5 square miles, about half of Sheffield Village's surface area and one quarter of the original 1815 Township. The youthful floodplain of French Creek is narrow—rarely over 200 feet wide, except at the stream's mouth were it merges with the Black River floodplain. Pioneer settlers knew the floodplain south of this confluence as the "Big Bottom" and it was one of the most productive farming areas in Sheffield. Much of the original floodplain has been filled with waste slag from the steel mill, but it is now home to a beaver colony, which has constructed a dam on Day Creek forming a large pond that is also visible from the Metro Parks' Steel Mill Trail.

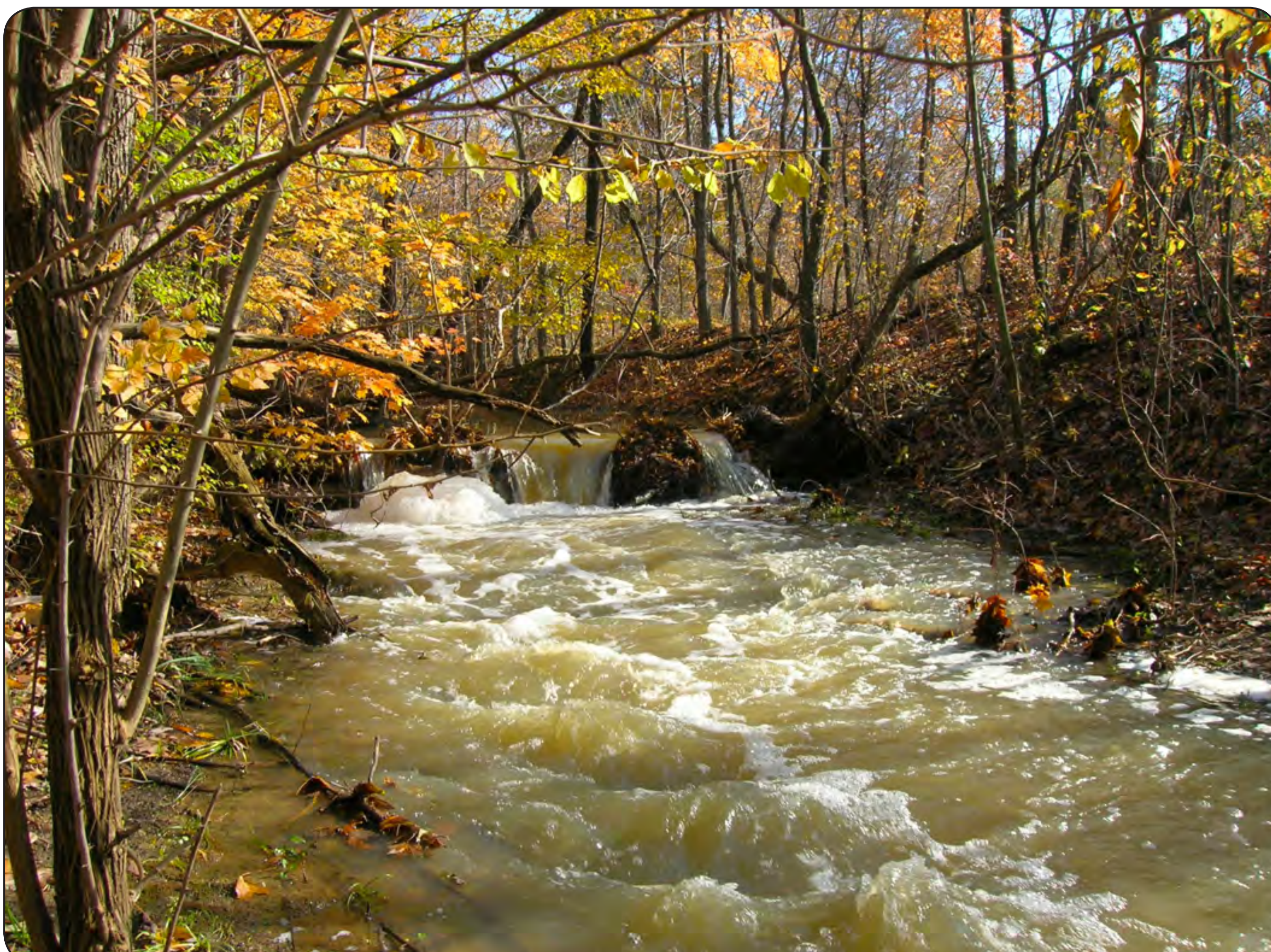


*French Creek valley at Lorain County Metro Parks' French Creek Nature & Arts Center (2012).*

***Sugar Creek Valley.*** Sugar Creek, the middle portion of which is known as Jungbluth Ditch, is the largest tributary to French Creek, which in turn is the largest tributary to the Black River. The first known map containing the name Sugar Creek for this stream was published by the Ohio Geological Survey in 1874. Sugar Creek has its source within the City of North Ridgeville, flows through the western portion of the City of Avon, and passes through the center of Sheffield Village where it merges with French Creek at James Day Park near the intersection of East River Road and Colorado Avenue. Under moderate- to high-flow conditions, this stream becomes extremely turbid, carrying large quantities of suspended solids, excessive amounts of nutrients, and deleterious concentrations of organic compounds. Rainfall events of several inches can cause flooding of residential neighborhoods in the area bounded by I-90 on the west, Detroit Road on the south, and Abbe Road on the east—an area known locally as the "IDA triangle."

Sugar Creek, within the Village of Sheffield, flows in a general westward direction along the crest of North Ridge from the Avon Line to just east of Abbe Road, where it turns northward and flows across the sandy beach ridge and down onto the clayey Erie Lake Plain. It is instructive to note the dramatic difference in the large amount of water flowing in the creek bed as it enters the Village verses the moderate flow some 5,000 feet to the northwest in the channelized portion of the stream in the College Heights sub-division. The difference in flow can largely be attributed to the percolation of water into the sandy streambed as the stream traverses some 3,000 feet through the beach ridge. This observation points out the importance of maintaining the natural integrity of the streambed, particularly in the vicinity of beach ridge, as an infiltration gallery to absorb storm water.

***Lake Erie Drainage.*** Much of Sheffield Village lying north of Colorado Avenue and all of Sheffield Lake drains directly into Lake Erie without first flowing into the Black River. About 3.0 square miles of the Village (29%) is drained in this manner via Schumaker and Sheffield Creeks, which over the years have largely been channelized to form drainage ditches. Within the Village the valleys of these streams are narrow and shallow, typically about 5 feet deep. However as these streams approach the lakeshore and cut through the bluffs in Sheffield Lake, they have etched valleys in the glacial till and shale to a depth of 20 feet. The gradient of these streams within the Village averages 15 feet/mile, about the same gradient as the land surface as it slopes toward the lake.



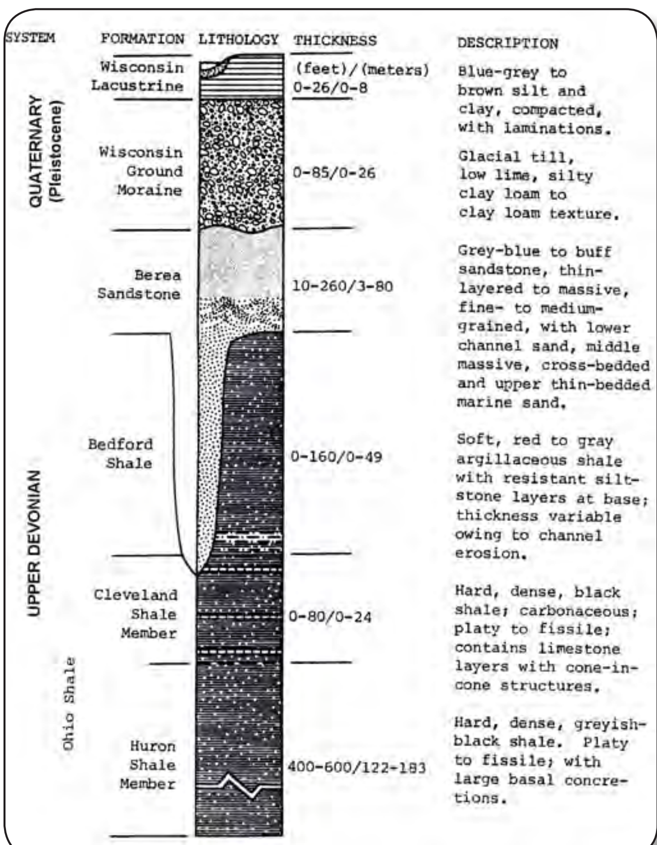
*Sugar Creek in southern Sheffield Village (2007).*

## BEDROCK GEOLOGY

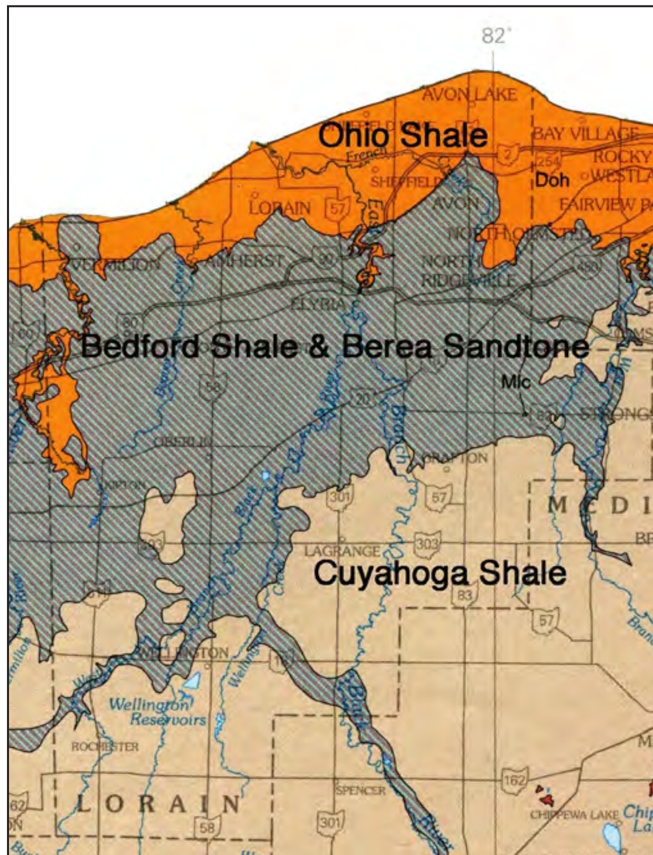
The bedrock underlying the soils and glacial deposits of Sheffield, and at places exposed in stream valleys and along the lakeshore, was formed during the middle portion of the Paleozoic Era, that span of time from 400 to 350 million years ago. These rocks consist of thick layers of shale, thin limestone and siltstone lenses, and massive beds of sandstone all deposited as sediments in tropical seas during the Late Devonian geologic period. In that distant past, the landmass we now know as Ohio was the bottom of a shallow ocean embayment known as Ohio Bay which was located south of the equator at about the latitude of present day Tahiti in French Polynesia. When the continent of Africa collided with North America, toward the end of this period, rocks were pushed up creating the Appalachian Mountains. Clays, silts, and sands from the erosion of these mountains were deposited in Ohio Bay, and were eventually compacted into the shale, siltstones, and sandstones that underlie Sheffield.

The oldest bedrock visible in Sheffield is the upper portion of the Ohio Shale Formation, which is spectacularly exposed in the nearly 100-foot vertical walls of the Black River valley. These beds can best be observed from Garfield Bridge as one travels east on SR 254, or on foot from the Bridgeway Trail in the Lorain County Metro Parks' Black River Reservation as the trail passes under Garfield Bridge, or from the Steel Mill Trail north of East 31st Street. Other exposures are found along the Lake Erie Shore (especially at Shell Cove Park) and along French Creek between East River and Abbe Roads. This shale formation is noteworthy for the fossils of ferocious placoderm fishes and sharks found in these beds, excellent examples of which can be viewed at the Cleveland Museum of Natural History. A replica of the head shield of the 20-foot-long placoderm, *Dunkleosteus terrelli*, is on display in the Sheffield Lake City Hall.

While a shallow Devonian sea occupied northern Ohio, the Appalachian Mountains were being built to the east and north. Recent studies of plate tectonics indicate that the collision of the northwest coast of Africa and that of eastern North America

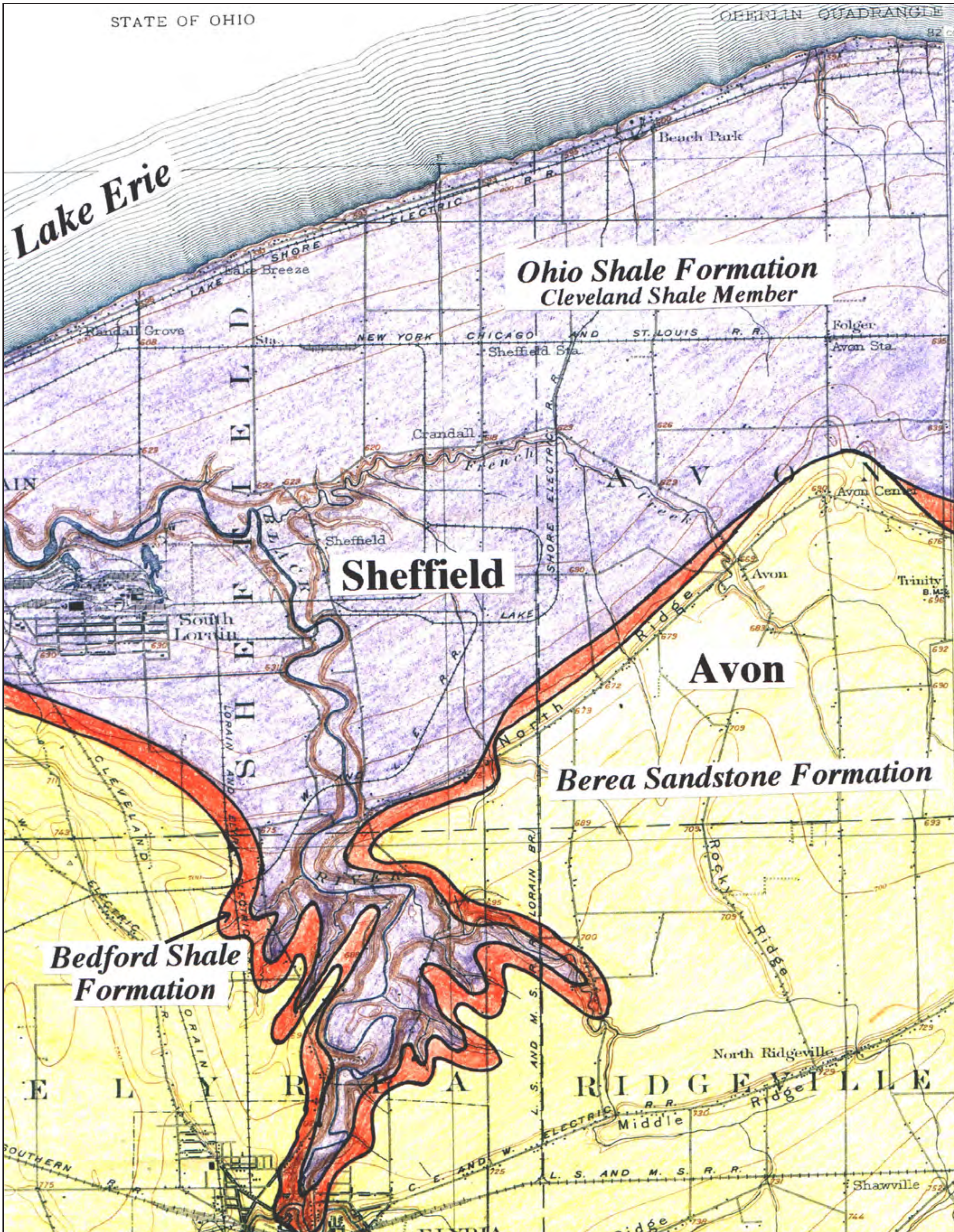



*Geologic column of bedrock exposed in northern Lorain County, Ohio.*




*Bedrock geology of Lorain County, Ohio (Ohio Geological Survey).*

*Dunkleosteus terrelli, placoderm fish fossil from the Ohio Shale (Cleveland Museum of Natural History).*




*Bedrock geology in the vicinity of Sheffield, depicted on 1903 U.S. Geological Survey map.*

*Shale cliff [Ohio Shale] along the Black River in southern Sheffield Village (2008).*

caused the sediments in the Appalachian geosyncline to be folded into a formidable mountain chain, while creating a deeper ocean basin in Ohio. Erosion of these newly formed mountains resulted in the deposition of mud, which covered the coral reefs that were present before the collision. Fossilized coral reefs from this earlier time (Middle Devonian) are exposed farther to the west on Kelleys Island and Marblehead Peninsula.

