

The geology of the Niagara Escarpment, Fayette, Michigan

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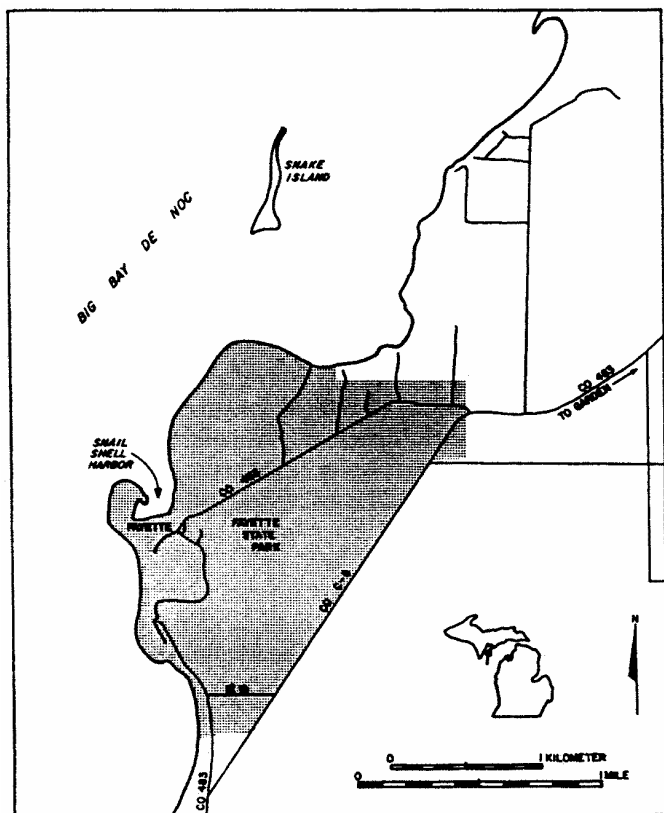


Figure 1. Map showing location of Fayette State Park and site of the restored town of Fayette, Chippewa County, Michigan.

LOCATION

Fayette State Park, the ghost town of Fayette, and an accessible portion of the Niagara Escarpment are located 8 mi (12.8 km) southwest of the town of Garden, Michigan, on the shore of Big Bay De Noc, Fayette 7½-minute Quadrangle. The sites are reached by U.S. 2 to Garden, then south on Michigan M-183 to Fayette State Park (Fig. 1). The sites may also be reached by boat through entry into Snail Shell Harbor.

SIGNIFICANCE

The Niagara Escarpment at Fayette (Fig. 2) is the largest exposure of the Middle Saurian Burnt Bluff and Manistique groups. These two groups of the Niagaran series are recognized as separate groups in outcrops throughout the Michigan Basin (Fig. 3). The groups are not defined separately in the subsurface of the Michigan

Basin, but are collectively identified as the Clinton Group (Harrison, 1985).

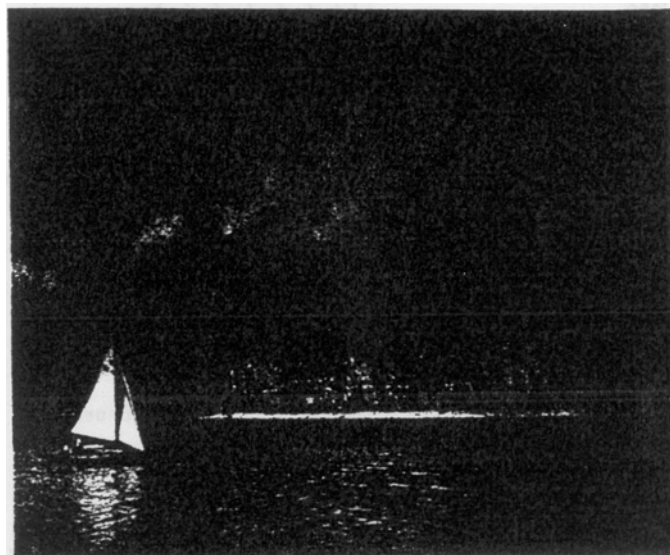


Figure 2. The Niagara Escarpment at Fayette, Michigan (courtesy Michigan Department of Natural Resources).

The Middle Silurian Engadine Group, not exposed at the Fayette location, but predominant on the eastern shore of the Garden Peninsula, will also be discussed in this paper (Fig. 4). In the subsurface the Engadine Group is identified as the Niagara Group (Harrison, 1985). Biohermal reefs found in the Niagara Group form the rich hydrocarbon producing "Northern Reef Trend" of Michigan's Southern Peninsula (Fig. 5). Recent discoveries of hydrocarbons associated with the Clinton Group are restricted to the central Michigan Basin (Fig. 5).

