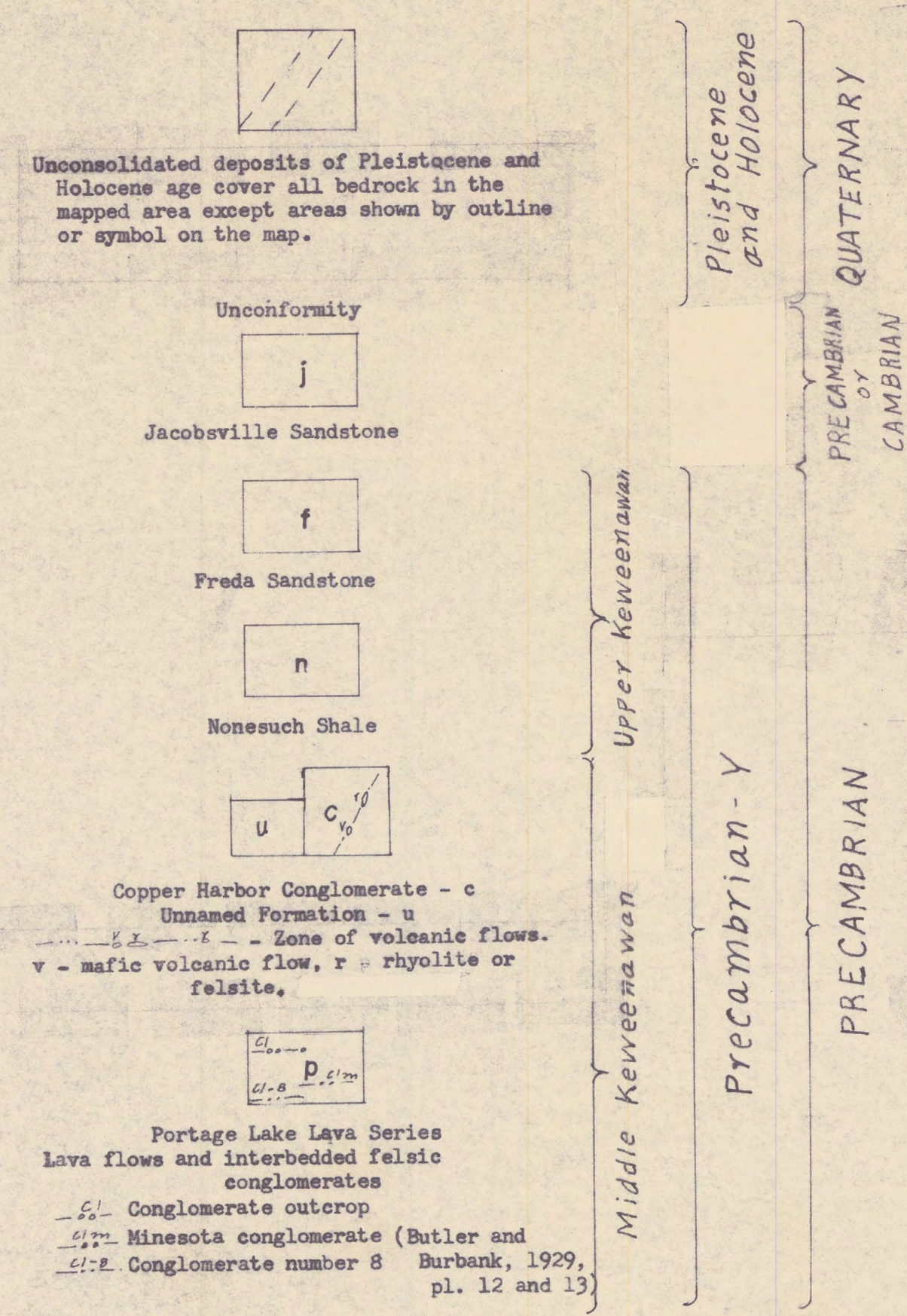


EXPLANATION

CORRELATION OF MAP UNITS

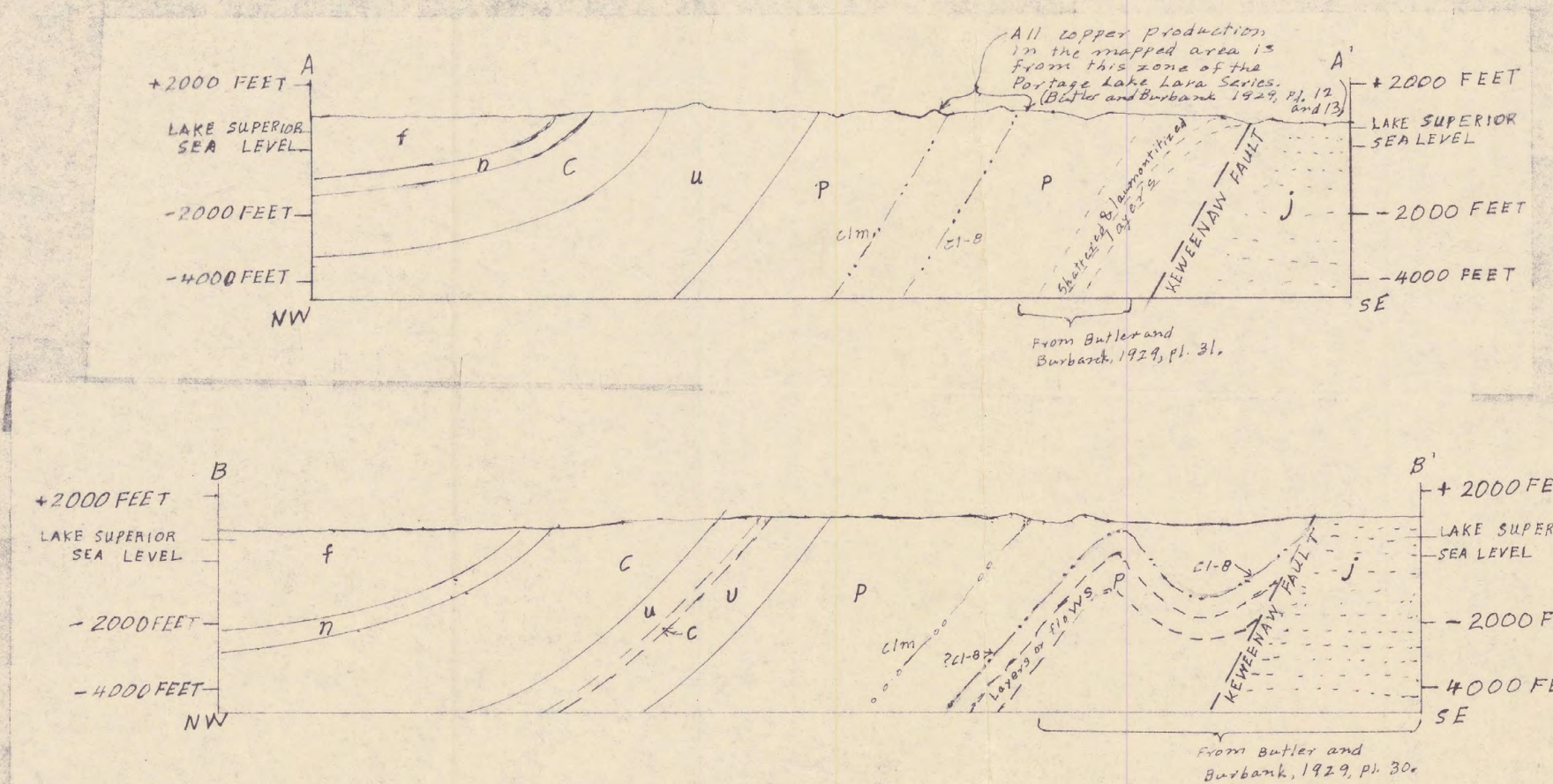


UNNAMED FORMATION (PRECAMBRIAN Y).—Dark gray to grayish-black, grayish-red, grayish-brown and moderate red fine-grained to aphanitic and in part porphyritic flows of rhyolite to andesitic composition; minor basaltic or more interbedded conglomerates are present. Locally as much as 40 feet of a section is composed of small angular angular fragments, some of which were scoriaceous, and fine-grained debris fills the spaces between the fragments. The unnamed formation is as much as 4,000 feet thick at the east edge of the adjacent Matchwood quadrangle (R. F. Johnson and W. S. White, unpubl. data). This unit thins northward and is arbitrarily ended in sec. 27, T. 51 N., R. 37 W. The unit was not recognized east of the Firesteel River and is not present in exposures in sec. 24, T. 52 N., R. 37 W., in the adjacent Winona quadrangle (Copper Range Exploration Co., unpub. data). The lava flows are brittle, break with sharp edges, and commonly have a reddish to red coating on joint and fracture surfaces. Exposures of rhyolite are labeled r on the map. The interbedded conglomerate is similar to the conglomerates in the Portage Lake Lava Series and the Copper Harbor Conglomerate. The unnamed formation appears to intertongue with the Copper Harbor Conglomerate and conformably overlies the Portage Lake Lava Series.

PORTAGE LAKE LAVA SERIES (PRECAMBRIAN Y).—Consists primarily of mafic flows ranging from medium gray to greenish-black and very dark red and from coarse-grained and ophitic to aphanitic. Individual flows or flow units range from thin (5 feet or less) to over 300 feet thick (see Butler and Burbank, 1929, pl. 15, for representative columnar sections). Interior of flows is medium to coarse-grained massive rock. Tops of all flows are angular, locally fragmental, and range from thin to several feet thick. Fragmental flow tops are fairly common in the 4,000 feet of flows above conglomerate number 8. Minerals filling vesicles and fractures are predominantly calcite, quartz, epidote, and chlorite; red to reddish-brown potash feldspar is fairly common. Zeolites, principally laumontite, are present in minor amounts. Native copper is a trace constituent that rarely exceeds 1 percent of the rock. Interbedded with the mafic lava flows but forming only a small part of the total thickness are felsic conglomerates and sandstones of undetermined origin and as much as 200 feet thick.