During the Late Devonian Period, following the deposition of the sediments which became the black Ohio Shale, silt and sand deltas were built from the north and east into a shallower Ohio Bay. These beds became the red and gray shales of the of the Bedford Shale Formation and the buff-colored, cliff-forming sandstones of the Berea Sandstone Formation that overlie the black shale in Lorain County. The sandstone is exposed in the Black River valley at Cascade Park, in the French Creek valley at Avon Isle in Avon, and north of Penfield Junction in southwestern Sheffield Township.

Because the Berea Sandstone is considerably more resistant to erosion, northward whaleback-projections of these rocks in Avon and near Penfield Junction caused the glacial Lake Warren beach ridge to swing northward. Correspondingly, Detroit and North Ridge Roads (SR 254) swing northward reaching their apexes at SR 83 in Avon and at Broadway in Sheffield Township.

A long period of erosion ensued following the deposition of Devonian rocks and little is known of the geologic processes for the next 250 million years. Here, the geologic record stops until the glacial deposits of the Pleistocene Epoch. These ice age deposits include the beach ridges, which were so important as transportation routes for Native Americans and early settlers.

### *Characteristics of the Berea Sandstone*

The Berea Formation is a gray- to buff-colored, medium- to fine-grained, thin-layered to massive, cross-bedded and ripple-marked sandstone. Principal sand grains are clastic (composed of broken pieces of older rocks), subangular to subrounded quartz showing secondary enlargement; with lesser amounts of other minerals: microcline, orthoclase, plagioclase, muscovite, leucoxene, zircon, tourmaline, calcite, chlorite aggregates, and rims of siderite. The bonding material is primarily chert and clay. The Berea Formation is divided into three parts: (1) lower channel sandstone, present only as fills in erosion valleys in the Bedford and Ohio Shales where it is characterized by steep walls, rounded basal profiles, and meander patterns, (2) middle massive sandstone, strongly cross-bedded and containing flow rolls, and (3) upper thinly bedded marine sandstone with distinct oscillation-type ripple marks. Fossils are rare, but some remains of delta-type plants have been found in the South Amherst

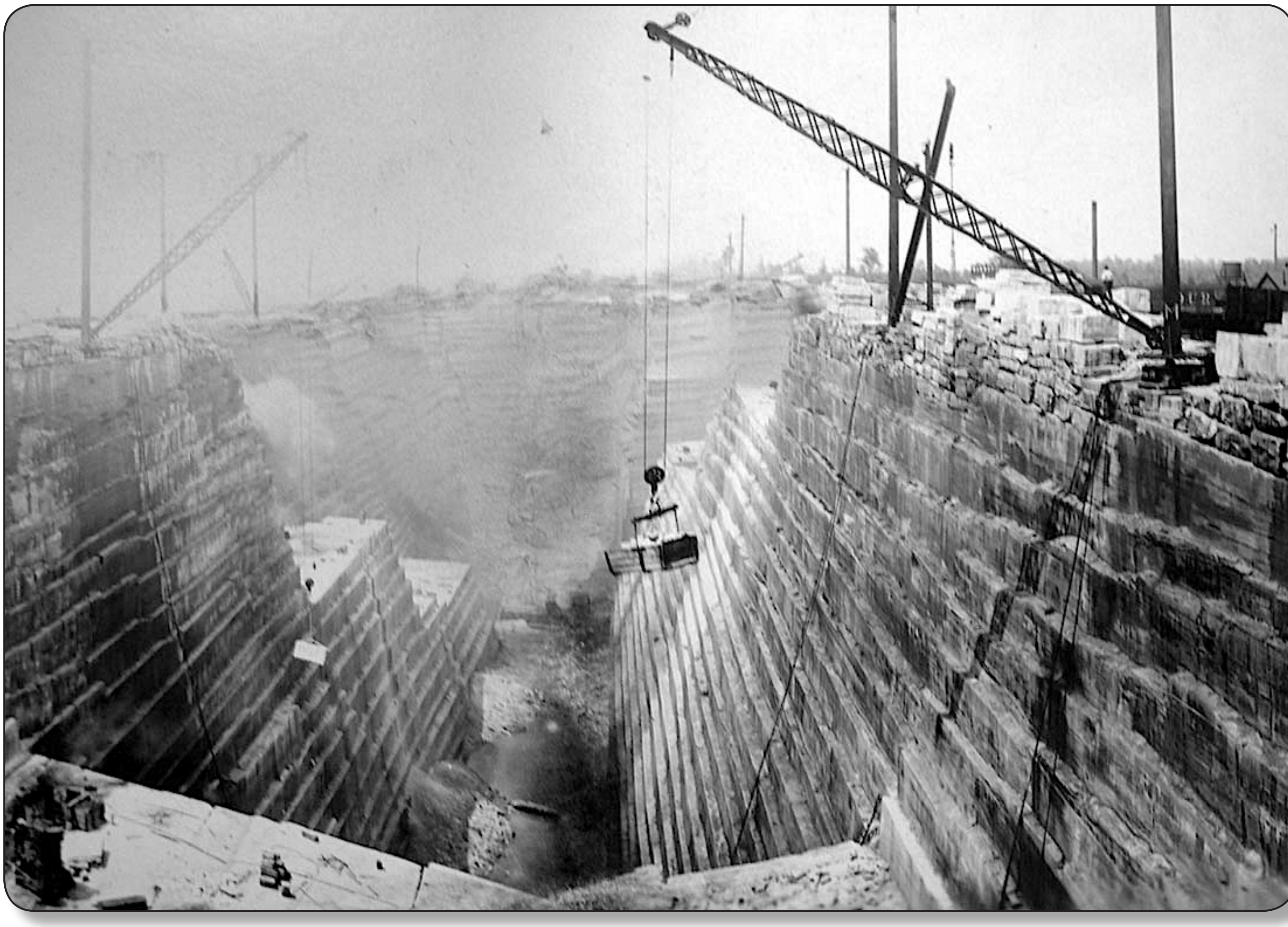
*Red Bedford Shale along the Vermilion River (2007).*

quarries and fossils of freshwater fish have been discovered at Chagrin Falls. This formation is highly erosion resistant, forming ridges and hills as well as influencing the orientation of glacial-lake beach ridges and bluffs.

The channel sandstone ranges in thickness from a few feet to at least 260 feet at the Cleveland Quarries Company operation at South Amherst. In the 1960s, the Berea Sandstone was being quarried to a depth of approximately 235 feet from the company's Buckeye Quarry. West of South Amherst the thickness of the channel sandstone decreases, however, the amount of thinning is obscured by the overlying glacial till. About 175 feet of Berea Sandstone is exposed in the quarry operation of the Nichol Stone Company at Kipton. The lower part of a channel sandstone is exposed on the Lake Erie shore about two miles east of the Vermilion River, where the erosion-resistant sandstone forms a narrow headlands that juts out into the lake nearly 20 feet. The channel is flanked by red Bedford Shale and black shale of the Cleveland member of the Ohio Shale. From the lakeshore the channel can be traced inland about half a mile to an abandoned quarry where over 50 feet of sandstone is exposed. Most channels appear to have a north-south trend, except for one near the Village of Berlin Heights, which runs more northeast-southwest and may represent a side distributary channel. Over 100 feet of sandstone is exposed in this channel at the abandoned Baillie Stone Company quarry. The water pool that has accumulated in the bottom of this quarry is noted for its population of nickel-sized, freshwater jellyfish (*Craspedacusta sowerbii*). Outside the quarry district, the Berea Formation is a widespread sandstone, varying in thickness from only 25 to 60 feet.

In Sheffield Township, the Berea Sandstone crops out near Penfield Junction at the abandoned cliff-phase shore of glacial Lake Warren. Here, two small sandstone quarries were opened in the late 1800s or early 1900s north of Clearview High School. On the same northward-projecting whaleback, another quarry was opened a short distance south of Vincent in Elyria Township by the Eschtruth family in 1894.

Berea Sandstone forms an impressive escarpment. This is an erosional feature that occurs along much of the northern outcrop edge of the formation. Because this sandstone is the most erosion-resistant bedrock formation exposed in north central Ohio, erosion has left it standing proud, well above the surrounding shale beds. This is especially the case in the vicinity of Berlin Heights in Erie County where the escarpment occurs in a mile wide band that extends in a northeast-southwest direction between the Huron and Vermilion Rivers. Impressive rock gorges have been cut through the escarpment by Old Woman



*Berea Sandstone quarry in South Amherst, circa 1945 (Amherst Historical Society).*

and Chappel Creeks in Erie County and by the Black River and French Creeks in Lorain County. The base of the escarpment lies at an elevation of about 660 feet and rises to a maximum elevation 850 feet northeast of Berlin Heights. The steepness of the escarpment's north slope is governed by the relative erosion resistance of the underlying rocks—the weaker the underlying shale, the more precipitous the escarpment.

Because Berea Sandstone strongly resists erosion, it often becomes the cap rock over which waterfalls occur. In Elyria's Cascade Park, Berea Sandstone forms the cap rock for waterfalls on both the east and west branches of the Black River. Several communities in Cuyahoga County have the word "Falls" as the second word in the town's name, such as Olmsted Falls. In most cases these town names are derived from the waterfalls created by the Berea Sandstone cap rock at the northern edge of the formation's outcrops.

## SURFACE GEOLOGY

The surface geology of Sheffield consists of unconsolidated, loose material that often masks the underlying bedrock. This material is largely the result of glacial deposition, sedimentation in lakes and wetlands, and accumulations along the floodplains of flowing streams. Once deposited, the upper layers of these materials began the complex process of soil formation.

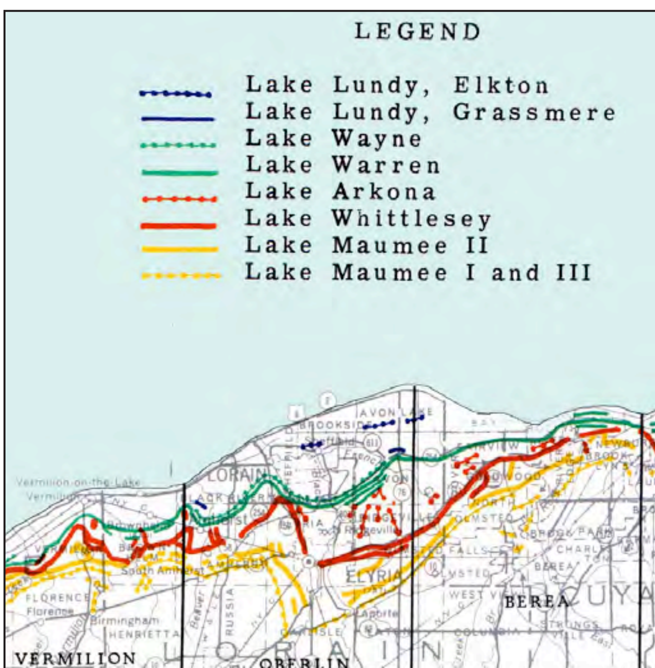
### Glacial Deposits and Modern Features

Kames are low mounds or terrace-like ridges consisting of sand and gravel deposited between a melting glacier and a valley wall. A small feature of this type is located adjacent to the Rocky River valley in southern Columbia Township. Ground moraines are accumulations of clayey till deposited or released from the ice during glacial retreat, forming a flat to undulating surface. Deposited from 18,000 to 14,500 years ago, this till covers most of Lorain County south of the lake-planed moraine surface. End moraines are ridge-like accumulations produced at the margin of an actively flowing glacier, typically formed when its forward advance is matched by its rate of melting. Two end moraines [Spencer and Defiance Moraines] are located in southwestern Lorain County in Huntington and Rochester Townships. Lake-planed moraines are glacially deposited ground moraines (clayey till) that has been planed to a very flat surface by waves in glacial lakes. Other than the Black River alluvium and the North Ridge sand deposits, most of the land surface of Sheffield consists of lake-planed moraine deposits with a thin veneer of lake sediments that extends south nearly to Grafton, Oberlin, and Birmingham. The till was deposited 18,000 to 14,400 years ago and was planed by glacial lakes 14,200 to 12,000 years ago.

***Abandoned Beach Ridges.*** These prominent features consist of fine sand to coarse gravel deposited along the shores of former

*Granite boulder transported by a glacier from the Canadian Shield and deposited in the Black River valley in Sheffield as a "glacial erratic" (2009).*

glacial lakes; including shore dunes and nearshore bars and spits. Several beach ridges extend from west to east across northern Lorain County. The northernmost prominent of these (North Ridge) underlies Detroit Road (SR 254) at the southern end of Sheffield. This ridge was deposited on the shores of glacial Lakes Warren and Wayne about 13,000 to 12,700 years ago at elevations of 660 to 690 feet above sea level. To the south, Lake Whittlesey beach ridges were deposited about 13,200 years ago at an elevation of 740 feet in the vicinity of Center Ridge Road in North Ridgeville. Still farther to the south, Lake Maumee beach ridges were deposited about 14,200 to 14,000 years ago at elevations of 760 to 780 feet near Butternut Ridge Road in Carlisle and Eaton Townships. A small remnant ridge of another glacial lake, Lake Lundy at 12,400 years ago, is located south of Oster in Sheffield Village and Walker Road in Avon Lake at an elevation of about 620 to 625 feet.