The town of Fayette was established as an iron-smelting facility in 1867. Dolomite from quarries in the Niagara Escarpment surrounding the town was used as flux in the smelting furnaces. The Burnt Bluff Group and portions of the Manistique Group can easily be viewed in the now-abandoned quarries as well as along the western shore of the Garden Peninsula south of Fayette.

DESCRIPTION

In 1973, Ehlers described the rocks of the Niagaran Series in outcrop in the Northern Peninsula of Michigan. He defined the Burnt Bluff as the succession of limestone and dolomites occupying a position between the top of the Maryville Dolomite and a disconformity at the base of the overlying Manistique Dolomite. The type locality of the Burnt Bluff is on the western shore of the Garden Peninsula (Fig. 4). The largest exposure of the group occurs along the shoreline. Ehlers based the disconformity between the Burnt Bluff and Manistique strata on a faunal break, which is most observable where the uppermost strata of the Burnt Bluff are limestones. According to Ehlers, at these localities, the Burnt Bluff limestones contain a few diagnostic fossils, primarily *Camarotoechia winiskensis*, *Leperdita fabulina*,

and *Isochillina latimarginata*, and are overlain by a thick-bedded, coarsely crystalline dolomite of the Manistique Formation, which contains numerous molds of the brachiopod *Pentamerus*. The disconformity is very poorly defined in most localities because the dolomitization has destroyed the few fossils present Ehlers (1973) proposed that the Burnt Bluff be a formation of the "Clinton Group," and divided the "Burnt Bluff Formation" into two members, the "Byron" and the "Hendricks." Ehlers applies the "Byron Member" to the lower member of the group because this member consists of beds "which seems to be continuous with the Byron strata of northeastern Wisconsin."

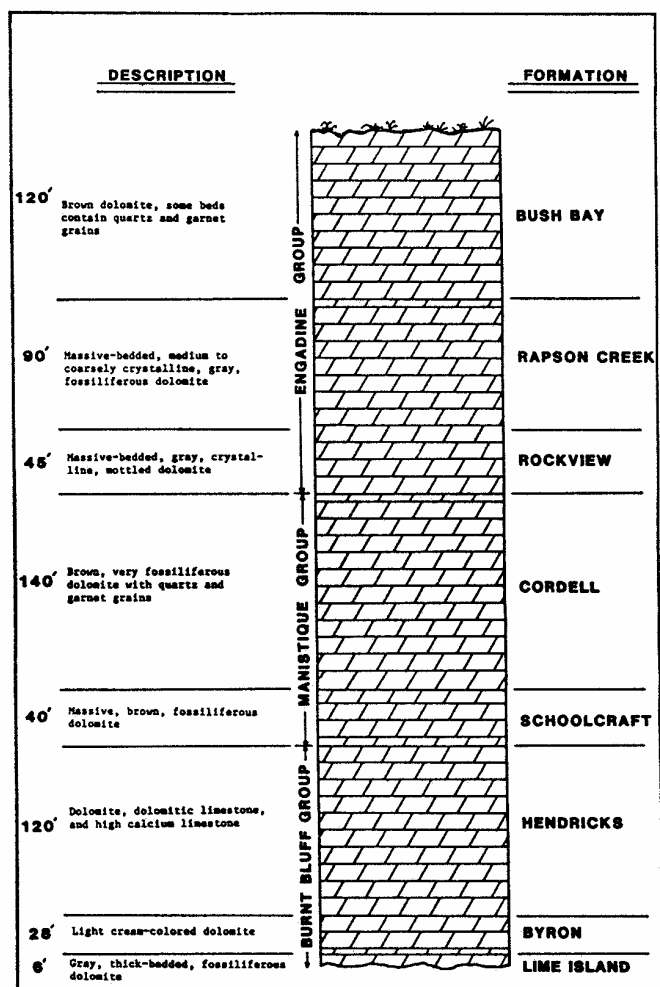


Figure 3. Generalized stratigraphic column of Niagaran Series rocks exposed at Fayette, Michigan.

Ehlers (1973) places the "Hendricks Member" conformably above the "Byron Member" and below the disconformity at the base of the Manistique.

