

**Precambrian, Banded Iron Formation (Negaunee Formation)
along US-41/M28, south of Coon Lake,
Baraga County, Michigan**

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**Banded Iron Formation on the north side of US-41/M28, looking north
*Photo taken by: Steven Baumann on 5-10-2013***

Negaunee Formation along US-41/M28, south of Coon Lake, Michigan

Location:

This outcrop is approximately 720 feet east of the US-41/M28 intersection with Beaufort Lake Road, along the north side of the highway.

GPS location is North 46.54427 by 88.16102 West (see Figure 1). The base of the outcrop is approximately 1631 feet above mean sea level (MSL).

The outcrop is exposed, with the base at the GPS location, at road level of US-41.

Significance:

The *Negaunee Formation* is part of the *Menominee Group* of mostly Precambrian meta-sedimentary rocks. However, the *Negaunee Formation* is locally surrounded by the largely covered volcanics of the *Hemlock Formation*. The *Negaunee Formation* is a text book example of what is referred to as “banded iron formation” (BIF). This particular exposure is the upper part of the formation and belongs to a facies dominated by red chert (jasper) interbedded with specular hematite (see Figure 2). Hematite is a major source of iron and has been mined since the 19th century. BIF is commonly mined for its iron ore throughout the Upper Peninsula of Michigan. There are many large mines still active within a 25 mile radius of this location. Locally in Baraga County, the slightly younger BIF of the *Bijiki Formation* is more commonly mined because it is finer grained. The *Bijiki Formation* has produced about four times the iron than the *Negaunee Formation*.

In the area of the outcrop the *Negaunee Formation* is about 400 feet thick. Only small road cuts provide good exposure. This outcrop is near the northern edge of a local structure referred to as the Marquette Trough. The trough formed during the Penokean Orogeny, which began around the time the *Negaunee Formation* was being deposited. The rocks at the outcrop have a structural trend of N85E 39SE into the Marquette Trough. The age of the *Negaunee Formation* is around 1.865 billion years old.

BIFs are somewhat of a geologic enigma. They are the only type of sedimentary rocks that do not have a modern equivalent. Earth stopped making BIFs in large amounts about 1.80 billion years ago. Only two BIFs younger than 1.80 billion years old are known in the Midwest. The Freedom Formation in the Baraboo Wisconsin area is 1.65 billion years old. There is a 1.40 billion year old BIF interbedded with tuff in Missouri. BIFs before 1.80 billion years ago are extremely common throughout the Midwest. There are at least a dozen recognized BIFs in the Midwest (oldest about 2.7 billion years old). Then, deposition drastically declines around 1.80 billion years ago. The Sudbury Impact occurred at this time in what is now Ontario and may have played a significant role in stopping the deposition of BIFs. The impact occurred at 1.850 billion years ago. Other events were going on around this time. Oxygen levels in the atmosphere reached at least 2%, modern plate tectonics was fully underway, and the appearance of significant landmasses were assembled into the supercontinent Nuna (three supercontinents before Pangaea). The youngest known BIF in the world is about 750 million years old, possibly initiated in a “snowball earth” environment. All of these events probably played some role in the cessation of BIF deposition.

FIGURE 1

Gordon Lake Formation Outcrop

SITE LOCATION MAP

Date Studied: 5/10/2013

Location: Approximately 720 feet east of the US-41/M28 intersection with Beaufort Lake Road, along the north side of the highway.

