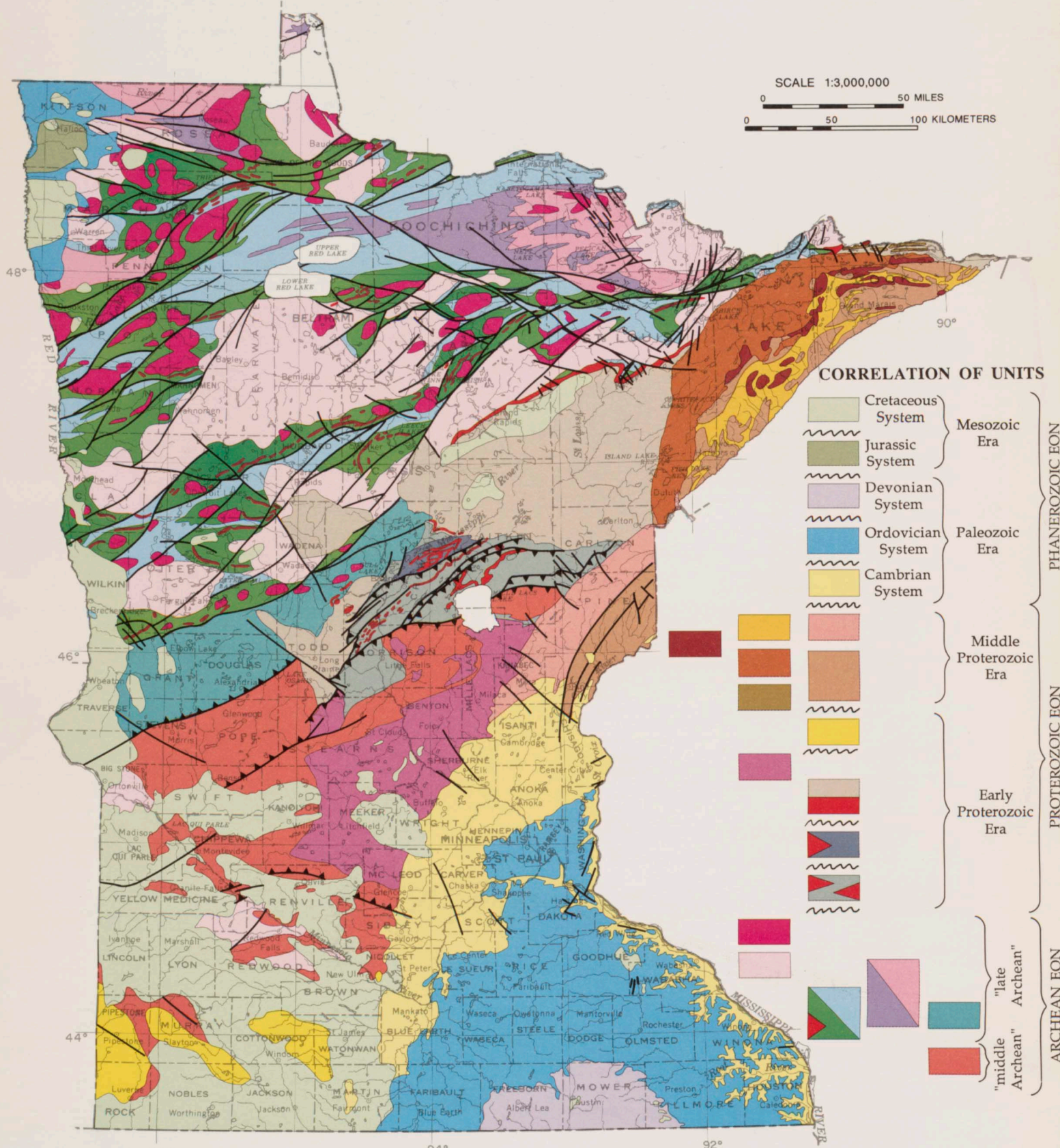
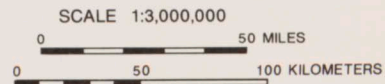
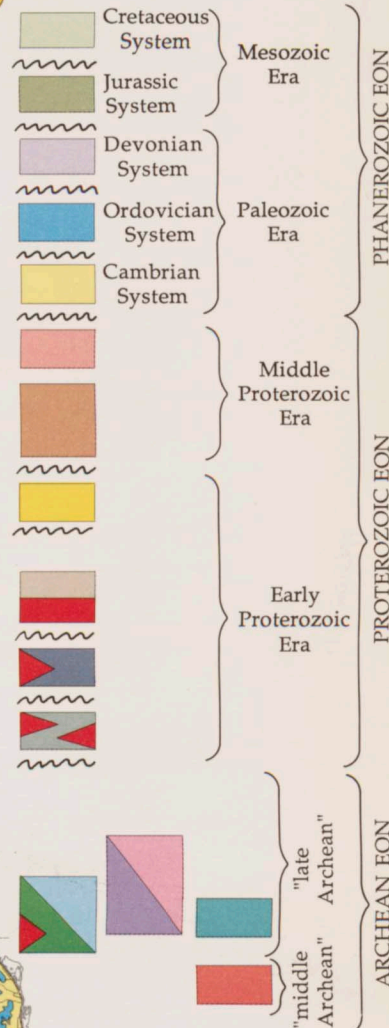


