Precambrian, Copper Harbor Formation along the Black River, Sandstone Falls, Ottawa National Forest, Gogebic County, Michigan

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G-102015-1A

Lower part of the Upper Member of the Copper Harbor Formation, looking south at Sandstone Falls.
Photo taken by: **Steven Baumann on 9-19-2015**

Outcrop of Copper Harbor Formation at Sandstone Falls, Gogebic County, MI

Location:
This outcrop is along the Black River at Sandstone Falls, in the Ottawa National Forest. It is on the east side of County Road 513 (a.k.a. Black River Road), 1.0 road miles south of the entrance to Black River Harbor at Lake Superior. There is a well marked sign that leads to parking on the east side of the road. There is only one way to get to it. You have to get on Route 513 in the town of Bessemer and drive north for about 11.5 miles to reach Sandstone Falls.

GPS location is North 46.65035 by 90.04754 West (see Figure 1). The outcrop is approximately 735 feet above mean sea level (MSL), in the studied area (see Figure 2). The exposure of the fall varies in elevation from 764 feet (south end) to 702 feet (north end) above MSL as the water flows mostly north-northeast over the falls 0.41 mile length.

Significance:
The *Copper Harbor Formation* represents over 90% of the exposed rocks along the Black River from Great Conglomerate Falls, north to Lake Superior. This is also the best place in Michigan to see almost the entire formation. There are four (arguably five) distinct lithological facies within the *Copper Harbor Formation* along the Black River (see Figure 1).

Sandstone Falls begins right at the contact between the second and third facies (labeled as Unit 2 and 3 in Figure 1). The rock here is distinctly purple. The other facies in the Copper Harbor Formation tend to be more red and brown. It is also dominantly a lithic arenite (sandstone free of silt and clay, made of mostly rock fragments). There is some feldspar but almost no quartz sand (although there are some feldspathic lithic arenites). The sandstone contains isolated rounded pebbles and cobbles. It is also planar to trough cross bedded at low angles. Ripple marks are extremely common on sandstone bedding planes and most are large and asymmetrical (see Figure 2A). This indicates the sand was deposited in wide, fast moving streams. The sandstone exists in large sheets, indicating the slope during deposition was low but not flat.

The sandstone is interbedded with massive rounded pebble conglomerate (see Figure 2B). The conglomerate is mostly made of large pebbles, with some cobbles. It is generally clast supported and the matrix is similar to the sandstone. The pebbles consist mainly of rhyolite but andesite is also common. There are minor amounts of basalt pebbles. Pebbles are oriented somewhat randomly, indicating deposition by very fast moving streams. The conglomerates were likely deposited during flood events. The conglomerate has no obvious bedding to it. The conglomerate is subordinate to the sandstone here but exists in two to five foot thick beds.

Since the deposition of the sandstone and the conglomerate, approximately 1.09 billion years ago, the rock units were locally tilted north and dip from about 23 to 31 degrees, towards Lake Superior. There are no known faults in the area. The falls are low lying compared to the neighboring falls. The present environment is much as it was when the rocks were deposited over one billion years ago. The Black River flows north into Lake Superior. A similar situation took place over a billion years ago. There is one big difference between then and now. There was no land life one billion years ago. The landscape would have been devoid of trees, plants, and animals. Since there was no terrestrial life when the rocks were deposited, there are no fossils.

