Appendix F

Warning: The Doan Brook gorge is beautiful and well worth visiting. However, you should keep in mind that some parts of the gorge are steep, with dangerous cliffs and overhanging rocks. Exercise appropriate caution here as you would in any natural area. Some parts of the gorge are also somewhat isolated and infrequently visited. You may wish to take a friend along for safety. Finally, the water in the brook may contain high concentrations of bacteria, particularly after a rain. While contact with the water is unlikely to make you sick, you should be aware that it may have high levels of bacteria and either avoid contact or wash carefully when you return home. Children should always be accompanied by an adult.

The Doan Brook gorge offers excellent opportunities for an amateur geologist to identify and examine some of the sedimentary rocks of northeast Ohio. Puzzling out the locations of the different formations and finding them along the stream can be both fun and challenging. Even though the rocks exposed along Doan Brook are sedimentary deposits that were laid down in relatively regular layers, the formations don't always appear quite as you would expect.

The tour offered here is intended to give the amateur geologist or interested layman a starting point — to point out where the different rock types can be seen and what they look like along Doan Brook. Some of the more interesting features of the rocks are also described. The descriptions should help you identify the different formations even if you don't know much about geology when you start. See Appendix E for an account of how the rocks got where they are.

Geologic descriptions in the tour and in Table F-2 are based on the work of a number of geologists (see the bibliography) and on the author's own exploration of brook geology. The true enthusiast may want to look at some of the references for more detailed descriptions of Doan Brook rocks. There is more to be seen and understood than is described here, so you may want to make your own explorations. If you find something really interesting, let the Nature Center at Shaker Lakes know so that they can pass it on to others.

The tour begins with the lowest (and oldest) rocks that are exposed along the brook and works its way upstream into the younger formations in the upper part of the watershed. Figure F-1 shows a schematic cross-section of the bedrock in the Doan Brook watershed. Figures F-2 and F-3 show the locations of most of the formations that are described in the text. Table F-1 summarizes the stops and sidetracks on the tour. Because the text is organized by geologic formations instead of by stops, formations that you can see at a single stop are sometimes discussed in more than one text section. The text is keyed to the stops shown in Table F-1, but it may be helpful to read ahead a bit. You will also want to refer to Table F-2 for more detailed descriptions of the rocks than are included in the text.

Table F-1	Summary of the Geologic Tour			
Stop #	**Location**	**Formations**	**Text Section/ Notes**	**Suggested Parking[1]**
1	North of Wade Park Lagoon	Chagrin Shale	F.1	MLK along W. side of Wade Park Lagoon
2	Lower Ambler Park	Chagrin Shale	F.1	University Circle, Chestnut Hills at North Park, or Baldwin Rd. near Fairhill
		Cleveland Shale	F.2	
3	East Side of MLK between North Park and Ambleside	Cleveland Shale	F.2	
		Lower Bedford Sandstone	F.2	
Sidetrack 1	South Side of Fairhill East of Baldwin Road	Cleveland Shale	F.2	Baldwin Road, or go on foot from Ambler Park
		Lower Bedford Sandstone	F.2	
4	MLK Detention Basin	Cleveland Shale	F.2/look for fossils	Chestnut Hills at North Park, or go on foot from Ambler Park
		Bedford Gray Shale	F.2	
		Lower Bedford Sandstone	F.2	
5	Brook opposite North Park and Harcourt	Euclid Bluestone	F.3	South Overlook (or another side street) and North Park
6	Brook near North Park and Delaware	Bedford Formation Shale	F.3	
		Berea Sandstone	F.4	
7	Top of gorge at North Park and Grandview	Berea Sandstone	F.4/cross-bedding and thin bedding	
8	Gorge between North Park at Roxboro and Woodmere	Berea Sandstone	F.4/gorge and falls	
Sidetrack 2	South side of Brook opposite Kemper and Fairhill	Berea Sandstone	F.4/massive, thin bedding, cross-bedding	Kemper at Fairhill, or on foot from the Lower Shaker Lake dam
9	Fairhill at bridge between North Moreland and Coventry	Berea Sandstone	F.4/thin bedding	Lower Shaker Lake dam, or the Nature Center at Shaker Lakes
10	Brook from Lower Shaker Lake dam to Coventry	Orangeville Shale	F.5	
11	South branch of Brook at Nature Center at Shaker Lakes	Orangeville Shale	F.5	
12	Lower Shaker Lake	Glacial erratics	F.6	

1 If you are more energetic, the best way to take most of the geology tour is to pick a single parking spot on one of the side streets off of North Park between Coventry and MLK and explore Stops 2 through 10 from there.