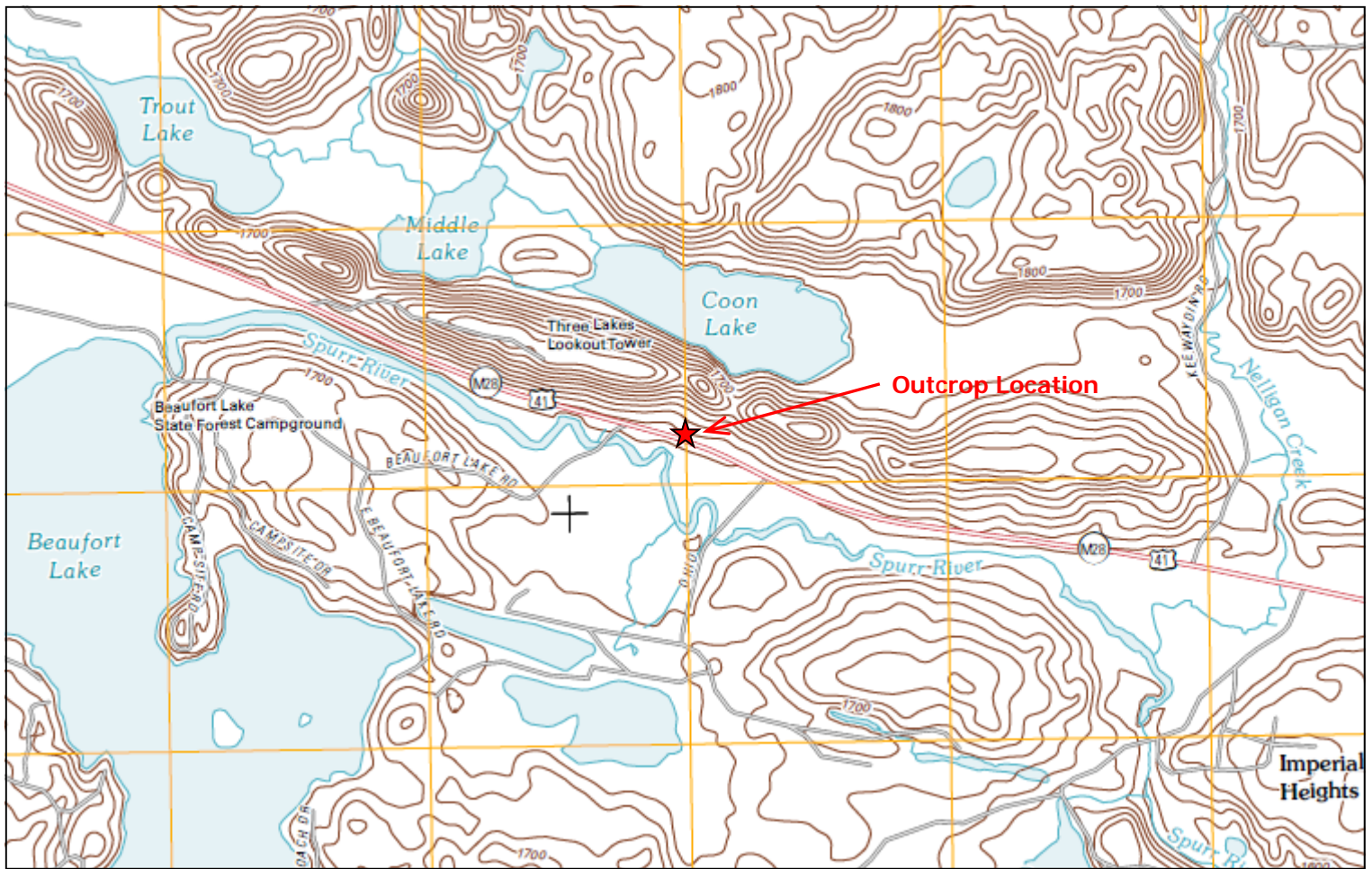
GPS location (Road Level):

N: 46.54427

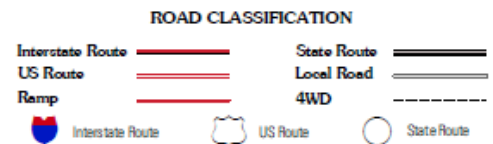
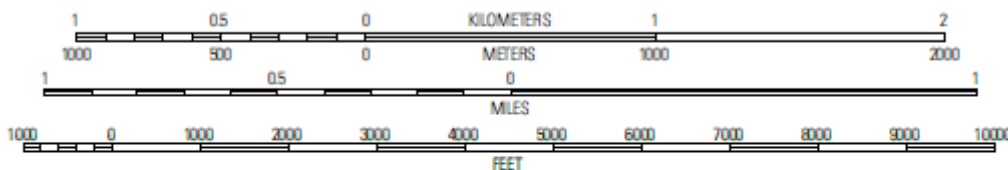
W: 88.16102

Elevation of Road: 1631 feet above MSL

THREE LAKES QUADRANGLE
MICHIGAN-BARAGA CO.
7.5-MINUTE SERIES



SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

2011

This map was produced to conform with version 0.5.10 of the USGS US Topo Product Standard. A metadata file associated with this product is draft version 0.5.16

FIGURE 2: Outcrop of Negaunee Formation along US-41/M28, Baraga County, MI



Outcrop on the North Side of the Highway

Looking West

General photo of the outcrop with reference points.

Road Sign for Scale

Taken on 5-10-2013



Overall Strike and Dip of the outcrop is about N85E 39SE

Close-up of the Negaunee Formation

Looking North

Close-up of the Negaunee Formation showing the red jasper interwoven with the gray metallic hematite.

U.S. Dollar Coin for Scale

Taken on 5-10-2013

References:

Baumann, S.D.J., 2013, *Precambrian Geologic Events in the Mid-Continent of North America*, Midwest Institute of Geosciences and Engineering, G-012011-1E

Klasner, J.S., 1978, *Bedrock Geologic Map of the Southern Part of the Michigan and Three Lakes Quadrangles, Marquette and Baraga Counties, Michigan*, United States Geological Survey, Map I-1078

Credits:

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