

## Mississippian Marshall Formation of the Pointe aux Barques region, eastern Michigan

**Randall L. Milstein**, *Subsurface and Petroleum Geology  
Unit, Michigan Geological Survey, Lansing, Michigan  
48912*

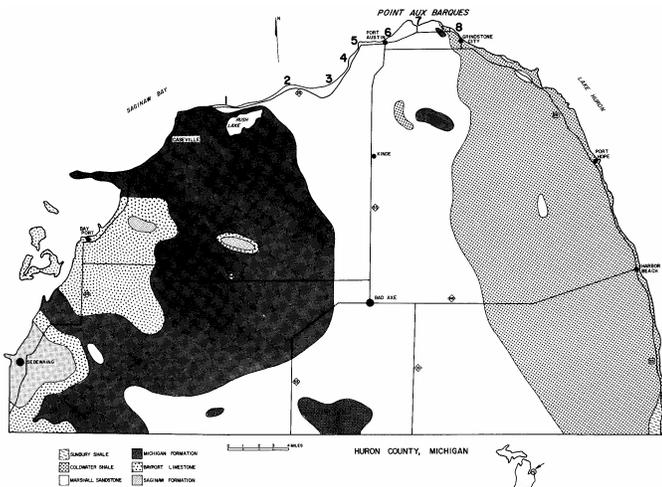


Figure 1. Bedrock geology map of Huron County, Michigan. Numbers indicate described outcrop locations.

### LOCATION

Pointe aux Barques Region T.18N., R.11E. and T.19N., R.13E., Huron County, Michigan; Rush Lake, Port Austin West, Port Austin East, and Kinde West, Michigan, 7½-minute quadrangles. The Pointe aux Barques region of Huron County extends east from Little Oak Point 18 mi (29 km) along the Lake Huron shoreline to Grindstone City (Fig. 1). The Pointe aux Barques area is reached by following Michigan 53 north from Bad Axe to Port Austin. This picturesque shoreline region is also accessible by boat.

### INTRODUCTION

The Lower Peninsula of Michigan resembles a man's mitten-covered hand. In such a comparison Saginaw Bay separates the thumb from the rest of the hand. Huron County is located at the very tip of the "thumb." Few counties of the Lower Peninsula have more rock outcrops exposed than Huron County. The majority of Huron County's outcrops are located at its northernmost boundary along the Lake Huron shoreline. The exposed cliffs, ledges, and wave-cut shoreline features make up the thumb's thumbnail.

The name Pointe aux Barques was given to the region by early explorers who noted the resemblance of the shoreline features to the prows of ships (Houghton, 1838). Along the Pointe aux Barques shoreline are numerous examples of sea caves, arches, stacks, and

wave-cut cliffs (Fig. 2). These dramatic shoreline structures are the result of changes in water level of the ancient and modern Great Lakes.



Figure 2. The Flagstaff (or Bowsprit) at Pointe aux Barques. This small island was formed by wave action of the ancient and modern Great Lakes (photo courtesy Michigan Department of Natural Resources).

The outcrops of the Pointe aux Barques region are composed of sandstones of the Mississippian Marshall Formation. Sediments of the Marshall Formation are generally well sorted locally, but lateral gradations in grain size are common. The sandstones and minor siltstones that comprise the Marshall Formation apparently were deposited in a shallow sea frequently disturbed by waves and currents (Monnett, 1948). Cohee (1979) finds the Marshall is time transgressive northward across the Michigan Basin and eventually occurs in the north as lenses of sandstone that interfinger with the overlying Michigan Formation.

The Marshall Formation overlies the Mississippian Cold-water Shale and is about 300 ft (91 m) thick at its most expressive outcrop in southern Michigan. The Marshall Sandstone is comprised of highly angular quartz grains embedded in a softer cement of mica, siderite, and clay. Cross-bedding in the Marshall Formation is subtle, making the rock seem perfectly homogeneous. The Marshall Formation consists of an upper unit, the Napoleon Sandstone Member, and a lower unit, commonly referred to as the lower member. The lower member is a fine-grained, greenish gray sandstone with some siltstone present. The Napoleon Member is a fine- to coarse-grained sandstone, commonly red in color.