F.1
Chagrin Shale: The Base of the Escarpment

The oldest rock that is exposed in the Doan Brook watershed, or anywhere in the Cleveland area, is the almost 400 million year old Chagrin Shale. The Chagrin Shale extends from several hundred feet below Lake Erie's current surface to approximately 175 feet above the lake level (see Figure F-1). In Doan Brook's lower watershed, the shale was generally eroded or scraped away by glaciers, and it is covered by as much as 600 feet of newer sediment. As a result, the shale can first be seen at the toe of the Escarpment, just below University Circle. The appearance of the Chagrin Shale in the Doan Brook streambed is one of the first signs that you are approaching the edge of the Escarpment, where Lake Erie's ancestors lapped at their highest shorelines.

You can find good exposures of Chagrin Shale in two reasonably accessible places:

- **STOP 1** Chagrin Shale: Just downstream from the University Circle culvert outlet — Take the sidewalk down hill (northwest) along the west side of the Wade Park Lagoon until you see the culvert outlet and brook about 50 yards away to your right. The Chagrin Shale outcrops in a number of places along the banks, with a particularly good exposure on the west (left if you are facing downstream) bank about 50 feet downstream from the culvert outlet. The appearance of the shale here is quite characteristic of the Chagrin Shale – it is gray with some weathering to a reddish tan and breaks into irregular fragments rather than consistently flaking into thin sheets. The shale bank is so soft that it turns to mud if you rub your boot across it. When there is not too much vegetation, you can see another Chagrin Shale outcrop if you continue downstream to the far side of the fenced maintenance building and look across the brook at the cliff on the far side (just below the Cleveland Museum of Art parking garage).
- **STOP 2** Chagrin Shale: Lower Ambler Park upstream from the University Circle culvert inlet — Ambler Park is a bit difficult to get to, but the surprising beauty and peace of this park surrounded by busy streets make the effort worthwhile. You can park on one of the side streets off of North Park Boulevard (Chestnut Hills Drive, for example) and walk down the hill, you can park in University Circle and walk up, or you can park on Baldwin Road at Fairhill. In any case, you should enter the park roughly opposite the intersection of Ambleside and MLK. Walk up the center of the park (southeast) until you find the culvert inlet. Continue upstream, following the brook, looking for areas where the brook has eroded away the bottom of its retaining walls as you go. Where the retaining walls are eaten away, you will see a dark shale below them. This is the Chagrin Shale. You can get a somewhat better look at the rock if you continue for about 100 yards until you reach a small, perhaps artificial, waterfall. The shale is well exposed in the face of the falls.

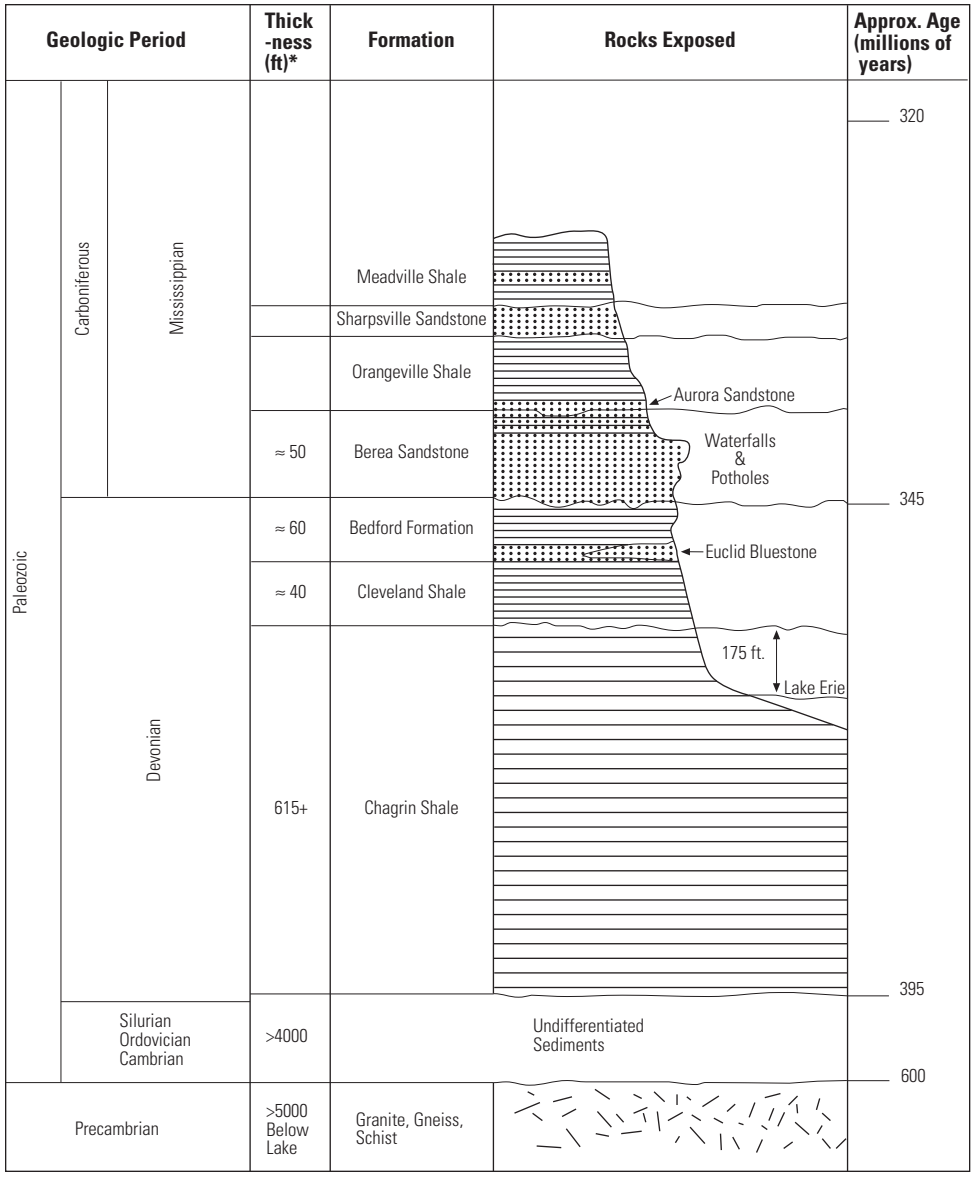
  The Chagrin Shale that is visible in this part of Ambler Park is all within the streambed and it is generally wet. It looks very dark gray here, with some areas stained to a deep reddish brown. The visible areas have weathered into moderately thin but somewhat blocky fragments. If you venture into the stream channel (this is somewhat difficult — be careful and remember that the brook's water is not entirely clean) you will find that the shale is soft and breaks easily between your fingers. The thin (one to two inch thick) very fine sandstone (or siltstone) layers that are characteristically interbedded with the Chagrin Shale are clearly visible here. They are the lighter colored stone that projects from the shale in the face of the waterfall and in many other places.