The Michigan Geological Survey (Ells and others, 1964) recognizes three formational members of the Burnt Bluff Group—the Lime Island Dolomite, Byron Dolomite, and Hendricks Dolomite. The basal member of the Burnt Bluff is the Lime Island, which overlies the Cabot Head Shale of the Cataract Group. At the exposures at Fayette, the Lime Island Dolomite is a buff to buff-gray, thick-bedded dolomite containing molds of the

brachiopod *Virginia decussata* (Whiteaves) and fragments of *Favosites* sp., which overlays the Cabot Head Shale of the Cataract Group (Ehlers and Kesling, 1957). The Lime Island dolomite is on the average about 6 ft (2 m) thick at the Fayette exposure.

The Lime Island Dolomite is conformably overlain by the Byron Dolomite, which at Fayette is a light cream-colored dolomite that contains no diagnostic fossils (Ehlers and Kesling, 1957). The Byron Dolomite that is overlain by the Hendricks Dolomite, which consists of beds of dolomite, dolomitic limestone, and high calcium limestone. At Fayette, the Hendricks Dolomite consists of beds of very finely crystalline massive dolomites and coarsely crystalline dolomites, with upper beds containing a few specimens of *Favosites* sp. and stromatoporoids (Ehlers and Kesling, 1957).

The Manistique Group disconformably overlies the Burnt Bluff Group, and is exposed on top of the bluffs on the northwestern side of the Garden Peninsula. The Manistique Group is divided into two formational units: the Schoolcraft Dolomite and the Cordell Dolomite. The Manistique Group is best seen in outcrop at quarries around the town of Manistique, in the Northern Peninsula of Michigan, but the group is also well exposed in the Fayette area.

The basal member of the Manistique Group is the Schoolcraft Dolomite. A disconformity marks the base of the Schoolcraft, the nature of which was previously discussed. The Schoolcraft Dolomite consists of massive, coarsely crystalline, brownish gray to buff dolomites, thin-bedded, brownish gray dolomites, and thin, even-bedded finely crystalline, bluish gray dolomites (Ehlers, 1973). Although fossils are scarce in the thin, even-bedded, bluish gray dolomites, they are numerous in the basal, massive, brownish gray to buff dolomites; the most predominant being replaced shells and molds of the brachiopod *Pentamerus* sp. The top of the Schoolcraft Dolomite is placed at the base of a thin, uneven-bedded, buff to brown dolomite, containing numerous layers of chert nodules, many remains of *Pentamerus* sp., and a few silicified corals and other brachiopods (Ehlers, 1973).

The overlying Cordell Dolomite consists almost entirely of thin, uneven-bedded, brownish gray to buff, siliceous dolomites with interbedded layers of chert nodules, isolated chert nodules, and silicified fossils. The most prominent fossils are corals, which are very abundant, including such genera as *Alveolites*, *Amplexus*, *Arachnophyllum*, *Favosites*, *Halysites*, *Heliolites*, *Lyellia*, *Omphyma*, *Ptychophyllum*, *Streptelasma*, *Syringopora*, and *Zaphrentis*.

The Engadine Group overlies the Manistique Group with a sharp lithologic break between the fossiliferous Cordell Dolomite; and the highly crystalline Rockview Dolomite with an apparently conformable contact (Johnson and others, 1979).

The Engadine Dolomite is subdivided into three formational members: the Rockview Dolomite, Rapson

Creek Dolomite, and Bush Bay Dolomite (Johnson and others, 1979).

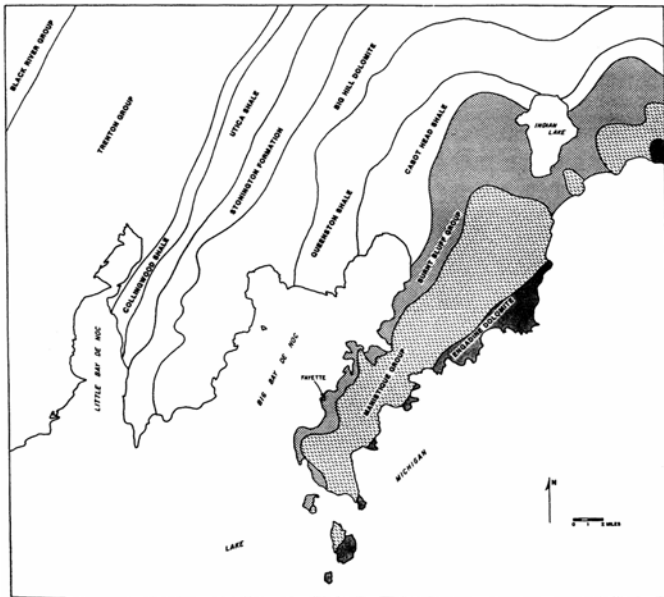


Figure 4. Bedrock geology map of the Garden Peninsula and surrounding region (courtesy R. L. Milstein, Michigan Geological Survey).