*Abandoned glacial-lake beach ridges of north central Ohio (Jane Forsyth, Ohio Geological Survey).*

***Formation of North Ridge.*** Other than the deep Black River and French Creek valleys and the lakeshore bluffs, North Ridge is the only prominent topographic feature in Sheffield. The origin of this ridge is directly related to the glaciers that once covered much of Ohio. About 20,000 years ago, the last continental glacier blanketed northern Ohio as it pushed down from the north to its maximum southern thrust. The ice sheet reached as far south as Cincinnati, then it began to melt back. As the glacier paused in its retreat, piles of rock and clay debris (end moraines) were built up at the ice margins. In places, these moraines were deposited in such a way as to dam the natural drainage and thereby form large lakes in depressions that the ice had scoured. Lake Erie is the remnant of such a lake, which at its highest stage was 230 feet above the present level of the lake. As the ice retreated, new outlets were uncovered and several lake stages were formed at successively lower levels.

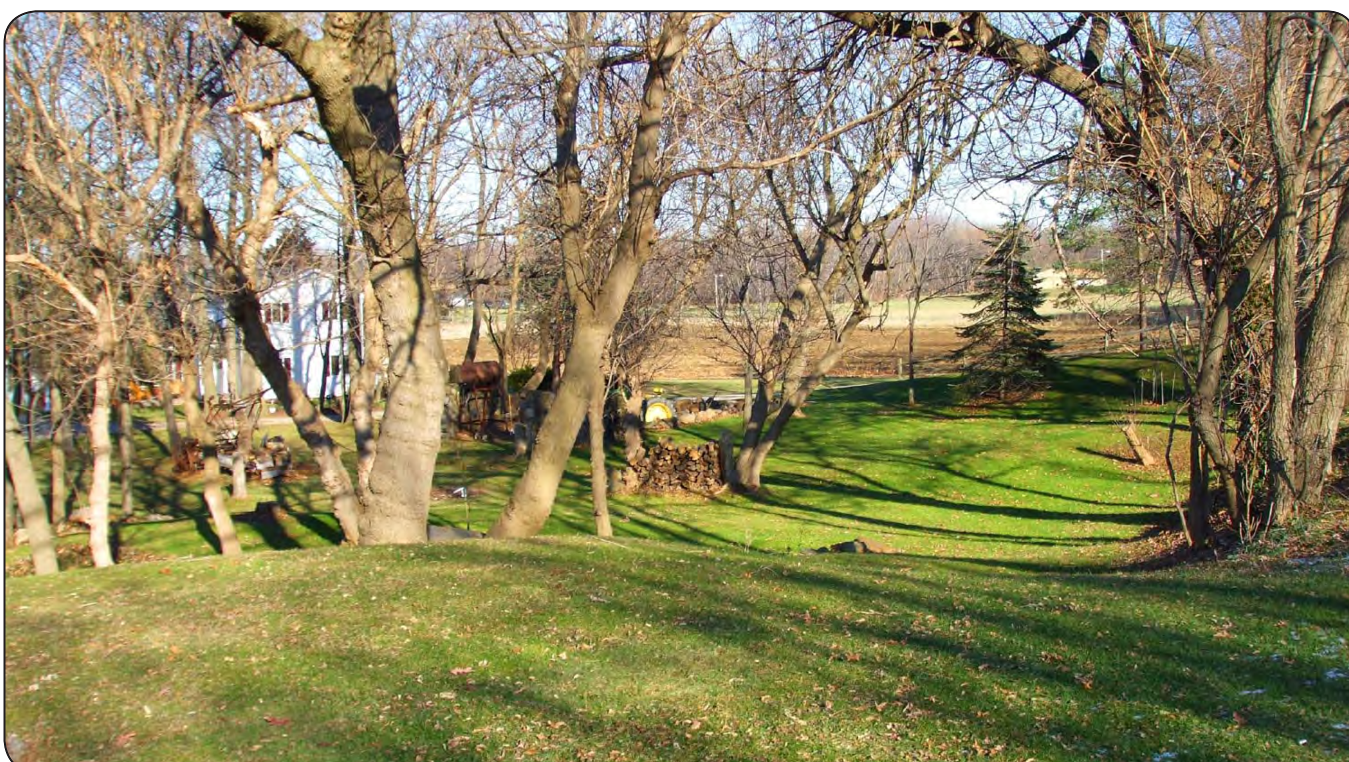
The chronology of lake stages in the Lake Erie basin relates a fascinating story of glacial action, movements of the earth's crust, and erosion by the waves to form the body of water we see today. The story begins nearly 15,000 years ago as the last glacier (Wisconsinan ice sheet) temporarily halted to form the Fort Wayne Moraine in northwestern Ohio, northeastern Indiana, and southwestern Michigan. When the ice retreated further, the first lake in the Great Lakes basin (Lake Maumee) was formed between the glacier and the moraine.

Low, continuous sandy ridges within a few miles of the lakeshore, in southeastern Michigan, northern Ohio, and northeastern Pennsylvania, are the most conspicuous reminders of the former glacial lakes. The people living near Lake Erie have long used these abandoned beaches for travel. Numerous east-west roads follow these ridges and many early homes were built on them. Such is the case for SR 254 in Lorain County.

Each ridge represents an ancient beach, formed along the shore of a former lake, which once occupied the Lake Erie basin at an elevation higher than the present lake. Because these former lakes (Maumee, Arkona, Whittlesey, Warren, Wayne, and Lundy— listed in order of formation) each had a different outline and each stood at a different elevation, each stage is marked by a separate set of beaches at a characteristic elevation. Beaches formed by a slowly falling water level are much more pronounced than those, once formed, that were later submerged by water rising to a higher level. Because submergence permits the erosion of former beaches by waves and alongshore currents, only three former beaches are easily recognizable, Maumee, Whittlesey, and Warren. At several places in north central Ohio where the former lakeshore was rocky (such as Amherst, Berlin Heights and Castalia), spectacular cliff features resembling sea caves, arches, and stacks can be seen.


*Abandoned glacial-lake beach ridges of Lorain County, depicted on a USGS topographic map (Frank Carney, Denison University 1909).*

*Wave-cut cliff of Glacial Lakes Maumee and Whittlesey along a sandstone outcrop on North Ridge, Amherst (1960).*



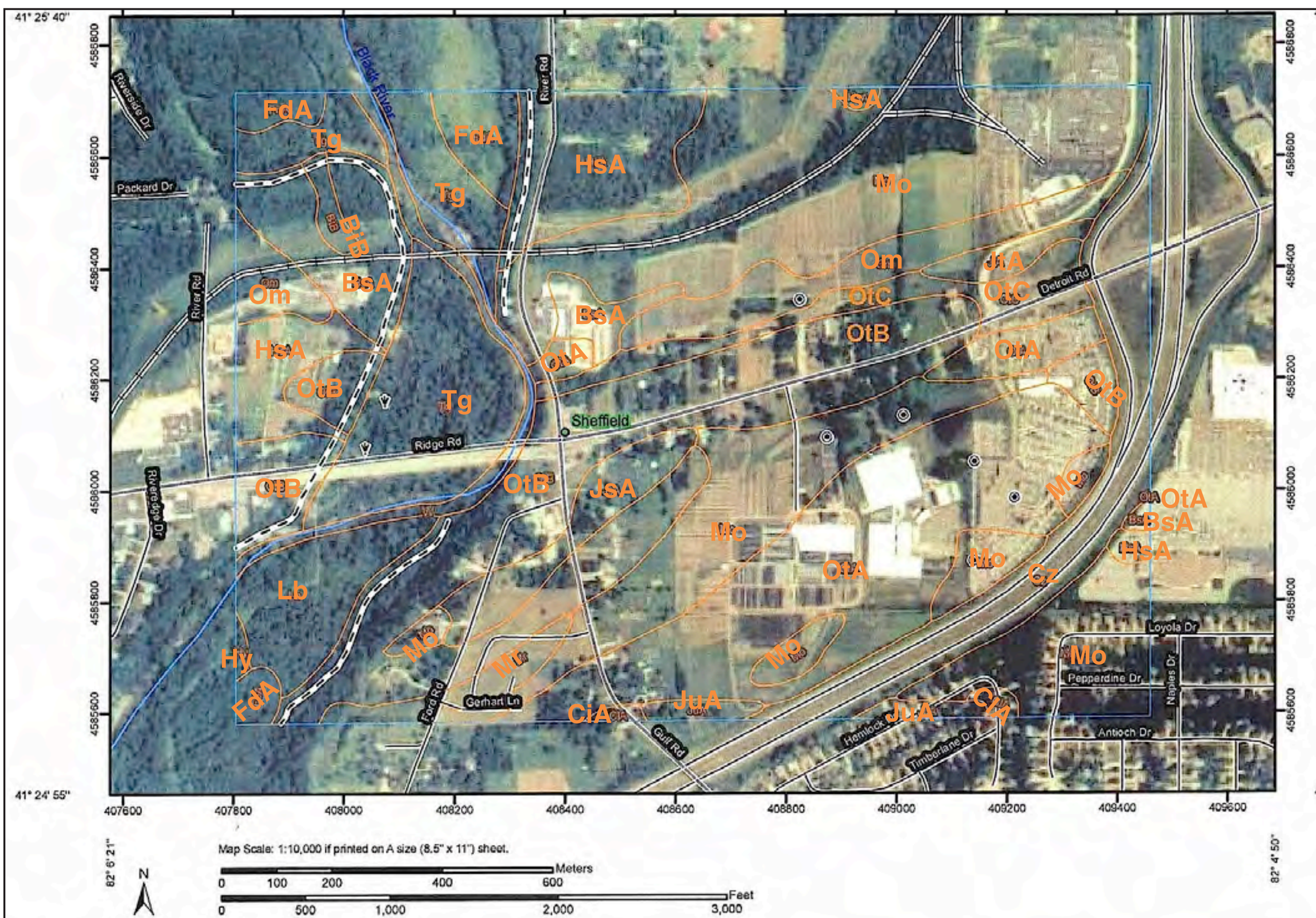
*Glacial Lakes Warren (foreground) and Wayne (background right) beach ridges along Detroit Road, Avon (2009).*

SR 254 follows the crest of the northernmost prominent ridge, known as Lake Warren, that was formed some 12,800 years ago. At that time ice still occupied the Niagara Escarpment preventing drainage to the east, so Lake Warren drained to the west along the ice margin into what is now Saginaw Bay of Lake Huron. Lake Warren had an elevation of approximately 680 feet above sea level and lasted about 300 years. During this period, a minor and temporary ice retreat to the northeast opened a new lower outlet to the Mohawk River valley in New York and the lake fell to an elevation of 660 feet. This lower stage, called Lake Wayne, lasted for less than 100 years and was ended when the ice readvanced, thereby reestablishing the Lake Warren stage elevation. Thus, as one travels along SR 254 a double beach ridge can be seen to the north. First the crest of Lake Warren, on which the highway was built, then the northward slope of the ridge for a few hundred feet to a second beach crest created by Lake Wayne, and finally the slope of that beach toward what at one time was the offshore waters of the lake. Renewed retreat of the ice margin about 12,500 years ago ended Lake Warren and eventually led to the creation of the Niagara River and our present Lake Erie.

***Lacustrine Sand.*** This is sand that was deposited in glacial lakes as shallow-water deltas, offshore bars, or sheet deposits. Lacustrine sands occur on and to the south of North Ridge, extending from Sheffield Village into Elyria and North Ridgeville. Another small deposit of lake sand is found to the north at the Lake Lundy beach ridge in Sheffield Lake.

***Lacustrine Silt.*** This is silt that was deposited in low-velocity, slack water of glacial lakes; includes some laminated fine sand or clay in delta deposits. Linear deposits of lacustrine silt occur adjacent to the Black River valley where glacial lake beach ridges intersect the valley, especially in the vicinity of Cascade Falls at Elyria.

***Modern Beach Sand.*** Sand deposits have accumulated on the Lake Erie shore in the past 3,000 years, since the time that Lake Erie reached in present level. Modest sand beaches occur along the lakeshore in Sheffield Lake, especially at mouths of small tributaries. As one travels along the Sheffield lakeshore it is easy to predict the presence of a sandy beach by noting where swales or dips in the roadway occur. A sandy beach is associated with virtually every swale, whereas beaches are typically absent along the intervening bluff areas. Places with major "stickout" structures, such as the new marina at the foot of Lake Breeze Road, have also accumulated beaches by intercepting the normal littoral drift of sand along the coast. Such accumulations tend to rob sand from adjacent downdrift areas resulting in increased shore erosion. Also, excessive accumulations at boat launching areas can become a detriment to navigation.




*Soils map of southwestern Sheffield Village along Detroit Road, showing Oshtemo and Mermill soils of North Ridge (USDA 2009).*

***Peat.*** This naturally occurring material is an accumulation of semi-carbonized plant remains in water-saturated environments, such as bogs. Peat deposits have formed in the past 12,000 years, since the drainage of the glacial lakes that once covered the northern portions of Lorain County. Such deposits over one foot in thickness have been mapped near the Avon-Sheffield boundary on the north side of North Ridge and along the Avon-Avon Lake boundary between the Sheffield Village line and Avon Belden Road (SR 83). The Ohio Geological Survey investigated and mapped the peat deposits of Lorain County in the early 1900s and concluded the deposits "…were doubtless once cranberry [*Vaccinium macrocarpon*] marshes."

***Alluvium.*** This stream-deposited sediment, ranging from silty clay to sand, gravels, and cobbles, occurs in present and former floodplains. Alluvium deposits are found in the floodplain of the Black River from its mouth to Cascade Falls at Elyria and upstream to the southern townships of Lorain County. Alluvium is also present in the lower French Creek valley at the Black River confluence.

***Soils.*** The soils of Sheffield were formed from parent material consisting of glacial till, ancient lake bottom deposits, glacial lake beaches, and river deposited alluvium. Lorain County soils have been mapped by the U.S. Department of Agriculture in cooperation with the Ohio Department of Natural Resources, classifying them into 23 soil series based on parent material, physical properties, and topography. An example of a soils map for central Sheffield Village is reproduced at left. The two- or three-letter code on the soils map indicates the name of the soil and slope—the first two letters constitute an abbreviation for the soil name and the third letter refers to the slope of the ground (e.g. A=0 to 2%, B=2 to 6%, C=6 to 12%, & D=12 to 18% slopes). For example the dominant soil of North Ridge has a map designation of OtC, indicating Oshtemo sandy loam with a slope of 6 to 12% [meaning for 100 feet of horizontal distance the surface drops greater than 6 feet, but less than 12 feet vertically].