  See Section F.2 for a description of the exposure of the Cleveland Shale that lies near the waterfall in Ambler Park.

F.2
The Cleveland Shale and the Lower Bedford Formation: The Edge of the Escarpment and the MLK Detention Basin

The Cleveland Shale lies immediately above the Chagrin Shale. The top of the Chagrin Shale shows evidence of weathering, indicating that the land surface emerged from the water and was eroded between the time that Chagrin Shale deposition ended and Cleveland Shale deposition began. Although the Chagrin rock and the Cleveland rock are both shales, the difference in the two materials is quite obvious. The Cleveland Shale is a hard, brittle shale that generally weathers into thin, sharp-edged sheets. The shale is black when it is first broken, but it appears dark gray or deep red when weathered. The thin edges may appear tan in a cliff face where they have been coated by eroded material from above. The Cleveland Shale does not weather to a soft mud as the Chagrin Shale does.

The Cleveland Shale is exposed in the middle part of the steep part of the Escarpment.



*Thickness is approximate thickness along Doan Brook. Units may have different thickness elsewhere.

Figure F-1 Doan Brook Bedrock Cross-Section

Where it appears along Doan Brook, it is generally capped with a clearly visible sandstone layer from the lower part of the Bedford Formation. Like the Chagrin Shale exposures in Ambler Park, the Cleveland Shale cliffs along Doan Brook lie in Ambler Park and along busy MLK and Fairhill and are a bit difficult to reach. They are readily identifiable once you reach the spot, though. Good exposures can be found in the following places:

- **STOP 2** As you stand by the waterfall in Ambler Park that is described at Stop 2 in Section F.1, you can see that a flaky shale forms the steep slope to your right (as you face upstream — spectacular tree roots wrap the top of the shale mound). This is the hard, brittle Cleveland Shale. If you break a piece, you'll see that the freshly broken surface is dark, reddish black.
- **STOP 3** Cleveland Shale and Bedford Formation Sandstone: East side of MLK between North Park and Ambleside — As you curve down the steep hill of the Escarpment on MLK, you see a steep cliff on the right (northeast) side of the road. This cliff is made of Cleveland Shale capped by the sandstone at the base of the Bedford Formation. You must walk along the sidewalk (up from Ambleside or down from North Park) to see the rock. On foot, you will see that the lower part of the cliff is made up of a sharp-edged, thinly bedded shale that appears to be a dirty tan color. Fragments of the shale that you can pick up from the piles that collect along the base of the retaining wall show that the shale is actually black (look at the edge of a freshly broken piece) but weathers to gray and deep red. The tan appearance of the shale on the cliff seems to be the result of coating by material washed down from above. The shale is hard and brittle, breaking cleanly between your fingers.