SYMBOLS

- f / n / c
- PLEISTOCENE AND HOLOCENE (QUATERNARY).—Comprises mostly unconsolidated clayey silt to sand of lacustrine origin, less abundant till and moraines of clayey silt to boulder-size debris of glacial origin, and some sand and gravel along streams and along the shore of Lake Superior. These deposits cover approximately 99 percent of the bedrock in the mapped area and are as much as 100 feet thick (Copper Range Exploration Co., unpub. data). No attempt was made either to differentiate deposits of Pleistocene age from those of Holocene age, or to determine relative amounts of lacustrine deposits and glacial deposits. Locally, glacial deposits are in lacustrine deposits. The Quaternary deposits unconformably overlie all older rock formations in the mapped area.
- j
- JACOBVILLE SANDSTONE (PRECAMBRIAN Y OR 2 OR CAMBRIAN).—Comprises, very pale, orange, grayish-brown, and moderate red sandy shale. Beds range from less than half an inch to several feet thick. Sandstones range from soft friable sand to hard well cemented and indurated rock that forms rapids and falls in small streams. Commonly, beds a foot or more thick show thin cross laminations inclined to the bedding plane. Locally, pebble-size conglomerate lenses and thin beds are common. They contain rounded fragments usually of quartz as much as 3/4 inch diameter. Endurated flattened, rounded masses of mud and small blocks of dried cracked mud are present and locally common. The Jacobsville is in fault contact with the Portage Lake Lava Series. The age relations of the Jacobsville to other rock formations in the mapped area cannot be determined, because neither the bottom nor the top is exposed. White, Cornell, and Shannon (1935) show a northwesterly steeply dipping thrust fault with the Portage Lake Lava Series brought against the Jacobsville Sandstone northeast of the mapped area.
- f
- FREDA SANDSTONE (PRECAMBRIAN Y).—Moderate-red, moderate-brown, grayish-brown, dark-yellowish-gray, light-gray, and greenish-gray sandstones with muscovite on bedding planes predominate. Locally has beds of light-red to light-greenish-gray shale. Two beds of conglomerate, each 2-3 feet thick, approximately 9 feet apart stratigraphically, are exposed in McGuire Creek in sec. 28, T. 51 N., R. 38 W. They are similar to the Copper Harbor Conglomerate near its top and are approximately 150 feet stratigraphically above the Nonesuch Shale. Some outcrop localities of Freda Sandstone shown on the Greenland quadrangle were not visited but were taken with permission from maps of the Copper Range Exploration Co. Thickness of the unit in the mapped area exceeds 4,000 feet but cannot be measured, because the total thickness is not exposed.
- n
- NONESUCH SHALE (PRECAMBRIAN Y).—Medium-gray, greenish-gray, dark-greenish-gray, and reddish-gray argillaceous siltstone, very fine-grained sandstone, and shale. Rocks range from medium-hard shale that breaks and crumbles easily to argillaceous siltstone and sandstone strong enough to use for flagstones. Beds range from less than an eighth of an inch to several inches thick; cross-bedding and ripple marks are common. Most crossbedding indicates that currents flowed northward. Thickness of the unit ranges from approximately 500 feet at east edge of the adjacent Matchwood quadrangle (R. F. Johnson and W. S. White, unpub. data) west of the Rockland quadrangle to approximately 665 