*Soils of North Ridge; the light colored soil in the foreground is Oshtemo sandy loam formed from beach ridge parent material, while the darker soil in the background is Mermill loam, a wetland soil formed in ancient lake deposits (2003).*

## *CHARACTERISTICS OF SHEFFIELD VILLAGE SOILS*

| SOIL SERIES | LOCATION | PATENT MATERIAL | DRAINAGE |
|---|---|---|---|
| Allis (Ak/Al) | Lake Plain | Glacial till | Poorly-drained (hydric/wetland) |
| Bogart (Bs/Bt) | Stream terraces & beach ridges | Sand/gravel beach deposits | Well-drained |
| Chagrin (Ch) | Black River floodplain | Alluvium (recent) | Well-drained |
| Chili (Cl) | Stream terraces & beach ridges | Sand/gravel beach deposits | Well-drained (droughty) |
| Dekalb (Dk) | Sandstone headlands | Sandstone bedrock | Well-drained |
| Ellsworth (El) | Till Plain on French Creek slopes | Glacial till | Well-drained |
| Fitchville (Fc/Fd) | Black River & French Creek floodplains | Glacial lake sediments | Poorly-drained |
| Fulton (Fu) | Lake Plain, NE Sheffield | Glacial lake sediments | Poorly-drained |
| Haskins (Hs) | Lake Plain, N Sheffield | Glacial lake sediments | Poorly-drained (hydric/wetland) |
| Holly (Hy) | Black River & French Creek floodplains | Alluvium (recent) | Poorly-drained (hydric/wetland) |
| Hornell (Hz) | Knolls on Lake Plain & valleys | Glacial till (shallow shale) | Well-drained |
| Jimtown (Js/Jt) | Flanks of beach ridges | Sand/gravel beach deposits | Poorly-drained |
| Lobdell (Lb) | Black River & French Creek floodplains | Alluvium (recent) | Well-drained |
| Lorain (Ln) | Lake Plain depressions | Glacial lake sediments | Poorly-drained (hydric/wetland) |
| Mahoning (Mg) | Lake Plain & stream borders | Glacial till | Poorly-drained |
| Mermill (Mo) | Lake Plain depressions | Glacial lake sediments | Poorly-drained (hydric/wetland) |
| Miner* (Mr) | Lake Plain depressions | Glacial lake sediments | Poorly-drained (hydric/wetland) |
| Mitiwanga (Mv) | Sandstone gentle slopes | Sandstone bedrock | Somewhat poorly drained |
| Olmsted (Om) | Depressions adjacent to ridges | Sand beach deposits | Poorly-drained (hydric/wetland) |
| Orrville (Or) | French & Sugar Creeks valleys | Alluvium (recent) | Poorly-drained |
| Oshtemo (Ot) | Beach ridges (crest & slopes) | Sand/gravel beach deposits | Well-drained (droughty) |
| Rawson (Rd) | French Creek terraces | Glacial lake sediments | Well-drained |
| Tioga (Tg) | Black River floodplain | Alluvium | Well-drained |

* highest percentage of soils in Sheffield

## CLIMATE

### Past Climate Trends

During the Pleistocene epoch, 1.6 million to 12,000 years before the present (YBP), at least four major glaciers advanced over the Great Lakes. Ice over a mile thick slowly proceeded across the landscape, scouring the surface, filling valleys, and leveling hills. The last glacier (Wisconsinan) reached as far south as Cincinnati (20,000 YBP) before it began to recede. Air temperatures ahead of the glacier were probably 18°F cooler than at present as spruce forests extended into Florida and Texas. As the glacier receded to the northeast, reaching present-day Niagara Falls about 12,000 YBP, a relatively dry tundra climate dominated northern Ohio in its wake. As the temperature slowly warmed and moisture increased, conifer forests became more prevalent as shown by spruce pollen found in sediment cores.

By 10,000 YBP the ice sheet had retreated north of the modern Great Lakes and air temperatures in northern Ohio had risen to just 5-7°F lower than at present. Gradually at first, then more rapidly, spruce and other conifers were replaced by oak and other deciduous trees. The first evidence of human occupation in the region is from this period, as nomadic Paleo-Indians hunted in the Black River valley. Lake Erie's water level was nearly 180 feet lower than present, leaving the central basin partially dry with the shoreline some 100 miles farther to the east-northeast as compared to the existing shoreline.

The climate continued to warm after 10,000 YBP with air temperatures in the Great Lakes region taking a dramatic jump of 7-9°F within a millennium. Pollen studies show that spruce was entirely replaced by hardwood trees, as boreal forests and tundra gave way to deciduous woodlands and prairie grasslands. A warmer climate also favored a more diverse fauna, including the propagation of game animals along the valleys of the Black River and French Creek. In response to this new resource, Early Archaic Indians established hunting camps on the stream bluffs around 8,000 to 4,000 YBP.

As the ice moved farther north, the prevailing winds shifted from off the ice front to more westerly and dryer air masses, thus, warmer weather spread across the region. Between 8,000 to 6,000 YBP the region was quite mild, perhaps 4-5°F warmer than at present, initiating a phase known as the Climatic Optimum or Hypsithermal Interval. Pollen records indicate that subtropical plants grew as far north as Minnesota during this interval. Following the onset of the warm phase, conditions became somewhat dryer and drought-resistant (prairie) vegetation moved into the region from the southwest.

Beginning around 1,200 YBP, a 500-year mild phase (Medieval Period, AD 800 to 1,300) ensued with temperatures 2°F warmer than present. The Whittlesey Indians inhabited northeastern Ohio during this mild phase, constructing small, fortified villages on high banks of streams that emptied into Lake Erie. Some researchers have speculated that near the end of the Medieval mild climate, the first European settlement in the region may have taken place when a Norse expedition traversed the length of the Great Lakes (circa 1362), leaving an inscription on the controversial Kensington Runestone in northeastern Minnesota.

In the later part of the 14th century (700 YBP), the climate swung back toward progressively colder, wetter conditions. Another Neoglaciation episode occurred from AD 1300 to 1850 that is sometimes called the "Little Ice Age." At this time the glaciers in northern Canada made a modest advance and Ohio became considerably colder. Presumably in response to adverse climatic conditions and hostilities among Indian groups, most of Ohio was without inhabitants from the 15th to 18th centuries, except for small settlements of Whittlesey Indians along the Lake Erie shore and Fort Ancient Indian villages in the Ohio River valley, where these water bodies moderated the climate.

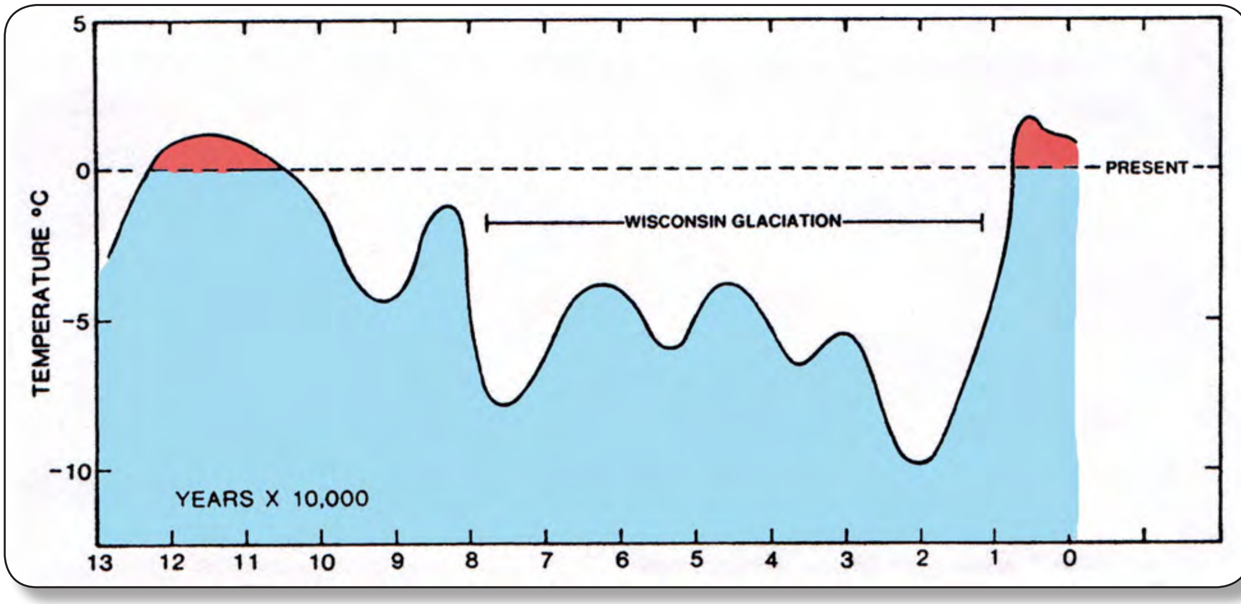
Settlement of the Sheffield by European stocks began appreciably by the first quarter of the 19th century. Summers were still cool during the first half of the 19th century, in particular 1816 has been called the "year without a summer" because frosts occurred each month attributed to sunlight attenuation by volcanic ash from the eruption of Mount Tambora on the island of Sumbawa in Indonesia (see page 82). Following this cold episode, until about 1940, temperatures warmed somewhat, followed by another period of lower temperatures. In recent years there has been another warming trend, which may be, in part, related to the greenhouse effect—warming of the atmospheredue to its transparency to incoming sunlight and opacity to heat radiated from Earth [opacity/heat is increased by added carbon dioxide, water vapor, methane, and dust in the atmosphere].

### Modern Climate

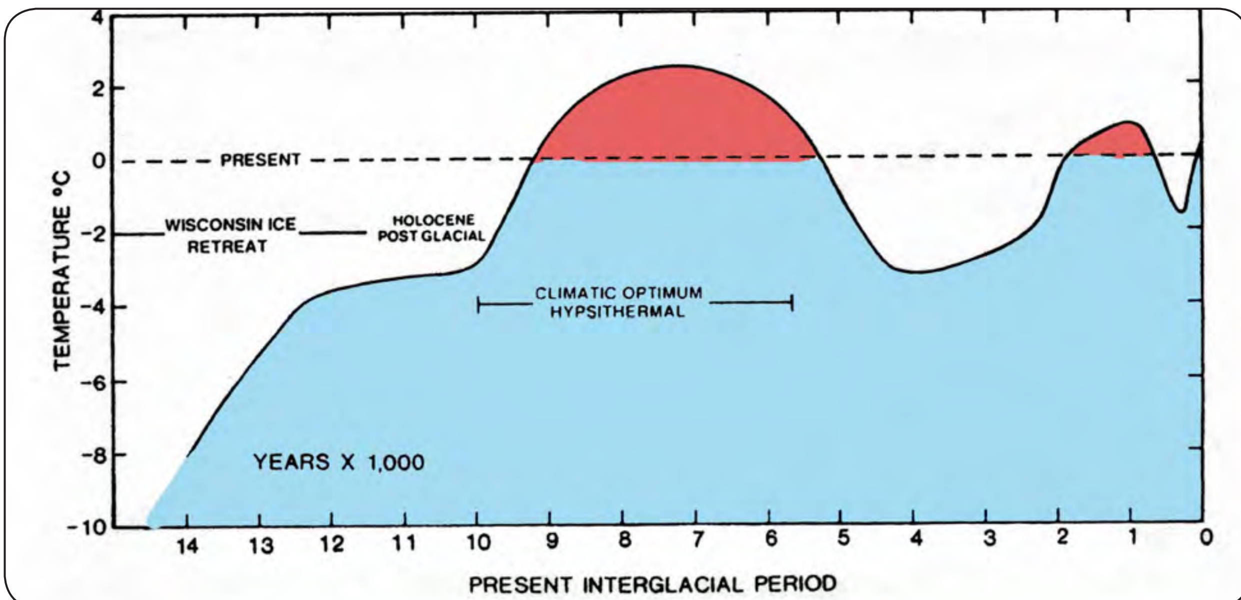
The climate of north central Ohio is classified as temperate—humid continental—long summer, signifying a middle latitude location [35°– 45° North] in the interior of a large land mass well removed from oceanic influences with ample rainfall, warm to hot summers, and cold winters. These climatic characteristics are expressed in four distinct seasons, large seasonal temperature ranges, frequent precipitation, and sudden changeability with the rapid passage of different weather systems through the area. While the prevailing winds are from the southwest, one or two weather disturbances affect the Black River watershed each week, bringing changes in wind direction, overcast skies, and often precipitation. The settled weather associated with high-pressure systems is thus interrupted every few days by disturbances such as fronts or low-pressure areas, which can bring warm subtropical air from the south or cold Arctic air from the north. Large annual, seasonal, and daily temperature ranges characterize our region.

Sheffield experiences a maximum of about 15 hours of daylight in the summer and a minimum of 9 hours in the winter. Cloudiness is greatest in the winter and least in the summer. Because of the cloud-producing effect of the lake, December and January ordinarily have less than 40% of possible sunshine, while June and July average more than 70%.

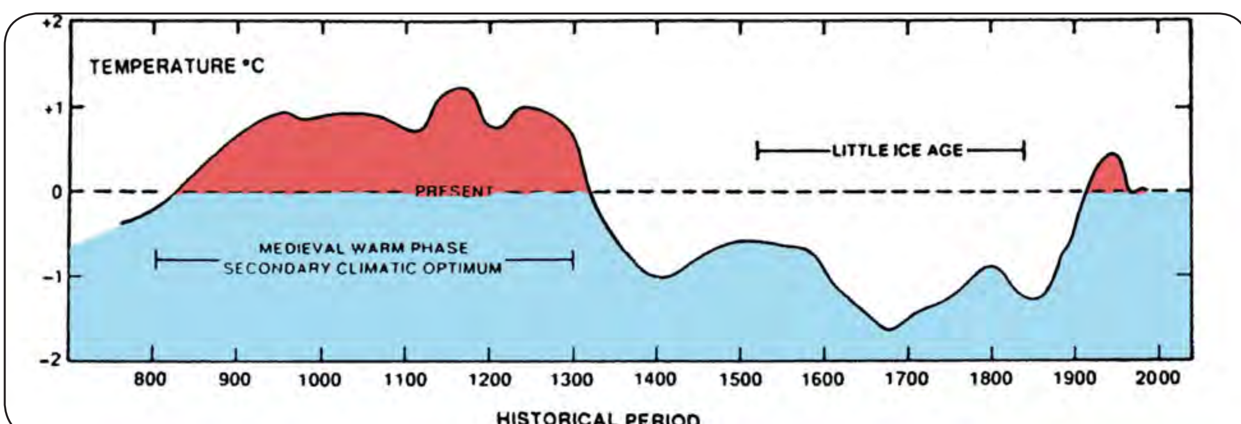
***Temperature & Precipitation.*** The climate of the Black River watershed is marked by large fluctuations in temperature and precipitation. Because of the proximity to the lake, winds from




*Great Lakes climate for Wisconsinan glacial period, 100,000 to 10,000 YBP (Environment Canada).*




*Great Lakes climate for Interglacial period, 14,000 YBP to present (Environment Canada).*




*Great Lakes climate for the Historic period, 1,200 YBP to present (Environment Canada).*

the northerly quadrants tend to lower daily temperatures in the summer, while raising them in the winter. The growing season at Sheffield Lake averages some 200 days (frostless days). Summers are moderately warm and humid with about 16 days where the temperature exceeds 90°F. Winters are generally cold and cloudy, however, the tempering effect of the lake limits subzero (F°) temperatures on the average to only 3 out of 5 years. Average annual precipitation is approximately 35 inches, with a 100-year rainstorm at 5.9 inches over a 24-hour period. As is typical for continental climates, precipitation is highly variable on a yearly basis, but in the Black River watershed it is generally abundant and evenly distributed with autumn being the driest season. Generally, humidity rises and falls inversely with the daily temperature. Thus, humidity is lowest in the summer and highest in the winter

***Lake Ice Cover.*** The shallow mean depth of Lake Erie and associated small thermal reserve gives this Great Lake the most rapid response to changing atmospheric conditions. Ice cover extends over 90% of Lake Erie's surface most winters. Significant winter open-water areas only persist during the last half of December and in April. Ice cover usually develops in the western end of the lake in the last half of December. During early March western Lake Erie usually has 40% to 60% coverage with ice and by the end of the month the Central Basin of the lake is open water. Rafting of ice can cause considerable concentration and grounding of ice flows along the shoreline, which at times can form windrows over 10 feet high. During the abnormally warm winter of 2011–2012 Lake Erie was essentially ice free, whereas two years later the extremely cold winter of 2013–2014 resulted in nearly 100% ice coverage.