From the mid-to-late 1800s the Marshall Formation outcrops of the Pointe aux Barque regions were quarried extensively for the production of grindstones. These grindstones were used for grinding, shaping, and polishing anything from axes and knives to fencing swords. When used for grinding purposes, the softer cement of the Marshall Formation wears away just fast enough to allow the remaining quartz grains to polish. It is the lack of outstanding cross-bedding, evenness of grain, sharpness of grit, and soft-cementing material that

gave the stone its peculiar value to the grindstone industry. Users of grindstones from the Pointe aux Barques region considered them to be the finest in the world and they were greatly sought after. Grindstones weighing up to 12,000 pounds (5,443 kg) and as much as 7 ft (2 m) across and 1 ft (0.3 m) thick were produced from the quarries and marketed worldwide. Numerous examples of these grindstones are still on display at Grindstone City, Michigan, or can be found discarded along the Lake Huron shoreline in the region.

The Marshall Formation contains units that are highly fossiliferous. An excellent summary of samples identified in the region can be found in Lane (1900). The most notable unit, a calcareous sandstone lying above the quarried grindstone beds, has often yielded remains of the fossil sharks *Orodus* and *Ctenacanthus* (Dorr and Eschman, 1977).

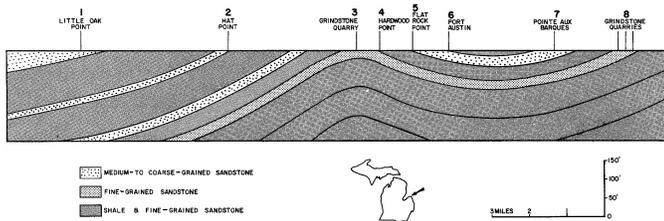


Figure 3. Cross section along shoreline, northern Huron County, Michigan, illustrating regional structure and location of described outcrop locations (modified from Monnett, 1948).

Monnett (1948) defines the major structural features of the Pointe aux Barques region to be an anticlinal fold and its associated syncline (Fig. 3).

## SITE DESCRIPTIONS

**Site 1.** Upper beds of the Mississippian Marshall Sandstone outcrop on the northside of Rush Lake, inland from Little Oak Point. The exposure is in the abandoned Babbit Quarry and can be reached by taking Michigan 25 east from Port Austin 9 mi (14 km) to the intersection of Oak Beach Road. Turn south on Oak Beach Road and proceed 0.75 mi (1.2 km) to Sand Road. Turn west on Sand Road and proceed 2.5 mi (4 km) to the quarry. About 15 ft (4.5 m) of medium- to coarse-grained, very friable sandstone, with abundant limonite throughout, is exposed in the quarry. The top 3 ft (0.9 m) of this exposure is thinly bedded, while the bottom section is massive and cross-bedded. Lane (1900) assigned the strata at this outcrop to the middle part of the Napoleon Member of the Marshall Formation.

**Site 2.** East of the Little Oak Point/Babbit Quarry exposure, the first outcrop of Mississippian sandstone along the shoreline is at Hat Point. To reach Hat Point, travel west on Michigan 25 from Port Austin 7.5 mi (12 km) to Philip County Park. A short walk west along the beach will bring you to the outcrop. At this exposure, 12 ft (3.5 m) of fine- to coarse-grained, cross-bedded sandstone is exposed. The color ranges from buff to greenish gray. Monnett (1948) describes streaks of

small quartz pebbles and flakes of black carbonaceous material occurring throughout the exposure. Lane (1900) assigned this outcrop to the lower Napoleon Member of the Marshall Formation.