  Toward the top of the cliff, massive layers of tan sandstone replace the shale. Some of the sandstone layers (maybe rocks that have fallen from above) project from the cliff and give platforms for overhanging trees. The sandstone is the basal (bottom) rock unit of the Bedford Formation that overlies the Cleveland Shale.
- **SIDETRACK 1** Cleveland Shale and Bedford Formation Sandstone: South of Fairhill between Baldwin Filtration Plant and Baldwin Road — As you drive up the Escarpment on Fairhill Road, you will see a cliff on your right just after you pass the open water reservoirs and the intersection with Baldwin Road. This cliff shows an exposure of Cleveland Shale and overlying Bedford Formation Sandstone very similar to the one on MLK directly across the brook. The only significant difference is that the sandstone seems to be absent or to form only a thin layer at the top of the cliff.
- **STOP 4** Cleveland Shale and Bedford Formation Shale and Sandstone: Doan Brook Streambed between MLK and the MLK Detention Basin Dam — As you walk west from MLK toward the MLK detention basin dam you descend into the Doan Brook valley. The Cleveland Shale is visible in the streambed and in the lower part of the cliff on the north side of the stream. A manmade retaining wall tops the Cleveland Shale. Above the wall is a layer (perhaps 20-30 feet thick) of gray shale that belongs to the Bedford Formation. Above the gray Bedford Shale, the basal sandstone of the Bedford Formation appears once again. Some fossils have been found in the upper part of the Cleveland Shale just below the Bedford Formation in this area.

F.3
The Bedford Formation: Red Shale and Euclid Bluestone

Tracing the location and character of the Bedford Formation presents one of the more challenging geologic puzzles along Doan Brook. The formation is generally described as consisting of a very soft red or blue shale interbedded with sandstone layers. However, a stroll along Doan Brook where the Bedford formation is exposed (between MLK and a bit downstream from Roxboro) might lead you to the conclusion that the Bedford Formation is entirely dark blue-gray sandstone. In fact, the lower part of the formation along Doan Brook consists of massive sandstone that appears tan in some places and dark gray or blue in others. This layer appears to be more than 25 feet thick along Doan Brook, and additional layers of dark blue sandstone appear to be interbedded with the shale above this basal layer. This massive, hard, fine-grained sandstone is the Euclid Bluestone that was a greatly valued building material and was quarried not only along Doan Brook but also farther north, where you now find Bluestone Road and Quarry Park. A layer of dark red, very soft shale overlies the sandstone, but the shale is so soft that it is easy to miss — there are no obvious cliffs of the red Bedford Shale. In fact, you can stand on a bank of the red shale and notice only that the mud is stained deep red. The blue (or gray) Bedford Shale seems to be scarce along Doan Brook, only appearing obviously at Stop 4, as is mentioned in Section F.2.