***Soil Moisture.*** The moisture content of the soil goes through a seasonal cycle that is somewhat independent of the amount of precipitation. Soil moisture typically reaches its lowest point in October and is replenished during winter and early in spring, when precipitation exceeds water lost by evaporation. Since the moisture needs of plants generally reach a maximum in July and August and rainfall is usually insufficient to meet those needs, there is a progressive drying of moist soils. When evaporation significantly exceeds precipitation for a prolonged period, a drought is said to occur. Two of the most sever droughts recorded for Lorain County were the "Dust Bowl" years during the growing seasons of 1930-1936 and the 35-month period from November 1962 to September 1965. Historically, another drought occurred in 1836, destroying some 17,000 mulberry trees planted on the Burrell farm as a silk production project of Oberlin College's Sheffield Manual Labor Institute (see page 145).

***Wind.*** Southwesterly winds prevail over Lorain County in all months of the year, a feature common to temperate regions of the northern hemisphere. In fall and winter, northwesterly winds can also occur frequently, reaching velocities of 40 to 50 miles/hour during severe storms. In spring, winds from the northeast are common, with storms producing velocities of 30 to 40 miles/hour (mi/hr).

In Sheffield, northerly winds blowing off Lake Erie tend to lower daily high temperatures in the summer and raise them in the winter when the lake is not ice covered. The autumn season in Sheffield is a long, mild, and a delightful one; but cold, raw northerly winds off the lake in spring are disagreeable even when the air temperature remains above freezing. Winds average 8 mi/hr in the summer and 12 mi/hr in the winter. Although the prevailing winds are southwesterly, the coast of Lake Erie has a history of severe storms from the northeast and northwest that have caused extensive damage to and recession of the shoreline. Wind blowing over land generally has a lower velocity than wind blowing over open Lake Erie, caused by a greater frictional drag over land. This difference is greatest in the cooler months when the temperature differential between air and water is greatest—on average the land to lake ratio is 1:1.66 (i.e., a 10 mi/hr wind over land would develop a velocity of 16.6 mi/hr over the lake).

Thunderstorms typically occur in Lorain County on 30 to 40 days each year and are most frequent from April through August. For the period 1900 to 1975, 10 tornados have been reported for the county. The most devastating tornado to hit the area was in 1924, when extensive property damage and loss of life occurred in Sandusky, Lorain, and Sheffield, including the destruction of the roof on the newly built Brookside School.

Storm events have a major impact on the water quality and quantity in the Black River and its tributaries as well as the biota dwelling within. When heavy rainstorms occur, turbid and chemically-laden waters flood the estuarine mouth of the river from the watershed, rapidly carrying large quantities of water into Lake Erie. Under these conditions wetlands in the lower reaches of the streams are unable to assimilate watershed contaminants. Under moderate- to low-flow conditions, estuarine wetlands and bottom sediments are more effective in removing contaminants.

***Lake Effect.*** Lake Erie has a modifying effect on the weather in the Black River watershed and particularly on the weather in Sheffield. As noted earlier, winds off the lake tend to lower the air temperatures on summer days and raise them on winter days. The daily variation in air temperature becomes greater with increasing distance from the lake and the average annual precipitation increases slightly. Compared with the lakeshore, the southernmost part of the watershed has an average daily maximum 1.5°F higher, an average daily minimum 4.0°F lower, and average annual precipitation that is about 1.1 inches greater. The frost period (interval between the first freezing date in the fall and the last freezing date in the spring) increases as the distance from the lake increases. This yields a longer growing season in the vicinity of the Sheffield than in the southern part of Lorain County. The frost-free period for communities in the watershed are given below:

| | Growing Season |
|---|---|
| Sheffield Lake (on Lake Erie) | ~200 days |
| Sheffield Village (3 miles south of Lake Erie) | ~180 days |
| Elyria (8 miles south of Lake Erie) | ~165 days |
| Wellington (17 miles south of Lake Erie) | ~155 days |

Because water has a higher specific heat [capacity to absorb thermal energy in relation to temperature change] than soil, Lake

Erie changes temperature more slowly than the land surface, delaying the change of seasons along the shore. Lake Erie absorbs a great amount of heat in the spring and summer with a relatively small change in temperature and slowly releases that heat in the fall and winter. The heat capacity of water not only permits the lake to act as a buffer against wide fluctuations in the coastal environment, it narrows the range of temperatures to which an aquatic organism is subjected as compared to those organisms living on land. Lake temperatures rarely exceed 80°F, whereas air temperatures as high as 108°F have been recorded in the vicinity of the watershed.

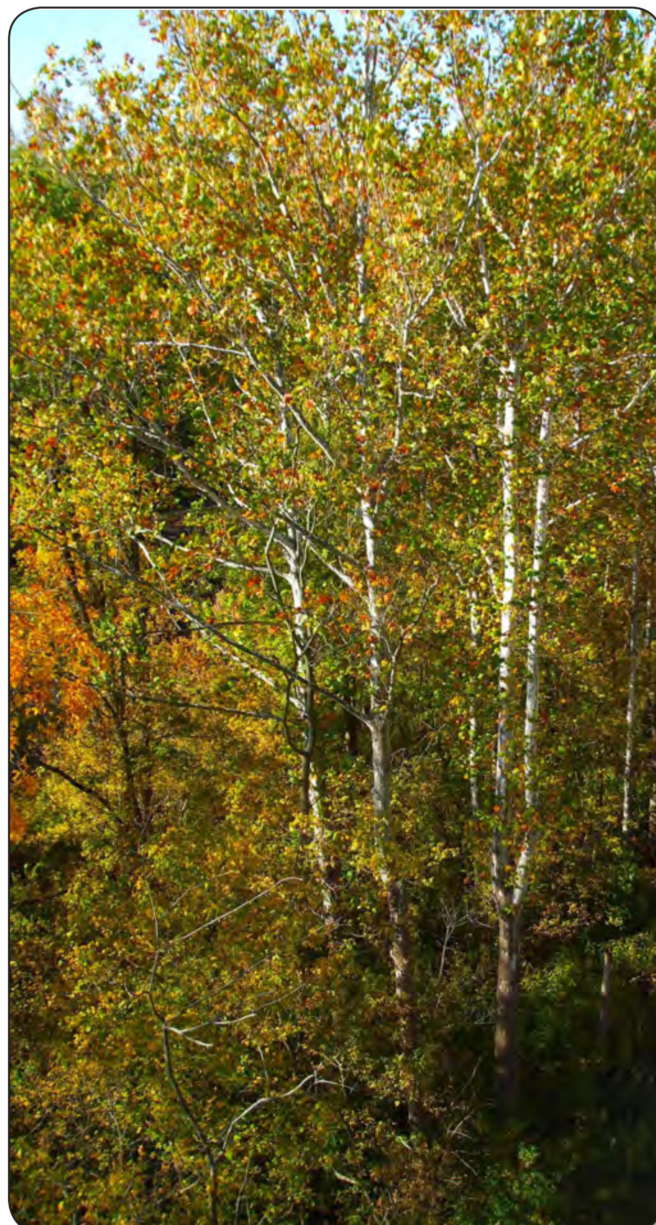
As the water in Lake Erie gradually warms in the spring, the land within about 3 miles of the shore remains cooler than the more southerly portions of the Lorain County. After reaching a temperature of 75-80°F in August, the lake begins to cool slowly during autumn and early winter, tempering the first cold waves of winter and pushing back the first freeze by several weeks. Lake Erie also adds moisture to the air during the cooling period. Evaporation of lake water is greatest as this time because the water is much warmer than the air. The added moisture results in frequent cloudiness; sunny days occur less than 20% of the time in November. The moisture evaporated from Lake Erie by cold air masses gives rise to “lake-effect” rain and snow, particularly as the cold, moist air masses ascend over steep uplands.

Lake Erie is large enough to induce lake-land breezes. During the day in summer, the lake is typically cooler than the surrounding shore, and a breeze blows onshore to replace rising air masses over the warmer land. The effect of these cooling breezes can extend over 15 miles inland. At night the lake remains about constant while the land quickly cools, and the direction of the breeze changes and blows off the land to replace air masses rising over the lake. These conditions cause downdrafts of air over the lake during the day, which tend to disperse clouds ahead of shoreward moving lake breeze fronts, resulting in clear skies over the lake and shore for 30-50% of the days in summer. Conversely, at night updrafts over the lake can lead to severe thunderstorms.

***Climate Changes and the Lake Erie Coast.*** Studies of the impacts of climate change on water levels in Lake Erie resulting from a doubling of atmospheric carbon dioxide, which is predicted for middle of the $21^{st}$ century, suggest the Detroit River flow will decrease by 36%, which would result in a drop in the long-term average lake level of five feet [from an elevation of 570 to 565 feet]. A decline in water level of this magnitude would result in very significant decreases in water volume and surface area. Water volume for Lake Erie would fall about 20% and the surface area would correspondingly decrease, resulting in losses of wetlands, freshwater estuaries, and embayments. Estuaries, such as the Black River mouth, would only be inundated during major lake-storm events or when excess precipitation in the upper Great Lakes basins would cause water levels to rise above the newly established level. Some migration of beaches and coastal wetlands would be expected, but many of Lake Erie’s coastal wetlands will not be able to migrate lakeward due to man-made shore structures or other barriers along the coast.

## *NATIVE VEGETATION*

About 12,000 years ago the last glacial lake drained from Sheffield, which initiated the colonization of the new land surface by terrestrial plants. The geologic features and materials left behind by glacial ice and the ensuing glacial lakes influenced the development of plant communities. These factors coupled with topography, drainage, climate, time, and the formation of soils resulted in the flora that greeted the pioneers. Nearly all of Lorain County was covered with a mixed hardwoods forest and formed a part of the great Deciduous Forest of Eastern North America—the continent’s second most extensive, only surpassed by the species-depauperate boreal forests of Canada and Alaska. This native forest was stunningly diverse with some 200 native tree species. In Sheffield alone, 75 species of native trees have been identified.



*Autumn foliage on stately sycamore trees in Sheffield’s Black River valley (2009).*

At least a dozen major tree groups were common throughout the great Deciduous Forest: white, black, and northern red oaks; red and silver maples; white and green ashes (now in distress due to the emerald ash borer); bitternut and shagbark hickories; hop-hornbeam, American hornbeam, slippery and American elms (the latter were formerly more abundant). Additionally, sugar maple, American basswood, Ohio buckeye, black walnut, and American beech were also locally significant in Sheffield. Since the late 19th century, scourges of invasive pests and pathogens have shifted forest composition by decimating or virtually eliminating several species in our region. American beech was struck in the 1890s, but retains a significant presence. American chestnut, once common on North Ridge, was hit soon after and is now essentially gone. American elm and now the ashes are victims of subsequent epidemics.

In Sheffield, four distinct vegetation regions developed: (1) Black River valley and floodplain, (2) French Creek valley and floodplain, (3) North Ridge–Berea Sandstone headlands, and (4) Erie Lake Plain. The Black River and French Creek valleys consist of steep-sided Ohio Shale bluffs and flat, alluvium-filled floodplains. The valleys are subjected to frequent flooding, which results in the meandering of the stream channels across the flat floodplain from time to time. The Black River forms the western boundary of much of Sheffield Village. The dramatic changes that can occur in the stream channels are demonstrated by comparing USGS maps of Black River meanders in 1994 with those in 1903 in the vicinity of East 31st Street (pages 5 and 13). The sandstone headlands are the remnant sand and gravel beaches and cliffs of glacial Lakes Warren, Wayne, and Whittlesey. This well drained terrain at the southern border constitutes the highest ground in Sheffield (about 745 feet above sea level in Sheffield Township). Lakeward of North Ridge, the ground is poorly drained clay that slopes gently north to Lake Erie. Only French Creek and its tributaries break this plain. Prior to settlement, the Erie Lake Plain consisted of swamp forests, peat bogs, and wet meadow wetlands.

In the early 1800s distinct floral communities typified each of these regions, generally dominated by tree species. The stream valleys, particularly the Black River floodplain, exhibited sycamore trees as a signature species. A journey along the rim of this valley today still gives the traveler marvelous views of these distinctive trees, with their striking white and tan patches, that tower well above the shale bluffs. Other native trees of the bottomlands were walnut, elm, hemlock, cottonwood, and willow. The upland bluffs of the streams were covered with a mixture of red and white oak, hickories, American beech, and tulip-trees. The well-drained ridges and sandstone headlands had an association of oaks, hickories, chestnut, white ash, sugar maple, butternut, and tulip-trees. The Erie Lake Plain swamp forests and bogs consisted of pin oak, red and black ash, red maple, swamp white oak, elm, and buttonbush. Draining these wetlands and lowering the water table have significantly

*Tickseed-sunflower (Bidens coronata) brightens the First Energy transmission line right-of-way in Sheffield Village (2009).*

*Large white trillium (Trillium grandiflorum), Ohio's state wildflower, is one of the showiest in the woods of the Black River valley.*

altered the local flora, as well as the introduction of alien plants as settlement took place, which has displaced some native species.

On the youthful Erie Lake Plain, the original dense forest cover appears to have accentuated poor drainage by retarding stream formation, so that much so that the flat upland area surrounding the Black River valley was swampy. Other than the ancient beach ridges and sandstone headlands, the best-drained surfaces were close to the streams and immediately adjacent to the lakeshore, where short ravines developed since the glacial retreat. Our forefathers dealt with swampy conditions by installing field tiles and drainage ditches to create agricultural fields. Unfortunately, more recent residential developments have cut the old tiles and relocated drainage channels causing today's flooding problems at numerous home sites throughout the Erie Lake Plain. It appears that the early settlers had a better grasp of dealing with the natural environment than some modern-day administrators, developers, and engineers.