Rockview Dolomite is the basal formation, which conformably overlies the cherty, fossiliferous Cordell Dolomite. The Rockview Dolomite is characteristically a massive-bedded, gray to bluish gray, medium to coarsely crystalline, mottled dolomite, which weathers to a striking white.

Some fossils have been found mainly in the lower beds of the formation, the most significant being the trilobite *Scutellum laphami*, generally as fragments; the brachiopod *Stricklandia multilirata*, and various algal remnants. However, because the matrix is dolomite, few fossils specimens have good preservation (Johnson and others, 1979).

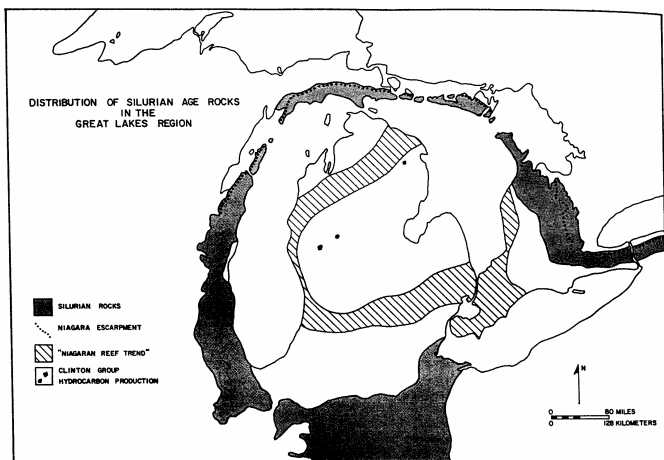


Figure 5. Map showing the distribution of Silurian Age rocks in the Great Lakes region, location of the Niagara Escarpment, the subsurface "Niagaran Reef Trend," and hydrocarbon-producing fields of the Clinton Group (courtesy R. L. Milstein, Michigan Geological Survey).

The Rapson Creek Dolomite overlies the Rockview Dolomite and underlies the Bush Bay Dolomite. The Rapson Creek Dolomite is a massive-bedded, medium to coarsely crystalline, light-gray to buff-gray dolomite, which contains a wide variety of corals and brachiopods.

The Bush Bay Dolomite is the uppermost formation of the Engadine Group, which is overlain by the Salina Group. The basal portion of the Bush Bay Dolomite consists of thin to medium-bedded dolomites, containing few fossils and inter-bedded with white nodular chert layers. The middle portion is massive, but weathered to thin uneven beds, buff-brown, fine-grained to finely crystalline, with local lenses containing quartz and garnet sand grains; fossils are scarce, with a few scattered brachiopods, cephalopods, and corals (Johnson and others, 1979). The upper portion of the Bush Bay Dolomite contains gray colored, medium to thick beds. The beds contain wide irregular dolomite bands, the upper portions composed of vuggy porous interreefal deposits. This portion of the formation is quite rich in fossils, containing a wide variety of stromatoporoids, corals, brachiopods, gastropods, cephalopods, and bivalves.

REFERENCES CITED

- Ehlers, G. KL, 1973, Stratigraphy of the Niagaran Series of the Northern Peninsula of Michigan: Ann Arbor, University of Michigan Museum of Paleontology Papers on Paleontology, no. 3, 39 p.
- Ehlers, G. M., and Kesling, R. V., 1957, Silurian rocks of the Northern Peninsula of Michigan, Michigan Geological Society Annual Geological Excursion: Ann Arbor, Michigan Geological Society, 30 p.
- Harrison, W. B., III, 1985, Lithofacies and oppositional environments of the Burnt Bluff Group in the Michigan Basin, in Ordovician and Silurian rocks of the Michigan Basin and its margins: Ann Arbor, University of Michigan, Michigan Basin Society Special Paper 4, p. 95-108.
- Johnson, J. M., Kesling, R. V., Lilienthal, R. T., and Sorenson, H. O., 1979, The Maple Block Knoll Reef in the Bush Bay Dolostone (Silurian, Engadine Group), Northern Peninsula of Michigan: Ann Arbor, University of Michigan Press, Museum of Paleontology Papers on Paleontology, no. 20, 33 p.