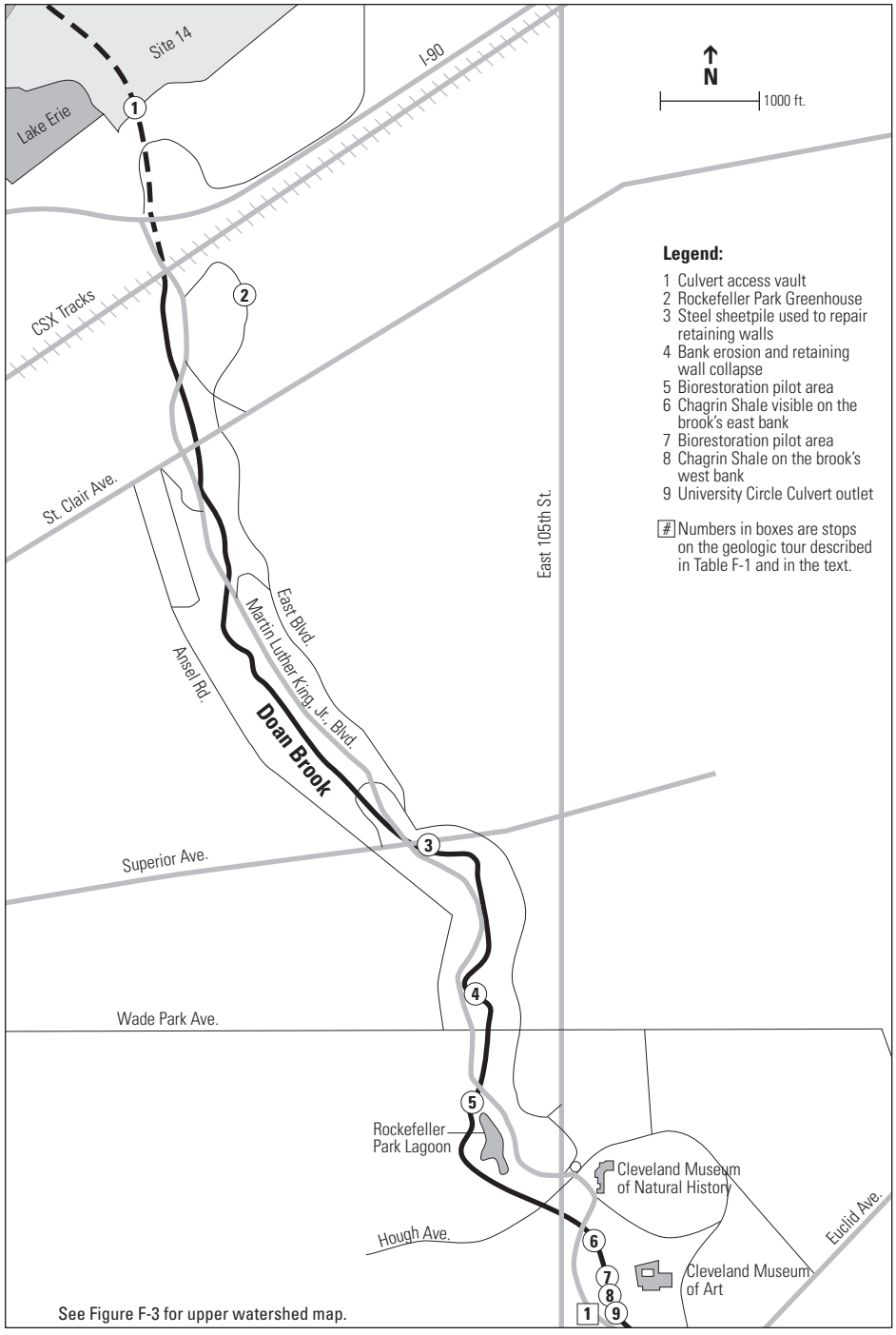


Figure F-2 Doan Brook Geology Tour Map: Lower Watershed

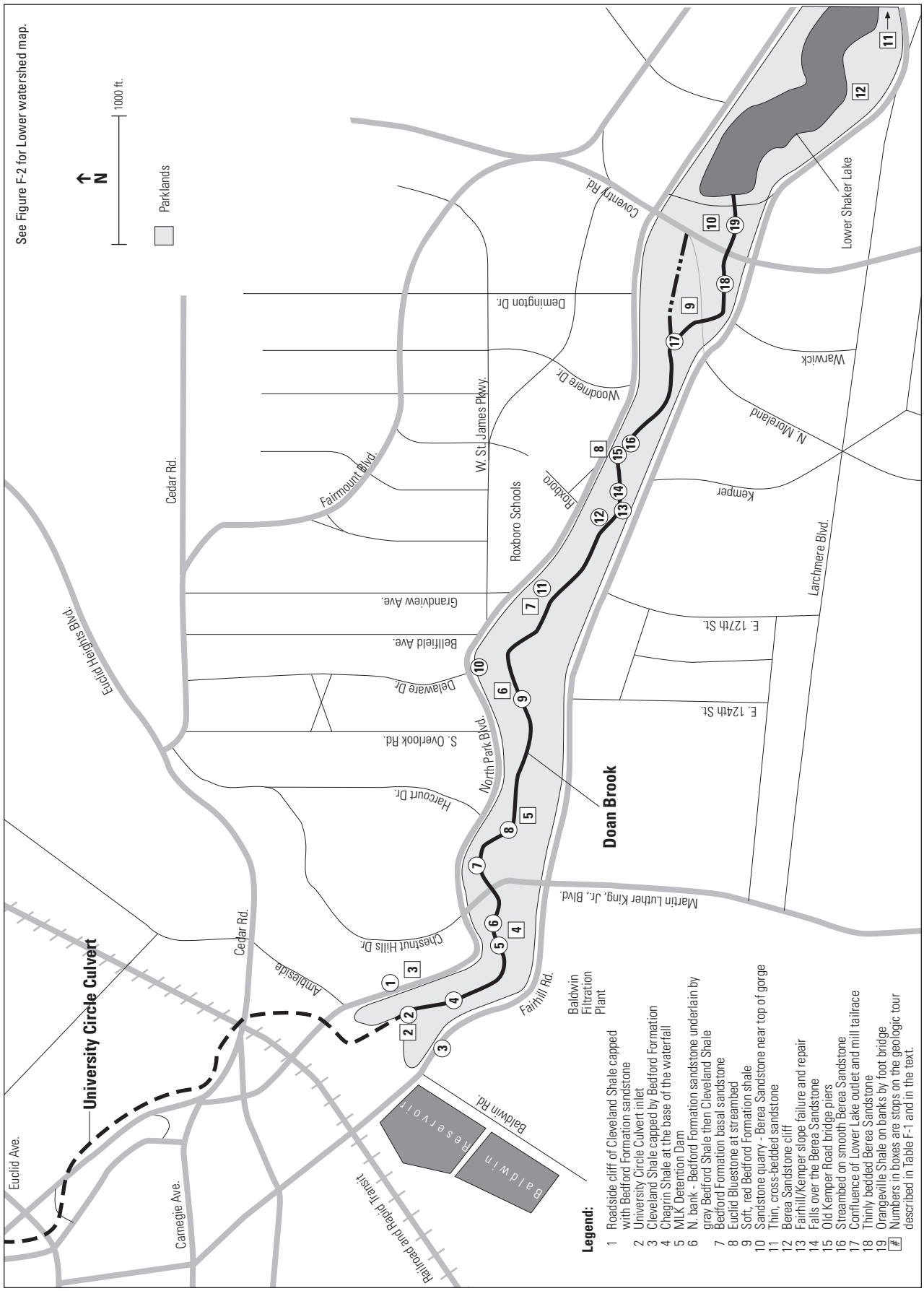


Figure F-3 Doan Brook Geology Tour Map: Upper Watershed

You can see the very bottom of the Bedford Formation sandstone where it intersects with the underlying Cleveland Shale in the locations described in Section F.2. In addition, the Bedford formation extends from the top to the bottom of the Doan Brook gorge between MLK and South Overlook — almost any rock that you see in the gorge in this area is from the Bedford Formation, unless it was carried there from outside. Particularly good exposures of both the Euclid Bluestone and the red Bedford Shale can be seen in the following locations:

- **STOP 5** Euclid Bluestone: The Brook Opposite Harcourt — The Euclid Bluestone is visible in the Doan Brook gorge in many places between MLK and Delaware.[2] The most spectacular place to see the Bluestone, though, is in the streambed about opposite the intersection of North Park and Harcourt. To get to this point, you must descend into the gorge opposite South Overlook and walk back downstream. If you work your way down toward the brook, you will eventually reach a point where the streambed is formed of dark, smooth rock rather than of mud or cobbles. The banks here are dark, greenish sandstone that juts into the brook in a horizontal stair-step pattern, with regular blocks that almost look manmade (the retaining walls on the south side of the stream *are* manmade). If you break a piece of this stone, the broken surface will be a lighter bluish gray, and the sandstone will appear dense and fine-grained. This is the classical exposure of the Euclid Bluestone. If you look carefully at the chunks of sandstone along the banks and in the gorge, you will see some examples of cross-bedding, or places where the layers of sandstone are at angles to each other. You may also find ripple marks in the stone — places where you can see evidence of wave action on the sand that was later compressed to make the stone.

  Although the classic Euclid Bluestone is best found at this location, the same name was used generally to refer to all of the dense, fine-grained sandstone that was found in the Bedford Formation. Some of this stone (like the material that is visible at Stop 4) is tan, without the slightest hint of blue.

- **STOP 6** Bedford Formation Shale: Downstream from North Park at Delaware — The best place to find the elusive Bedford Formation red shale is on the banks of the brook downstream from Delaware Road. Opposite the intersection of North Park and Delaware, there is a set of stone steps that lead from North Park into the gorge. Take the steps down, and continue toward the brook and downstream. When you reach the stream bank, look down at the