The early settlers began clearing the forests for their farms in the early 1800s and by 1967 only 13% of the Lorain County's land area was wooded. Fortunately, much of the Black River, French Creek, and Sugar Creek valleys within Sheffield have been preserved as woodlots within the county and municipal park systems. Woodlots are also being reestablished along abandoned railroad rights-of-way.

### *Early Accounts of Native Vegetation*

Knowledge of the original vegetation of Sheffield and Lorain County comes from several sources spanning the period from the mid 1700s to the early 1900s. They include a settler taken captive by Indians, the surveyors who first charted the lands of the Western Reserve, pioneers who settled the land, and early botanists who studied the local flora.

***Earliest Record of Vegetation: Col. James Smith (1750s).*** In the mid-18th century, when Indians sparsely occupied the Black River valley, the entire surface of the Lake Erie Plain was covered with a hardwood forest. James Smith, a young captive of the Delaware Indians at that time who was taken from his home in Pennsylvania was forced to journey to Lake Erie. Smith later escaped and published his memoirs. Of our area he wrote, "My adopted brother, called *Tontileaugo*, took me to the head waters of the Muskingum; thence to the waters of the *Canesadooharie* [Black River] where there is a large body of rich, well lying land—the timber is ash, walnut, sugar-tree, buckeye, honey-locust, and cherry intermixed with some oak and hickory. At the time the blackhaws [hawthorn berries] were ripe and we were seldom out of sight of them."

"I had no gun, but Tontileaugo, who was a first-rate hunter, carried a rifle gun, and every day killed deer, raccoons, and bear. We left the meat, except for a little for present use, and carried the skins until we encamped and stretched them with elm bark, in a frame made of poles stuck in the ground and tied together with lynn [basswood] or elm bark; and when the skins were dried by fire, we packed them up and carried them with us the next day. As we proceeded down the *Canesadooharie* waters our packs, increased by the skins that were daily killed and we could not march more than 8 to 10 miles per day. We came to Lake Erie about 6 miles west of the mouth. The wind was very high in the evening and I was surprised to hear the roaring of the water and high waves that dashed against the shore. The next morning the lake was only in moderate motion and as we marched along the sand to the toward the mouth, I saw on the strand [beach] a large number of fish left in hollow places as the wind fell and the waves abated; and numbers of bald and gray eagles were along the shore devouring them. At the mouth of the *Canesadooharie* we came to a large camp of Wiandots [Wyandots], where Tontileaugo's wife was and we were kindly received. They gave us a kind of rough, brown potatoes, which grew spontaneously and called it *ohnenata*. These potatoes peeled and dipped in raccoon's fat, tasted nearly like our sweet-potatoes. They also gave us what they called *caneheanta*, which is a kind of green corn, dried, and beans mixed together."

Smith continued, "From the headwaters of the *Canesadooharie* to the mouth, the land is generally good; chiefly first or second rate, and, comparatively, little or no third rate. The only refuse [worthless land] is some swamps, that appear to be too wet for use and I found some difficulty getting round swamps and ponds, yet I apprehend a number of them, if drained, would make excellent meadows. The timber is black-oak, walnut, hickory, cherry, black-ash, white-ash, water-ash, buckeye, black-locust, honey-locust, sugar-tree, and elm; there is also some land, though comparatively small, where the timber is chiefly white-oak or beech—this may be called third rate. In the bottoms, and at many places in the upland, there is a large quantity of wild apple, plum, and red and black haw trees. It appeared well watered, and plenty of meadow ground, intermixed with upland, but no large prairies or glades, that I saw or hear of. In the route, deer, bear, turkeys, and raccoons, appeared plenty, but no sign of buffalo, and very little sign of elks." In Smith's time trees were considered good soil indicators—nut-bearing trees for example indicated superior [first rate] soil.

After a lengthy stay at the river mouth, Smith and his party embarked in a large birch bark canoe, 35 feet long, 4 feet wide, and 3 feet deep, with a heavy burden, up the *Canesadooharie*. "A few miles upstream we went ashore to hunt; but to my surprise they carried the vessel that we all came in up the bank, and inverted it with bottom up to convert it to a dwelling house, and kindled a fire before us to warm ourselves by and cook. With our baggage and ourselves in the house we were very much crowded, yet our little house turned off the rain very well. We kept moving and hunting up this river until we came to the falls [Cascade Falls]; ... remained several weeks, and killed a great number of deer, several bears, and a great number of raccoons. On our passage up I was not much out of the river, but what I saw was good land, and not hilly. About the falls is chestnut land, which is almost the only chestnut timber I ever saw... ."

Smith's fascinating journal, *An Account of the Remarkable Occurrences in the Life and Travels of Col. James Smith during His Captivity with the Indians in the years 1755–1759*, was published in 1799 and reprinted in 1978 by the Ohio Historical Society as *Scoouwa: James Smith's Indian Captivity Narrative*. Scoouwa was the Indian name given to Smith when adopted.

***Native Vegetation Records in Original Land Surveys (1796-1807).*** One of the most important sources of information on the natural vegetation of our area is the records of the earliest land surveys. The first survey was in 1796 when General Moses Cleaveland of the Connecticut Land Company sent Augustus Porter along the Lake Erie shore to make a traverse in order to have accurate geographical knowledge of the contour of the lake east of the Cuyahoga River, although this land was still Indian territory. When the Indian claims were extinguished by the Fort Industry Treaty in 1805, the Connecticut Land Company contracted with Abraham Tappen and Anson Sessions to survey the land, which would become Lorain County. These surveyors and the men they hired, such as Joshua Henshaw, followed the practice of utilizing conspicuous trees at township section corners as witness trees. Compass bearings and distances from the corner to several witness trees were recorded in the surveyor's field notes, as well as the kind and size of the trees. In Elyria Township, the next township south of Sheffield, Joshua Henshaw presented one of the most accurate descriptions of the original vegetation. He noted that most of the area was covered by a beech-maple forest with some large swamps dominated by ash-elm-maple-oak woodlands and some open marshes covered with cranberry, edged by elderberry and willow.

Often the surveyors described the vegetation along traverse lines with entries such as "cranberries by the bushel can be gathered on this marsh" or "chestnut, oak, and hickory found on this ridge" or "land scalded, unfit for cultivation except grazing." As mentioned above, the term "scalded" was typically used in connection with wet or swampy areas, referring to land that appeared to be scorched by the sun, which can occur when land is saturated with water during the early part of the growing season. A century ago a farmer recorded that water stood unusually deep in his woodlot almost all summer, killing all of the trees and understory vegetation. Today this circumstance might be described as evidence of woodland vernal pools, which are still common in Sheffield woodlots on the Erie Lake Plain.

Two centuries ago, as the first pioneers arrived in Lorain County, the only dry land in many parts of the area was on the ridges. Thus, the early roads were built on them, in most cases following old Indian trails that also followed the ridge crests. Where the land was too wet, planks or split logs were used to form the roadbed. Because of their rough nature they were referred to as corduroy roads. Depending on the wetness and extent of the swamp, log roads varied from a few feet to many miles. The longest was built from the mouth of the Black River to Lodi, a distance of some 33 miles, traversing the southwestern corner of Sheffield Township. From the location of this and at least 16 other log roads that were built in the county, one can infer the extent of the original swamp forest before settlement.

***Pioneer Botanist: May Eliza Day (late 1800s to early 1900s).*** May Eliza Day (1850-1938), granddaughter of Capt. John Day—founder of Sheffield, Ohio—distinguished herself as an accomplished botanist through her studies and writings on the local flora of Sheffield and Lorain County. Her father, James Day (1807-1896), traveled to Ohio as a nine-year-old boy with his parents, Capt. John and Lydia [Austin] Day in 1816. In

*First Growth Forest Tree—specimen tree preserved from the original forest (May Day). Until the Nickel Plate Road tracks were laid in 1881, this tree stood on the farm of Norman Day in Sheffield. Originally the whole township was thickly covered with trees of this size.*

*Making maple syrup and sugar on the James Day farm, circa 1915 (Lorain County Metro Parks).*

1931 May and her sister, Celia [Day] Durand (1845-1939) were instrumental in the donation of 45 acres of the family farm in scenic French Creek valley to Sheffield Village for a park to be named in honor of their father.

Professor George Frederick Wright of Oberlin College prepared a treatise titled *Day Family of Sheffield Township* for inclusion in the 1913 Edition of *Genealogical Register of the Descendants in Male Line of Robert Day*. Professor Wright noted that, "At one time or another nearly all those who were born in Sheffield [Ohio] have pursued their higher education in Oberlin College … ." Regarding May Eliza Day, he stated, "Not satisfied with knowledge attended in school, May, daughter of James Day, became a recognized authority in the botany of Lorain County so that she was constantly consulted by professors of Oberlin. The herbarium which she presented to the College contains some specimens that had not before been discovered in the county." Specifically, she contributed extensively to publications of Professor Albert A. Wright (1889,1893) on the flowering and fern plants of Lorain County.

On her own, May E. Day published a chapter on the Botany of the [Lorain] County in Professor George Frederick Wright's *A Standard History of Lorain County* (1916). In the chapter, May Day documents that in 1885 Judge William Day sold a stand of black walnut trees in Sheffield Township for $4,500. The largest tree measuring 10,000 board feet [a unit of volume for timber equal to 144 cubic inches, notionally 12 inches by 12 inches by one inch] of lumber, sold for $60 per thousand, bringing $600. The tree was nearly 5 feet in diameter and 35 feet to the first limb. Also in Sheffield, her father, James Day, dug out a large black walnut log from a flood pile along the Black River where it had lain for many years and sold the 18-foot plank that was made from the log for $100. May Day included a photograph of a magnificent black walnut tree taken on the farm of her Uncle, Norman Day, which is reproduced on page 28 with her candid assessment.

Discussing various other tree species, May Day noted, "The tulip-tree, commonly known as whitewood, is one of the most beautiful of our native trees. It grew abundantly near the lake ridges. The Indians used this tree for their dugout canoes. The lumber was much prized by early settlers in building houses, especially for siding. The chestnut tree was also found on the ridges. The fruit is valuable and in early times the chestnut made the best wood for rail fences, because it is readily split and durable." She also reported, "The lumber from large wild black cherry trees was prized in the early days for furniture making. The tall straight white oak—many feet up to the lowest limbs from having grown surrounded by other trees—was perhaps of the greatest value." In the 1840s, they were sawed into planks 3 to 4 inches thick and sold for ship planking. One white oak tree produced 2,500 feet of plank. May Day found that some of the finest oaks grew where the U.S. Steel plant is now situated, on soil that in some places was less than a foot deep over shale bedrock. She enumerated five other oaks found in our area—red oak, pin oak, scarlet oak, chestnut oak, and black oak, stating, "The inner bark of the last named oak was used by pioneers for coloring cloth." She also observed that sycamore trees grew to immense size near the Black River, "Some of these trees, too large to be sawed whole, were split in two with dynamite."

May Day found several species of maples in Sheffield. In particular the red maple, "...grows most luxuriantly in the swamps." Describing the sugar maple, she reported, "The early settlers obtained a bountiful supply of sugar from these trees, and it is evident that some of the old large maples along the river had been tapped before the settlers came." James Smith confirms this observation in his description of Indians gathering the sap from maple trees in the valley during his captivity in the 1750s. May Day points out that the making of maple syrup and sugar was an important industry in Lorain County in the early 1900s. For example, in 1915 there were 75,744 maple trees from which syrup or sugar was made, the product being 13,652 gallons of syrup and 2,159 pounds of sugar.

***Interviews with Sheffield Farmers: Lewis James Ives (1947).*** In February 1947, Lewis James Ives, a graduate student in the Department of Botany at Oberlin College, interviewed four farmers from Sheffield Village who were descendants of early pioneers to the Township. He asked each of them to describe the native vegetation they had observed in their lifetime and to give their recollections of what their forebears had told of the plants encountered by the pioneers. The following is a summary of those interviews from Ives' Master of Arts thesis, *The Natural Vegetation of Lorain County, Ohio*.

**Peter Eiden.** The Eiden farm was located at the crest of the north bluff of the Black River overlooking the mouth of French Creek. The predominant timber trees located on the Eiden farm were elm (*Ulmus americana*), silver maple (*Acer saccharinum*), tulip-tree (*Liriodendron tulipifera*), pin oak (*Quercus palustris*), and hickory (*Carya* spp.). On the higher knolls were beech (*Fagus grandifolia*), maple (*Acer* spp.), hickory, red oak (*Quercus rubra*), and white ash (*Fraxinus americana*). There was a large group of buckeye (*Aesculus glabra*) trees in his woodlot. Eiden noted that no chestnut trees (*Castanea dentata*) grew on the Lake Plain north of North Ridge.

**Al Bungart.** The Bungart farm was located on the north bluff of the Black River near the south end of Root Road and included Cromwell Island (aka Bungart Island). There were oak and hickory trees along the upper bluff of the river and walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), and cottonwood (*Populus deltoides*) on the floodplain. Elm was the most common on the low moist land. On the Day farm, situated on the north side of French Creek, cucumber-tree (*Magnolia acuminata*) and spicebush (*Lindera benzoin*) were found. Buttonbush (*Cephalanthus occidentalis*) was common, particularly near Lake Erie.

**Dwight Burrell.** The Burrell farm was located on the Black River, immediately upstream of the mouth of French Creek. Burrell's ancestors told him that the land on the rim of the Black River valley once had a large quantity of white oak (*Quercus alba*), red oak, and tulip-tree. The bottomland was mainly sycamore and walnut. Elm, maple, hickory, and basswood (*Tilea americana*) were also common along the river bank.

**Henry Garfield Root.** The Garfield-Root farm was located on North Ridge about a quarter-mile east of the Black River valley. Black ash (*Fraxinus nigra*), elm, and silver maple were the predominant timber trees north of North Ridge. There were also large numbers of pin oak, bur oak (*Quercus macrocarpa*), and cottonwood. No chestnuts grew north of North Ridge, although they were plentiful on the ridge, to the south, and along the Black River. Hemlock (*Tsuga canadensis*) was found along the banks of the Black River as far north as Garfield Bridge (SR 254), whereas white pine (*Pinus strobus*) only came north to a place about 2 miles south of the bridge. Along the upland bank of the river was a very large stand of white oak and tulip-tree. Sassafras (*Sassafras albidum*) was found there too. On the bottoms, walnut, sycamore, and willows (*Salix* spp.) dominated.

Wild grapes (*Vitis vulpine*) with fruit nearly as large as Concord grapes grew over the trees. At times, the pioneers felled these trees and then picked 4 to 5 bushels of grapes from the vines on each tree. Other timber trees in the area included basswood (*Tilia americana*), butternut (*Juglans cinerea*), wild black cherry (*Prunus serotina*), wild crabapple (*Malus coronaria*), red haw (*Cataegus coccinea*), hop hornbeam (*Ostrya virginiana*), ironwood (*Carpinus caroliniana*), black locust (*Robinia pseudoacacia*), and honey locust (*Gleditsia triacanthos*).