FIGURE 1

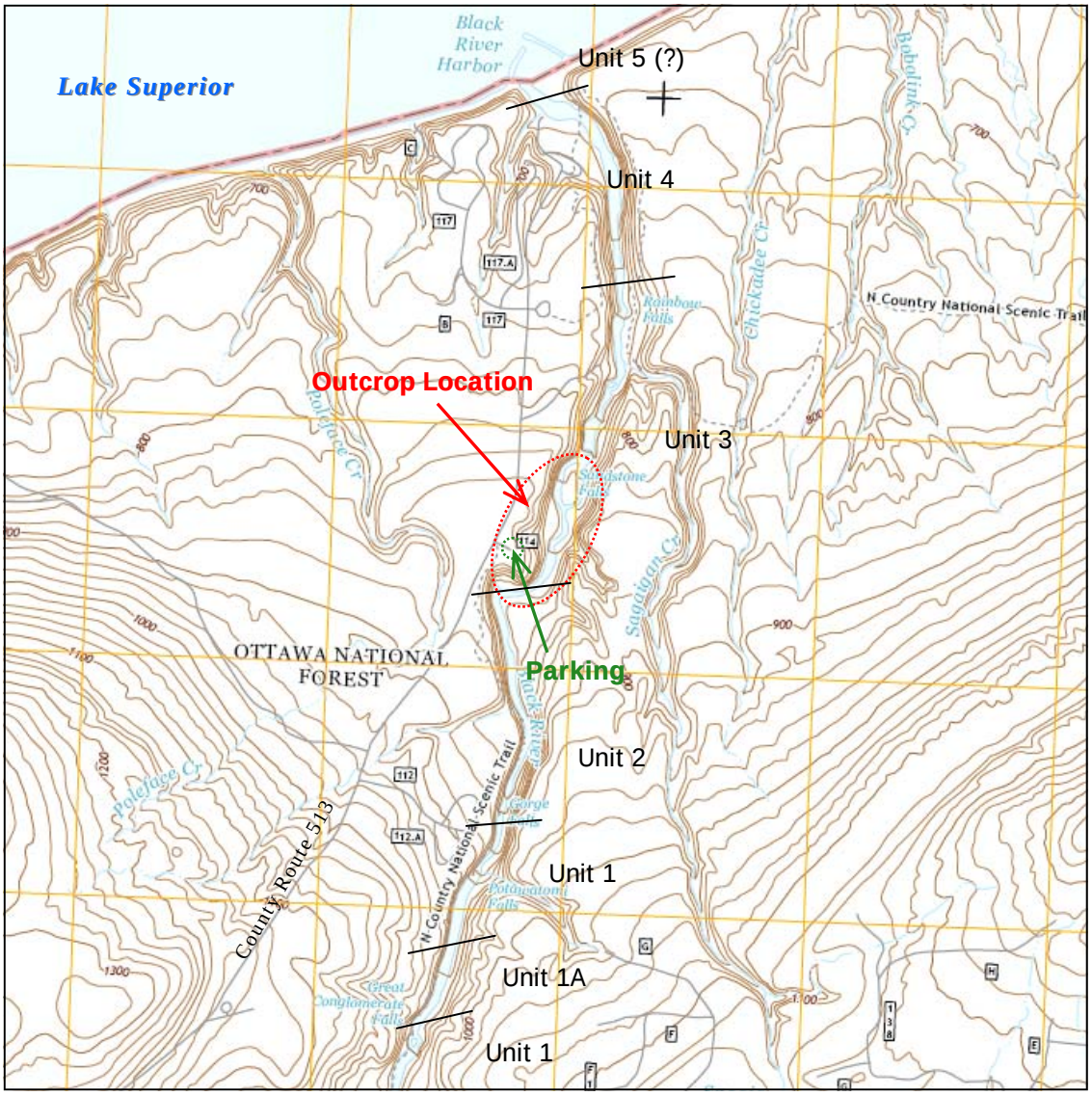
Copper Harbor Formation Outcrop

SITE LOCATION MAP

Date Studied: 9/19/2015

Location: Sign to parking lot along the east side of County Route 513, approximately 1.0 road miles south of the entrance to Black River Harbor.

GPS location (Studied Area):
N: 46.65035
W: 90.04754
Elevation of Road: 739 feet above MSL



SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.16

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route
FS Primary Route
FS Passenger Route
FS High Clearance Route

BLACK RIVER HARBOR, MI
2014

Geologic Contacts between exposed Units

FIGURE 2: Outcrop of Copper Harbor Formation at Sandstone Falls, Gogebic County, MI

FIGURE 2A: Precambrian Ripple Marks

Looking South-southeast

Precambrian ripple marks in the lithic purple sandstone. Their asymmetrical form indicates deposition in a fast flowing stream environment.

10" Hammer for scale

Taken on 9-19-2015

FIGURE 2B: Conglomerate and Sandstone

Looking North

Conglomerate interbedding with the sandstone. Cross bedding is visible in the sandstone (yellow dotted lines)

10" Hammer for scale

Taken on 9-19-2015

References:

Baumann, S.D.J., 2015, *Bedrock Geology of the Black River Harbor Quadrangle, Gogebic County, Michigan, United State, 7.5 Minute Quadrangle*, Midwest Institute of Geosciences and Engineering, M-102015-1A

Hubbard, H.A., 1972, *Geologic Map and Section of the Little Girl Point, North Ironwood, and Northern Part of the Ironwood Quadrangles, Michigan*, United States Geological Survey, Open File Report 75-152, Plate 1

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