mud under your feet. If you are on a Bedford Shale bank, the mud will be stained red. If the bank where you are standing isn't reddish, walk up or downstream and dig around a bit along the stream bank until you find a spot where it is. When you find a reddish bank, examine it closely until you find small bits of projecting, brick red, soft rock. This red shale, which looks more like small chunks of solid red mud than anything else, is the red Bedford Shale.

  As you continue a bit farther downstream along the bank (no farther than South Overlook), you will see that the far (south) bank of the stream looks quite red. If you venture across the brook (the rocks are slippery and the water is dirty) you will find a clear exposure of the red Bedford Shale on the far bank. You can also reach this bank by taking the path that leads toward the brook from Fairhill Road just east of the condominiums at Fairhill and East 126th Street.

F.4
Berea Sandstone: The Lower Shaker Lake to the Grist Mill

The Berea Sandstone's resistance to erosion led to the formation of the deepest, steepest part of the Doan Brook gorge and created the waterfall that the Shakers used to help power their five-story stone grist mill. The formation consists of light colored gray or tan pure quartz sandstone that is relatively coarse compared to the Bedford Formation sandstones. The individual sand grains are loosely cemented together, so that the rock can hold a great deal of water. Because of this, the Berea Sandstone is one of the most important aquifers in the area. The bottom part of the formation is massive — that is, it has few layers — while the upper parts are thinly bedded, with many clearly visible layers that may be less than an inch thick. The lower, massive part of the formation is also very erosion resistant, so that many streams, including Doan Brook, form waterfalls over the lip of this level of the Berea Sandstone.

The interface between the Berea Sandstone and the underlying Bedford Formation is irregular. It is evident that the seas receded after the Bedford Formation rocks were deposited, so that the surface of the formation was eroded before the seas returned to deposit the sand that was to become the Berea Sandstone.

The Berea Sandstone is hard to miss along Doan Brook. It extends from the top of the gorge to the streambed from below Coventry Road to below Roxboro Road. It forms the walls of the most spectacular part of the Doan Brook gorge, as well as the stream's stone bottom.

2 Caution – The stone at the top of the gorge beginning slightly downstream from Delaware and extending upstream is Berea Sandstone, not Euclid Bluestone.

Figure F-4 Berea Sandstone in the Doan Brook gorge, showing massive bedding along the brook and thin, cross-bedded layers above. Photograph by L. C. Gooch.