Root told of a black walnut tree that grew on the Black River floodplain that was thought to be the biggest in Ohio. Sumner B. Day was hired by an English firm to cut and saw the tree. Day had to order a special saw blade for his nearby sawmill to handle the felled log. Once the bark and sapwood were removed, the log measured 40 feet long and 6 feet in diameter. It was floated down the river to Lorain where it was shipped by train to the East Coast.

Knolls of clay lakeward of North Ridge had beech and maple trees on them. Most of the land north of the ridge was low and marshy. In some places, there was a layer of muck 18 inches deep. Root's grandfather, Capt. Aaron Root, picked cranberries (*Vaccinium macrocarpon*), swamp blueberries (*Vaccinium corymbosum*), and huckleberries (*Gaylussacia baccata*) in bogs located in the northern portion of Sheffield near Oster Road. Root also recalled that a creek was formed on his farm in the pioneer days when a log was hauled out by a team of horses. The land at that time was marshy and undrained north of the ridge where the log was hauled out. Water draining away over the years in the path made by the log had cut a channel 6 feet deep.

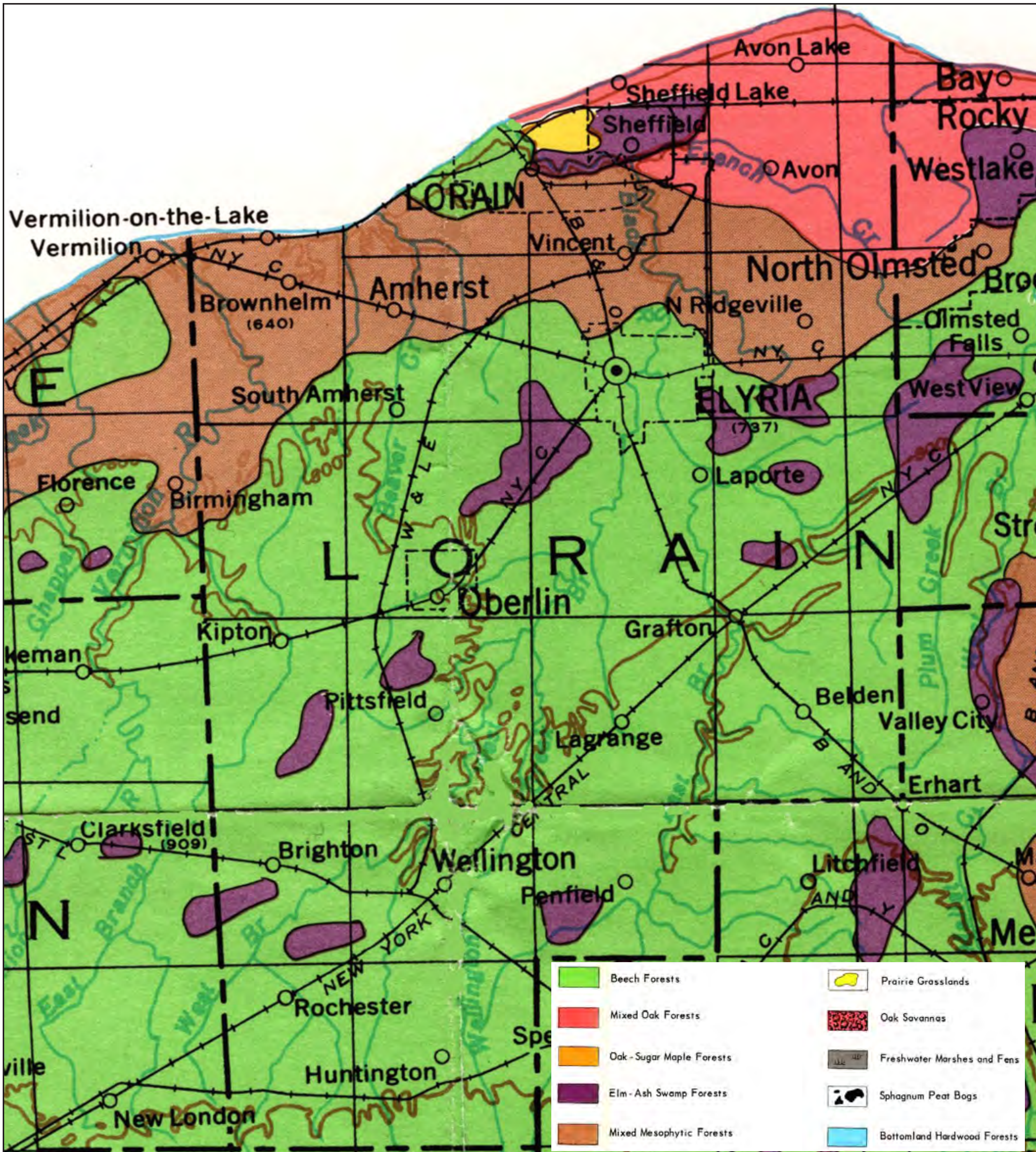
### *Botanical Survey (1960s).*

The Ohio Biological Survey mapped the natural vegetation of Lorain County as part of a statewide project using pioneer and early surveyor records in the 1960s. The original vegetation of Sheffield and the surrounding townships were grouped into five major vegetation types: (1) Beech–Maple Forests, (2) Mixed Oak Forests, (3) Elm–Ash Swamp Forests, (4) Mixed Mesophytic Forests, and (5) Prairie Grasslands. A sixth type, Sphagnum Peat Bogs, was most likely too small to be included on the map, but is clearly shown near the intersection of Avon, Avon Lake, and Sheffield Village on an earlier Ohio Geological Survey map of peat deposits. A seventh type, Wetland Vegetation, was mapped by Professor Frank Carney of Denison University as swamps on both the north and south flanks of North Ridge, as well as in association with the other beach ridges farther to the south. An eighth type, Floodplain Vegetation, was mapped by Lewis James Ives of Oberlin College along the valley floor of the Black River and the lower reaches of French Creek. The highlights of each group are given below:

***Beech–Maple Forests.*** These forests are characterized by a large percentage of American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), white ash (*Fraxinus americana*) and, white oak (*Quercus alba*), with scattered clusters or individuals of basswood (*Tilia americana*), shagbark hickory (*Carya ovata*), wild black cherry (*Prunus serotina*), and rarely cucumber-tree (*Magnolia acuminata*) and tulip-tree [aka yellow-poplar or whitewood] (*Liriodendron tulipifera*). Large beech-maple forests originally occurred on the poorly drained Erie Lake Plain in the vicinity of the Black River mouth and in the rolling Till Plain south of the glacial lakes beach ridges.

***Mixed Oak Forests.*** These woodlands include a wide variety of forest types, of which the most widespread is white oak–black oak–red oak (*Quercus alba–Quercus velutina–Quercus rubra*) and shagbark hickory–bitternut hickory (*Carya ovata–Carya cordiformis*) communities. Originally, American chestnut (*Castanea dentata*) was found in these forests, particularly along the beach ridges, but disappeared from Ohio woodlands in the 1920s and 1930s. Mixed oak woodlots are found along the Lake Erie shore and much of the French Creek drainage basin.

***Elm–Ash Swamp Forests.*** These forests once had a dominant tree canopy that consisted of American elm (*Ulmus americana*), black ash (*Fraxinus nigra*), white ash (*Fraxinus americana*), silver maple (*Acer saccharinum*), and red maple (*Acer rubrum*). The soil in these forests is generally poorly drained. In extremely wet areas, cottonwood (*Populus deltoides*), swamp cottonwood (*Populus heterophylla*), and sycamore (*Platanus occidentalis*) are common, while better-drained areas had shellbark hickory (*Carya laciniosa*), red oak (*Quercus rubra*), and basswood (*Tilia americana*). At times referred to as "swamp oak–hickory communities" these forests are locally enriched with swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustris*), white oak (*Quercus alba*), black walnut (*Juglans nigra*), and tulip-tree (*Liriodendron tulipifera*). These swampy forests once occupied a large portion of the Erie Lake Plain in northeastern Lorain County. In Sheffield, this was an area bounded on the south by North Ridge, on the west by the Black River valley, and on the north by the lakeshore, with transitions to mixed oak and beech–maple forests along the perimeter. Attacked by Dutch elm disease in the 1930s, American elm trees have largely disappeared from Ohio, but some still survive in the Black River valley.




*Native vegetation map of Lorain County (Ohio Biological Survey).*

***Mixed Mesophytic Forests.*** These forests are dominated by several broad-leaved, deciduous tree species, that require moderate moisture conditions, but not so exclusively by any single species as to represent a large percentage of the total. In Sheffield, from the southern edge of the swamp forests south to Elyria, including North Ridge, Mixed Mesophytic Forests are composed of such species as American chestnut (*Castanea dentata*), white oak (*Quercus alba*), black oak (*Quercus velutina*), red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), Ohio buckeye (*Aesculus glabra*), American beech (*Fagus grandifolia*), black walnut (*Juglans nigra*), red mulberry (*Morus rubra*), shagbark hickory (*Carya ovata*), wild black cherry (*Prunus serotina*), cucumber-tree (*Magnolia acuminata*), and tulip-tree (*Liriodendron tulipifera*).

***Prairie Grasslands.*** These grass-dominated communities were described in the records of early land surveyors as treeless plains, natural meadows, swales, barrens, openings, and prairies. Most were associated with wetlands, except beach and dune areas along the Lake Erie shore. The wet prairies were dominated by tall grasses, such as reed grass [or giant reed] (*Phragmites australis*), prairie cord grass (*Spartina pectinata*), Canada bluejoint (*Calamagrostis canadensis*), and big bluestem (*Andropogon gerardii*). Dry, sandy prairies were characterized by little bluestem (*Schizachyrium scoparius*), switch grass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*). A sizable natural prairie was mapped in the northeastern portion of the original Sheffield Township (now within the cities of Lorain and Sheffield Lake), just south of the lakeshore. Unfortunately, the area designated as a natural prairie is now built out as a residential development and no prairie remnants were found during a recent reconnaissance survey.

***Peat Bog Vegetation.*** Generally, there is a striking contrast in the vegetation of a peat-forming lake or bog and that of an ordinary marsh. Although these two types of wetlands may appear similar in the early stages, in the later phases of the infilling process of peat bogs a distinct assemblage of plants is typically present, such as peat mosses (*Sphagnum* spp.), round-leaved sundew (*Drosera rotundifolia*), pitcher plant (*Sarracenia purpurea*), ericads such as cranberry (*Vaccinium macrocarpon*) and leather-leaf (*Chamaedaphne calyculata*), and conifers, notably tamarack (*Larix laricina*). The peat deposits near the Sheffield, Avon, and Avon Lake junction likely had such an assemblage of bog plants in depressions following the retreat of the Wisconsinan Glacier some 12,000 years ago. Presumably, isolated blocks of ice were left embedded in the ground moraine surface, forming small glacial kettle lakes upon melting. After formation of these lakes, typical bog succession most likely took place. The initial stage includes the invasion of aquatic plants, followed by sedges (*Carex* spp.), grasses, and sphagnum moss. Once a sedge mat has formed over the edge of the lake, shrubs invade it. These in turn are followed by tree species, such as tamarack and eastern white pine (*Pinus strobus*). Analysis of pollen from peat deposits indicate that white pine and hemlock (*Tsuga canadensis*) once dominated the county's land surface. However, by the early 1800s these species had retreated to the cool, deep ravines of the Black River south of North Ridge.

Eventually, bog soil formed in the marshy area surrounding the kettle lakes. Because the ground was saturated most of the time and water circulation was poor on the flat Erie Lake Plain, plant decay was retarded and partially decomposed organic material accumulated into layers of peat over a foot thick. Beneath the peat, sticky bluish-gray clay composed of glacial till formed an imperious layer, which helped retain the water in the bogs. These marshy areas were slowly filled through plant succession and finally drained for agricultural pursuits by the early settlers in the first half of the $19^{th}$ century. Today these former bogs are marked by the presence of Lorain silty clay loam (Ln), which is a hydric soil characterized by areas of peaty organic material in the surface layer.

***Wetland Vegetation.*** The sandy beach ridges are underlain by impervious glacial till clay, which lies near the surface at the base of the ridges. As a result, rainfall that is absorbed on the ridges is released as a line of springs on the north and south flanks of the ridges, forming a series of marshes and swamps. The main distinction between these two types of wetlands is that marshes lack the woody plants found in tree-covered swamps. In the early 1900s, Professor Frank Carney of Denison University mapped the wetlands that had formed at the base of the ridges. The trees found in these swamps include black ash (*Fraxinus nigra*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustris*), buttonbush (*Cephalanthus occidentallis*), and red ash (*Fraxinus pennsylvanica*).

The early surveyors made frequent mention of "scalded land" usually in connection with wet or swampy areas. This appears to be a local term of the time referring to land scorched by the sun, often occurring in land saturated with water. A farmer reported that one year in the early 1900s water stood unusually deep in his woodlot almost all summer, killing all of the trees and understory vegetation.

Marsh vegetation differs considerably from that found in a peat bog, particularly in the final stage of in filling. The herbaceous species typically found in the marshes at the base of beach ridges include sedges (*Carex* spp. and *Cyperus* ssp.), broad-leaved cat-tail (*Typha latifolia*), bulrushes (*Schoenoplectus* spp. and *Scirpus* ssp.), and swamp rose-mallow (*Hibiscus moscheutos*). Marshes (or fens) are typically alkaline or neutral in pH as compared to bogs that are generally acidic.

***Floodplain Vegetation.*** The upland banks of the Black River and French Creek are covered by a mixture of red oak (*Quercus rubra*), white oak (*Quercus alba*), hickory (*Carya* spp.), and tulip-tree [or whitewood] (*Liriodendron tulipifera*). The river bottomland was dominated by sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), and willow (*Salix* spp.). In addition to woodlots in the Black River bottomlands, a herbaceous prairie plant community still persists on the broad floodplain south of the French Creek confluence.

*Skunk-cabbage spathes emerge through a late winter snow (2009).*

*Skunk-cabbage leaves fully unfolded in spring along the Black River floodplain (2009).*

### Existing Vegetation

Today, the bottomland forests of the Black River valley contain magnificent sycamore trees (some exceeding 100 feet in height), black walnut, red elm, and willows. Stately beech trees grow along the upper slopes of the valley and hemlocks are present on the cool, lower slopes leading down to the river. Detroit Road, which runs along the crest of an ancient beach ridge, is noted for its tree-lined segments in Sheffield and on into Avon. Arching black walnut, red elm, maples and oaks present an inviting passage along the highway.

East and west of the Black River bluffs, most of Sheffield lies on the low, flat land of the Erie Lake Plain and, except for North Ridge, was poorly drained and covered with an ash-elm-maple swamp forest when the first pioneers arrived. Slightly elevated places on this plain were better drained and were covered with beech and maple trees. The ancient beach ridge (North Ridge) left by glacial Lake Warren is sandy or gravelly soil with rapid drainage, which favors an oak-hickory-chestnut forest.