feet at west edge of the adjacent Winona quadrangle (Copper Range Exploration Co., unpub. data) east of the Greenland quadrangle. The base of this unit is well exposed in McGuire Creek in sec. 28, T. 51 N., R. 38 W., and less well exposed in secs. 4 and 5, T. 50 N., R. 39 W. An excellent exposure of the upper part of the Nonesuch is in and near McGuire Creek in sec. 8, T. 50 N., R. 39 W., and good exposures are in sec. 4, T. 50 N., R. 39 W., and in sec. 28, T. 51 N., R. 38 W. The Nonesuch Shale conformably overlies the Copper Harbor Conglomerate and locally is transitional to it.
- c / n
- COPPER HARBOR CONGLOMERATE (PRECAMBRIAN Y).—Contains fresh-looking subrounded to well-rounded fragments of reddish felsite ranging from pebbles to boulders (as much as 24" in diameter) and a minor amount of rounded basalt fragments ranging from coarse-grained ophitic to fine-grained angular. The finer matrix is sand to silt and clay-size debris mostly from felsic rock; a minor amount is from mafic rock. Beds of sandstone of the same kind of debris are interbedded in the conglomerate and are more common in the upper than in the lower part of the formation. Sandstones are best seen in sec. 28, T. 51 N., R. 38 W., where the top of the formation is exposed, and in sec. 4, T. 51 N., R. 39 W. Locally, mafic flows (v) and rhyolite and felsite flows (r) are in the conglomerate. A zone of mafic and felsic flows is the traceable from sec. 19, T. 51 N., R. 37 W., northward to the east side of the Greenland quadrangle and is believed to correlate with the upper part of the unnamed formation. Five fair to good exposures of conglomerate are in the Greenland quadrangle and two exposures are in the Rockland quadrangle. The base of the conglomerate is exposed in sec. 24, T. 51 N., R. 38 W., where several feet of relief are visible on the underlying volcanics. The Copper Harbor Conglomerate seems conformable on the Portage Lake Lava Series near the east edge of the Greenland quadrangle, and intertongues with the unnamed formation in sec. 17 and 19, R. 37 W., and sec. 24, R. 38 W., all in T. 51 N. White (1972, fig. 5) shows that the Copper Harbor Conglomerate thins for about 10 miles westward of the Rockland quadrangle as the unnamed formation thickens.
- Strike and dip of lava flows and beds of sedimentary rocks
- Approximate top of Jacobsville Sandstone, an erosion surface
- Contour interval 40 feet
- 940
- DH
- Diamond drill prospect hole
- 940 - Altitude of bedrock
- A - Artificial flow
- 1010 - Altitude of bedrock
- Well log available from property owner
- G - Well bottom in glacial gravel
- 770
- Well
- Data from Doonan and Hendrickson (1969)
- 770 - Altitude of bedrock
- Well log available
- Data from Doonan and Hendrickson (1969)
- 9W-119
- Source of clay sample
- F-8
- Source of clay sample from
- Rustala and Bobcock (1968)
- Approximate discovery site of the
- Ontonagon copper boulder in
- sec. 37, T. 50 N., R. 39 W.



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FIGURE 2. GEOLOGIC MAP OF THE GREENLAND AND ROCKLAND QUADRANGLES, ONTONAGON COUNTY, MICHIGAN.

By  
Jesse W. Whitlow  
1972

U. S. Geological Survey  
SPEC FILE MAP 14-1123  
This map is preliminary and has  
not been edited for conformity  
with Geological Survey standards  
or nomenclature.

Michigan (Greenland and Rockland quads) geol. 1:62,500-1972  
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