Some particularly interesting spots to examine the sandstone are as follows:

- **STOP 6** Berea Sandstone: North Park at Delaware — At the bottom of the first flight of the stone steps that lead down into the gorge at the intersection of North Park and Delaware you find yourself in an open area with heavily-grafittied sandstone walls to the left and straight ahead. This is the first appearance of the Berea Sandstone at the top of the gorge, and it is one of many areas along the brook where sandstone was quarried. There is often water seeping from the rock, showing that the Berea Sandstone does indeed carry water. If you follow the steps down and around the rocks that lie straight ahead, you will see evidence of cross-bedding on the back of the sandstone.
- **STOP 7** Berea Sandstone with cross-bedding and thin bedding: North Park and Grandview — Just upstream from the intersection of North Park and Grandview, you can take a path that leads down into the gorge and upstream. A few feet down the path, you will see layers of exposed dark sandstone on your left. This rock is very thinly bedded, looking almost like sidewalk stones that have been cut and stacked. The formation has excellent examples of cross-bedding. That is, some layers of the rock have been turned aslant, only to be topped by still other layers that remain horizontal.
- **STOP 8** Berea Sandstone in the gorge and the falls: North Park from Roxboro Road to Woodmere Road — If you follow along the north side of the top of the gorge between Roxboro Road and Woodmere Drive, you can see the point where the brook cuts most steeply through the sandstone. The gorge walls here are nearly vertical, and the stream bottom is smooth sandstone. The brook plunges about twelve feet over a waterfall, although the falls are difficult to see from the top of the gorge. Some of the stone has been quarried out, particularly near the downstream end of this stretch. This was the site of the Shakers' stone grist mill and the dam that provided its power (see Appendix C and Chapter 2). Just a bit downstream from Woodmere, you will see the footings of an abandoned bridge in the streambed. This is the point where Kemper Road once crossed the brook.
- **SIDETRACK 2** Berea Sandstone bedding and cross-bedding: Fairhill at Kemper Road — You can see an exposure of about thirty feet of the Berea Sandstone from the bottom of the south side of the gorge opposite the intersection of Fairhill and Kemper. Follow the remains of the abandoned Kemper Road Bridge down into the gorge until you find yourself standing just above the sandstone floor of the gorge across the stream from a vertical sandstone cliff. The lower part of the cliff is massive sandstone with little or no evidence of layering, while the upper part is composed of many fairly thin layers. The layers of one section are aslant from another (cross-bedded), showing that some sections of the stone were tilted after they were deposited. Doan Brook's twelve foot falls over the massive section of the Berea Sandstone lie a short distance to the left (downstream).
- **STOP 9** Berea Sandstone thin bedding: Fairhill Road Bridge over the Brook between North Moreland and Coventry — The thinly-bedded upper part of the Berea Sandstone is visible in the bed and banks of the brook between Woodmere and Coventry Roads. You can get a good look at the shelving layers of the streambed from either side of the Fairhill bridge over the brook or by walking along the south side of the stream between Fairhill and Coventry.

F.5
Orangeville Shale: Coventry Road and Farther Upstream

The varied rocks of the Cuyahoga Formation overlie the Berea Sandstone in the upper parts of the Doan Brook watershed. Only the lowest layer — the Orangeville Shale — is visible along the brook. The next two layers — the Sharpsville Sandstone and the Meadville Shale — are buried beneath the upper watershed's glacial till. Still younger layers of the Cuyahoga Formation are found at higher elevations outside of the Doan Brook watershed.

The Orangeville Shale is a soft, blue-black shale that weathers very quickly where it is exposed.