Some deep ponds were left in northern Sheffield by the receding glacier. Several of these were still wet bogs when the pioneers settled, but were soon drained for agricultural fields. The pioneer settlers of the early 19th century understood the necessity of properly constructed nand maintained drainage systems, practices that present-day developers and engineers should take heed.

For Lorain County, total of 1,276 plant species have been identified. In Sheffield, 75 species of native trees have been recorded, as well as over 350 species of native herbaceous plants. Of particular interest is a prairie remnant located in the Black River valley along the Lorain County Metro Parks' Bridgeway Trail. In the past two centuries an additional 130 alien species and 60 introduced/cultivated plant species have been incorporated into the flora through human activities.

Appendix A contains a checklist of the plants that have been recorded as growing in the vicinity of Sheffield. Plants are listed by family [phylogenetic classification based on evolutionary development] with both scientific and common names. The checklist also indicates the origin of each plant: native (N), invading alien (A), or purposefully introduced or escaped from cultivation (C).

## *HISTORIC AND EXISTING WILDLIFE*

Scientific investigations of the wildlife resources of Lorain County demonstrate that some 70 fish, 25 amphibian, 15 reptile, 260 bird, and 35 mammal species currently frequent Sheffield and environs. Looking into the long period of human occupation (nearly 14,000 years), faunal inventories from archaeological sites and early historical accounts indicate northeastern Ohio provided habitats for a diverse array of terrestrial, aquatic, and avian animal species. Among the most important of these for early human exploitation was white-tailed deer [which remain abundant today, but one hundred years ago was rare], elk, black bear, eastern cottontail rabbit, beaver, raccoon, gray fox, wild turkey, passenger pigeon, ducks, geese, and many species of fish and mollusks. Historic sightings show a number of carnivores that are now extirpated from Lorain County, including black bear, badger, timber wolf, and panther.

*Beaver dam on Day Creek at confluence with French Creek (2008).*

*Green frogs (Rana clamitans melanota) are a common resident of ponds in the Black River valley (Ohio Division of Wildlife).*

Within the waters and along the valley of the Black River and French Creek a wide variety of plants and animals can be discovered by visitors to the parks on these waterways. Mallard and teal ducks, Canada goose, great blue heron, and several species of hawks are abundant, and the fortunate observer can see wild turkey, ring-necked pheasant, and owls. Steelhead trout in French Creek has become a recent attraction for anglers. A beaver dam on a small tributary [Day Creek] to French Creek has created a sizable pond on the Black River valley. The Ohio Division of Wildlife has reintroduced the river otter into nearby watersheds. These playful animals were once common in Ohio streams until habitat losses drove them from Ohio in the late 1800s. A recent sighting of a river otter in French Creek in North Ridgeville indicates that the population may be spreading back into the Black River watershed.

Appendixes B and C contain checklists of fish and birds that have been observed in the vicinity of Sheffield. The checklist of birds contain the relative abundance of each species by season. Appendix D is a composite checklist of amphibians, reptiles, and mammals. Scientific and corresponding common names are given for all animal families and species.

## *NATURAL HISTORY BIBLIOGRAPHY*


Alexander, W. H. 1924. *A Climatological History of Ohio*. Ohio State University, Engineering Experiment Station Bull. 26, Columbus, OH. 745 pp.

Assel, R. A., F. H. Quinn, G. A. Leshkevich, and S. J. Bolsenga. 1983. *Great Lakes Ice Atlas*. NOAA, Great Lakes Environmental Research Laboratory, Ann Arbor, MI. 115 pp.

Bolsenga, Stanley J. and Charles E. Herdendorf (eds.). 1993. *Lake Erie and Lake St. Clair Handbook*. Wayne State University Press, Detroit, MI. 467 pp.

Bramhall Engineering. 2006. *Flood Hazard Study for Jungbluth Ditch, Village of Sheffield, Ohio*. Bramhall Engineering Co., Avon, OH. 12 pp.

Brant, Russell A. and Charles E. Herdendorf. 1972. Delineation of Great Lakes Estuaries. *In*: G. D. Hedden (chairman), *Proceedings of the Fifteenth Conference on Great Lakes Research*. International Association for Great Lakes Research, Ann Arbor, MI. p. 710–718.

Braun, E. Lucy. 1961. *The Woody Plants of Ohio: Trees, Shrubs, and Woody Climbers—Native, Naturalized, and Escaped*. Ohio State University Press, Columbus, OH. 362 pp.

Brockman, C. Scott. 2002. *Physiographic Regions of Ohio*. Ohio Department of Natural Resources, Division of Geological Survey, Columbus, OH. Camp, Mark J. 2006. *Roadside Geology of Ohio*. Mountain Press, Missoula, MT. 411 pp.

Carney, Frank. 1910. *The Abandoned Shore Lines of the Oberlin Quadrangle, Ohio*. Denison University, Science Laboratory Bulletin 16:101-117, Grandville, OH.

Cleveland Quarries Co. 1960. *The Story of Sandstone and the Cleveland Quarries Co*. Cleveland Quarries Co., South Amherst, OH. 12 pp.

Cushing, H. P., F. Leverett, and F. R. Van Horn. 1931. *Geology and Mineral Resources of the Cleveland District*. U.S. Geological Survey Bull. 818, Washington, DC. 138 pp.

Dachnowski, Alfred. 1912. *Peat Deposits of Ohio: Their Origin, Formation, and Uses*. Ohio Geological Survey, Fourth Series Bulletin 16, Columbus, OH. 424 pp.

Day, May E. 1916. Botany of the County. *In*: George Frederick Wright, *A Standard History of Lorain County*. Volume I. Lewis Publishing Company, Chicago, IL. p. 13-19.

Eichenlaub, V. L. 1979. *Weather and Climate of the Great Lakes Region*. University of Notre Dame Press, South Bend, IN. 335 pp.

Ernst, James E., Donald K. Musgrave, and Ernest N. Hayhurst. 1976. *Soil Survey of Lorain County, Ohio*. U.S. Department of Agriculture, Soil Conservation Service, Washington, DC. 99 pp. + 62 maps.

Fagan, Brian. 2000. *The Little Ice Age: How Climate Made History 1300-1850*. Basic Books, New York, NY. 246 pp.

Feldmann, R. M. and M. Hackathorn (eds.). 1996. *Fossils of Ohio*. Ohio Department of Natural Resources, Division of Geological Survey, Columbus, OH. 577 pp.

Flint, R. F. 1971. *Glacial and Quaternary Geology*. John Wiley, New York, NY. 892 pp.

Forsyth, Jane L. 1959. *The Beach Ridges of Northern Ohio*. Ohio Department of Natural Resources, Division of Geological Survey, Information Series No. 25, Columbus, OH. 10 pp.

Frost, R. B. 1935. Lorain, Ohio: A Study in Urban Geography. *Ohio Journal of Science* 35(3):139-240.

Gordon, Robert B. 1969. *The Natural Vegetation of Ohio in Pioneer Days*. Ohio Biological Survey, New Series, Vol. III, No. 2, Columbus, OH. 113 pp.

Herdendorf, Charles E. 1966. *Geology of the Vermilion West and Berlin Heights Quadrangles, Erie and Huron Counties, Ohio*. Ohio Department of Natural Resources, Division of Geological Survey Report of Investigation No. 60, Columbus, OH. 1 color map w/ text and stratigraphic section.

Herdendorf, Charles E. 1987. *The Ecology of the Coastal Marshes of Western Lake Erie: A Community Profile*. U.S. Fish and Wildlife Service Biological Report 85 (7.9), Washington, DC. 256 pp.

Herdendorf, Charles E. 1989. Paleogeography and Geomorphology. *In*: K. A. Krieger (ed.), *Lake Erie Estuarine Systems: Issues, Resources, Status, and Management*. NOAA Estuary-of-the-Month Seminar Series No. 14, Estuarine Programs Office, Washington, DC. p. 35-70.

Herdendorf, Charles E. 2008. Sheffield Manual Labor Institute (1836–1837). *The Village Pioneer*. Vol. 3. No. 1. (March). Journal of the Sheffield Village Historical Society, Sheffield Village, OH. p. 7-10.

Herdendorf, Charles E. 2010. *Guide to the North Ridge Scenic Byway, Lorain County, Ohio*. Sheffield Village Historical Society and Avon Historical Society, Sheffield Village and Avon, OH. 276 pp.

Herdendorf, Charles E., David M. Klarer, and Ricki C. Herdendorf. 2006. *Ecology of Old Woman Creek: An Estuarine and Watershed Profile* (2nd Edition). Ohio Department of Natural Resources, Division of Wildlife, Columbus, OH. 454 pp.

Herdendorf, Charles E., Kurt Knebusch, Stanley J. Bolsenga, and Richard DeAngelis. 1986. *Central Lake Erie Recreational Climate Guide*. Ohio State University, Sea Grant Program Guide Series No. 13, Columbus, OH. 40 pp.

Hoover, Karl V. 1960. *Devonian-Mississippian shale sequence in Ohio*. Ohio Department of Natural Resources, Division of Geological Survey Info. Circ. No. 27, Columbus, OH. 154 pp. + 3 maps.

Hubbard, G. D. and M. M. Champion. 1925. Physiographic History of Five River Valleys in Northern, Ohio. *Ohio Journal of Science* 25(2):51-84.

Ives, Lewis James, Jr. 1947. *The Natural Vegetation of Lorain County, Ohio*. MA Thesis, Oberlin College, Oberlin, OH. 121 pp.

Lee, D. H., R. Moulton, and B. A. Hibner. 1995. *Climate Change Impacts on Western Lake Erie, Detroit River, and Lake St. Clair Water Levels*. NOAA, Great Lakes Environmental Research Lab., Ann Arbor, MI. 44 pp.

Leverett, Frank. 1902. *Glacial Formations and Drainage Features of the Erie and Ohio Basins*. U.S. Geological Survey Monographs, Vol. 41, Washington, DC. 802 pp.

Lewis, T. L. 1988. Late Devonian and Early Mississippian Distal Basin-margin Sedimentation of Northern Ohio. *Ohio Journal of Science* 88(1):23-39.

Newberry, John S. 1873. *Description of Fossil Fishes*. Ohio Geological Survey, Vol. 1, Part 2, Paleontology, Columbus, OH. pp. 244-355.

Newberry, John S. 1874. *Report on the Geology of Erie County and the Islands; Lorain County*. Ohio Geological Survey, Vol. 2, Part 1, Columbus, OH. p. 183-224.

Pavey, Richard R., Richard P. Goldthwait, C. Scott Brockman, Dennis N. Hull, E. Mac Swinford, and Robert G. Van Horn. 1999. *Quaternary Geology of Ohio*. Ohio Division of Geological Survey, Map No. 2, Columbus, OH. 1 map.

Pepper, J. F., W. de Witt, Jr., and D. F. Demarest. 1954. *Geology of the Bedford Shale and Berea Sandstone in the Appalachian Basin*. U.S. Geological Survey Prof. Paper 259, Washington, DC. 111 pp.

Phillips, D. W. 1989. Climate Changes in the Great Lakes. *In*: *Report of the First U.S.–Canada Symposium on the Impact of Climate Changes on the Great Lakes*. National Climate Program/NOAA, Rockville, MD. p. 19-42.

Potter, L. D. 1946. *Postglacial Forest Sequences of North-central Ohio*. MA Thesis, Oberlin College, Oberlin, OH.

Quinn, Marian, 1996. *Harvest of Memories: Andrew and Emma Conrad*. Hedgewood Press, Westlake, OH. 211 pp.

Richards, T. L. and D. W. Phillips. 1970. *Synthesized Winds and Wave Heights for the Great Lakes*. Canada Department of Transportation, Meteorological Branch, Climatological Studies No. 17, Toronto, ON. 53 pp.

Sampson, Homer C. 1930a. Succession in Swamp Forest Formation in Northern Ohio. *Ohio Journal of Science* 30(5):340-357.

Sampson, Homer C. 1930b. The Mixed Mesophytic Forest Community of Northeastern Ohio. *Ohio Journal of Science* 30(5):358-367.

Sears, Paul Bigelow. 1925-1926. The Natural Vegetation of Ohio: I, II & III. Virgin Forest, Prairies, Plant Succession. *Ohio Journal of Science* 25(3):139-149; 26(3):128-146; 26(4):213-231.

Slucher, Emie R., E. Mac Swinford, Glenn E. Larsen, Gregory A. Schumacher, Douglas L. Shrake, C. L. Rice, M. R. Caudill, and R. G. Rea. 2006. *Bedrock Geologic Map of Ohio*. Ohio Department of Natural Resources, Division of Geological Survey, Columbus, OH. 1 map.

Swain, W. R. 1984. Great Lakes Research: Past Present, and Future. *Journal of Great Lakes Research* 10:99-105.

Terasmae, J. 1961. Note on the Late Quaternary Climate Change in Canada. *Annals of the New York Academy of Science* 95:658-675.

Transeau, Edgar N. and Homer C. Sampson. 1934. *The Primary Vegetation Areas of Ohio*. Agricultural Experiment Station, The Ohio State University, Columbus, OH. 1 map.

U.S. Army Corps of Engineers. 2004. *Living Along French Creek: A User's Guide*. U.S. Army Corps of Engineers, Buffalo, NY. 24 pp.

Walters, Timothy L. 1994. *Flora of the Lorain County Metro Parks*. Lorain County Metro Parks, LaGrange, OH. 71 pp.

Webb, T. A., III and R. A. Bryson. 1972. Late and Postglacial Climate Changes in the Northern Midwest, USA: Quantitative Estimates Derived from Fossil Pollen Spectra by Multivariate Statistical Analysis. *Quaternary Research* 2:70-115.

Wells, N. A., A. H. Coogan, and J. J. Majoras. 1991. Field Guide to Berea Sandstone Outcrops in the Black River Valley at Elyria, Ohio: Slumps, Slides, Mud Diapirs, and Associated Fracturing in Mississippian Delta Deposits *Ohio Journal of Science* 91(1):35-48.

Williams, A. B. 1949. *The Native Forests of Cuyahoga County, Ohio*. Cleveland Museum of Natural History, Scientific Publications, Vol. 9, Cleveland, OH. 90 pp.

Winslow, J. D., G. W. White, and E. E. Webber, 1953. *The Water Resources of Cuyahoga County, Ohio*. Ohio Department of Natural Resources., Division of Water Bull. 26., Columbus, OH. 123 pp.

Wright, Albert A. 1889. Preliminary List of the Flowering and Fern Plants of Lorain County. E. J. Goodrich, Oberlin, OH. 30 pp. [Additions to *List of Flowering Plants*, published by Oberlin College in 1893, 11 pp.]


*Reconstructed Mixter Dentate ceramic vessel excavated from the White Fort Site, a Late Prehistoric Period village on the Black River south of Garfield Bridge, Lorain County, Ohio, by Dr. Brian G. Redmond, Cleveland Museum of Natural History.*