**Site 3.** East of Hat Point is a sandstone outcrop exposed in a now-abandoned grindstone quarry. The quarry is located roughly 3 mi (5 km) west of Port Austin on Michigan 25 and occupies both sides of the highway. About 9 ft (3 m) of strata are exposed. The upper 7 ft (2 m) are thin-bedded, grayish green, very finegrained sandstone, but the lower 2 ft (0.6 m) are more massive. Evidence of a more massive but unexposed sandstone unit under the latter is indicated by large discarded quarry slabs lying around the pit. Monnett (1948) describes small pebble zones up to 2 in (5 cm) thick throughout the sandstone; these disappear laterally over short distances. In addition, Monnett (1948) describes a scattering of large individual pebbles throughout the unit. Large fragments of brown, pebbly conglomerate resembling peanut-brittle candy are found on the north side of the quarry. Lane (1900) identifies this and similar conglomerate rock found in the region as “peanut conglomerate.”

**Site 4.** About 4 ft (1 m) of very thin-bedded, fine-grained, greenish to reddish sandstone are exposed at Hardwood Point 2 mi (3 km) west of Port Austin on Michigan 25. The exposure is reached by parking at Jenks County Park and walking north along the shoreline. The sandstone at this outcrop is similar to the sandstone quarried elsewhere within the region to produce grindstones. Winchell (1861) noted the outcrop contained numerous Early Mississippian fossils.

**Site 5.** The shore of Lake Huron is barren of outcrops from Hardwood Point to Flat Rock Point. From Flat Rock Point to Port Austin, about 25 ft (7.5 m) of medium- to coarse-grained, light-gray sandstone outcrops almost continually. The sandstone is massive, cross-bedded, and friable. Monnett (1948) describes numerous seams of small pebbles, which disappear laterally, throughout the outcrop. Flat Rock Point can be reached by taking Larned Road north from Port Austin to the Lake Huron shoreline and then walking west, or by turning west of Larned Road on any residential road once past the intersection of Michigan 5.

**Site 6.** One-half mi (0.8 km) west of Port Austin, the outcrops have been broken into large blocks by joints, and the shoreline takes on a very distinct appearance. By following the shoreline east from this point, the massive sandstone is gradually replaced by a thin-bedded, greenish to reddish, fine-grained sandstone. The ability to locate this unit depends entirely on the seasonal water level of Lake Huron. This sandstone unit is capped by an 8-in (20 cm) band of “peanut conglomerate.”

**Site 7.** The sandstone cliffs and picturesque shoreline features of Pointe aux Barques are the first outcrops east of Port Austin (Fig. 2). The outcrops rise about 20 ft (6 m) above Lake Huron and are composed of massive,

cross-bedded sandstone, with grain size ranging from fine to coarse. The sandstone is light gray to buff in color, friable, and porous. The Pointe aux Barques scenic area occupies about 0.6 mi (1 km) of the Lake Huron shoreline and can be reached by traveling 2 mi (3 km) east of Pointe aux Barque Road from Port Austin to the Pointe aux Barques Golf Club Access Road. Turn north on the access road and continue 1 mi (1.6 km).

**Site 8.** East from Pointe aux Barques, no bedrock is exposed along the Lake Huron shoreline until reaching Eagle Bay. It is in Sections 23, 24, and 25, T.19N., R.13E. that the sandstone, which was quarried so extensively for grindstone purposes prior to 1900, outcrops intermittently along the shoreline. These “grindstone” beds are a very fine-grained, greenish sandstone occurring in beds 1 in (2.5 cm) to 1 ft (30 cm) thick. The overall outcrops are roughly 25 ft (7.5 m) thick. Large round quartz pebbles are scattered throughout the beds. The sandstone is moderately hard and argillaceous. Overlying the “grindstone” beds is a layer of “peanut conglomerate.”

Visitors are encouraged to stop in Grindstone City 5 mi (8 km) east of Port Austin off Michigan 25. Grindstone City has many parks, displays, and historical markers describing the quarries and grindstone production operations of the last century.

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