Table F-2	Bedrock Outcrops in the Doan Brook Watershed – Highest Formation to Lowest[3]	
Formation	**Description**	**Location**
Cuyahoga Formation	Orangeville Shale, Sharpsville Sandstone, and Meadville Shale underlie the Doan Brook watershed. Only the Orangeville Shale is exposed. The main body of the Orangeville Shale is a soft blue-black clay shale. Some beds are fissile,[4] others more solid, but all are weak and yield rapidly to the weather. The exposures along Doan Brook below the Lower Shaker Lake appear very flaky and weather to reddish rusty brown and gray. The edges of the fragments are tan, but the flat sides are reddish brown or gray. The shale is so fragile and the fragments so thin that the exposed edge of the formation looks almost like a dry pile of decaying leaves.	Orangeville Shale appears on the banks of the brook between the Lower Shaker Lake dam and Coventry Road. It is also sometimes visible along the south fork of the brook just upstream from the Lily Pond marsh at the Nature Center at Shaker Lakes.
Berea Sandstone	Light gray to yellowish brown, medium to fine grained clay-bonded quartz sandstone. May be ripple marked or cross-bedded. The formation is massive at its base and thinly bedded in its upper parts. This unit is highly erosion-resistant, leading to the formation of deep, steep-walled channels.	The Berea Sandstone forms the banks and channel of Doan Brook between Coventry and Roxboro Roads and is present at the top of the gorge as far downstream as the quarry opposite Delaware Road. The sandstone forms the erosion-resistant layer in the stream bed that creates the falls at the Shaker grist mill site, opposite the intersection of North Park and Roxboro.
Bedford Formation: Shale and Euclid Sandstone Member	Soft clayey shale ranging in color from blue gray to maroon or black, with thin interbeds of fine-grained blue-gray sandstone. Contains hard dark-gray concretions. Thicker sandstone interbeds form the Euclid Sandstone Member. Sandstone may be ripple-marked; shale layers may be tilted. The base of this unit is frequently a rather thick sandstone layer.	The basal sandstone of the Bedford Formation can be seen capping the Cleveland Shale in the cliffs up the hill from the intersection of MLK and Ambleside and up hill from the intersection of Fairhill and Baldwin Roads. Euclid Bluestone (part of the sandstone) can be seen in the stream bed opposite the intersection of North Park and Harcourt and along the gorge walls between MLK and South Overlook. The red Bedford Formation Shale can be seen on the north and south banks of the brook between Delaware and South Overlook. The grey Bedford Formation Shale can be seen in the middle part of the cliff on the north side of the brook just upstream from the MLK detention basin.
Cleveland Shale	Dark gray to black, weathering into thin, sharp-edged, slaty fragments which are stained reddish-brown. Pyrite and marcasite concretions may be found. A thin film of pyrite (<2" thick) is present along the base of this formation in some areas. A few fossils have been found in the upper part of the Cleveland Shale along Doan Brook.	Cleveland shale can be seen along the east side of MLK down the hill from Chestnut Hills Drive (going down the hill after the intersection of MLK with North Park). The lower part of the cliff here is composed of Cleveland Shale, as are the piles of shale fragments along the retaining wall at the base of the cliff. Cleveland shale can also be found in the lower part of the cliff on the southwest side of Fairhill Road below Baldwin Filtration Plant (between the plant and Baldwin Road), in the streambed and lower part of the cliff on the north side of the MLK detention basin, and on the southwest slope above the brook at the waterfall in Ambler Park.
Chagrin Shale	Soft clay shale, blue-gray, which weathers to sticky, soft clay. Interbedded with thin (one to two inch) sandstone layers.	Chagrin shale can be seen on the banks of Doan Brook just downstream from the University Circle culvert outlet. It can also be seen in the Doan Brook channel upstream from the University Circle culvert inlet in Ambler Park, where the brook has eroded the bottoms of the retaining walls. Thin sandstone layers that project from the surrounding shale are clearly visible here.

3 Geologic data are from a variety of sources. See the bibliography.

4 Fissile is a geologic term that indicates that a rock unit tends to break along parallel planes, resulting in thin, plate-like fragments.

Some parts flake readily into thin sheets, while others do not. The Aurora Sandstone, a fine-grained blue gray sandstone that weathers to yellowish brown, lies between the main body of the shale and the Berea Sandstone in some areas. Along Doan Brook, this layer is either absent or difficult to distinguish.

- **STOP 10** The easiest place to find the Orangeville Shale is along Doan Brook's banks between the Lower Shaker Lake dam and Coventry Road. Here, the shale appears rusty reddish brown and gray with tan edges. It breaks into very thin, weak flakes, so that the bank looks almost like a pile of dry, decaying leaves.

  There is an interesting contrast between the materials of the streambed and banks upstream and downstream of the Coventry Road bridge. Upstream from the bridge, the banks are purely soft, flaky Orangeville Shale — no hint of sandstone here. Downstream from the bridge, by contrast, you will find only the thinly bedded sandstone of the upper Berea Sandstone, with no sign of any shale. The interface between the two formations seems to occur entirely beneath the Coventry Road bridge.

- **STOP 11** The Orangeville Shale is sometimes exposed along the south branch of Doan Brook adjacent to the trails at the Nature Center at Shaker Lakes. As you walk along the trails, examine the steep banks that the stream has cut, looking for places where there is fresh erosion. You should be able to pick out some shale layers. Where there is no recent erosion, the shale weathers and is covered with soil from above, so that no clear rock layers are visible.

F.6
Glacial Erratics: Where Did *That* Rock Come From?

- **STOP 12** As you walk along Doan Brook you will occasionally see a large boulder that is quite unlike the sedimentary rocks that form the area bedrock. These boulders — usually granite but sometimes limestone or other rock — that don't seem to belong here are a legacy of the ice sheets that once covered the area. As the glaciers scraped across the land to the north, they pulled the rock apart and absorbed the resulting debris. Most of the material that the glaciers carried was in the form of the small particles — mixed clay, silt, sand, and gravel — that was left to become glacial till soil when the glaciers departed. Sometimes, though, the glaciers picked up large boulders and carried them hundreds of miles, only to drop them again as they receded. These boulders, scattered in a seemingly random pattern, are called glacial erratics. You can find a number of them in the Doan Brook watershed; some can be found easily along the shores of the Lower Shaker Lake.