GEOLOGIC MAP OF MINNESOTA
BEDROCK GEOLOGY

1993



CORRELATION OF UNITS



DESCRIPTION OF MAP UNITS

MESOZOIC ROCKS

- CRETACEOUS ROCKS, UNDIVIDED** — Dominantly marine shale, some sandstone, and lesser amounts of limestone and their non-marine sandy and shaly equivalents to the east and northeast.
- JURASSIC ROCKS, UNDIVIDED** — Reddish-brown dolomitic shale; minor cherty dolomite and gypsum.

PALEOZOIC ROCKS

- DEVONIAN ROCKS, UNDIVIDED** — Limestone and dolomite.
- ORDOVICIAN ROCKS, UNDIVIDED** — Limestone, dolomite, and some sandstone and shale.
- CAMBRIAN ROCKS, UNDIVIDED** — Quartzose and glauconitic sandstone and siltstone; lesser amounts of carbonate rocks.

MIDDLE PROTEROZOIC ROCKS

- KEWEENAWAN SUPERGROUP**
 Red to buff shale and feldspathic to quartzose sandstone. Includes Fond du Lac Formation and Hinckley Sandstone.
- Basalt and related volcanic and volcanoclastic rocks of the North Shore and Chengwatana Volcanic Groups.
- Subvolcanic gabbroic and related hypabyssal rocks. Includes the Beaver Bay Complex.
- Anorthositic, troctolitic, and gabbroic rocks, undivided, of the Duluth Complex.
- Granite and granophyric rocks of the Duluth and Beaver Bay Complexes.
- Diabasic gabbro in dikes and sills. Includes the Logan Intrusions.

EARLY PROTEROZOIC ROCKS

- Sioux Quartzite and related claystone (catlinite).
- Granitic rocks of the Penokean orogen, undivided; also includes a variety of older country rocks and coeval cover rocks.
- ANIMIKIE GROUP**
 Shale, siltstone, graywacke, and associated volcanic rocks of the Virginia, Thomson, and Rove Formations.
- Iron-formation. Biwabik and Gunflint Iron Formations and subjacent quartzitic and conglomeratic units.

NORTH RANGE GROUP

- Slate, metagraywacke, and associated metavolcanic rocks of the Rabbit Lake Formation and quartz-rich rocks of the Mahnommen Formation.
- Iron-formation. Trommald Formation and several other unnamed units of iron-rich strata.

MILLE LACS GROUP

- Metamorphosed quartzose sedimentary rocks; intercalated with carbonaceous strata and minor carbonate rocks, mafic and intermediate volcanic rocks, and iron-formation.
- Iron-formation. Glen Township Formation and several other unnamed units of iron-rich strata.

LATE ARCHEAN ROCKS

- Monzonite, syenite, and monzodiorite, together with mafic to ultramafic intrusions; generally late-tectonic in age.
- Granodiorite, granite, and smaller bodies of tonalite and monzonite; generally syntectonic to pre-tectonic in age.
- Granite-rich migmatite. Granitic gneiss, paragneiss, schist, and migmatite. Grades into granitoid rocks.
- Schist-rich migmatite and paragneiss. Grades into metasedimentary rocks.

- Metasedimentary rocks, including graywacke, slate, conglomerate, arenite, graphitic argillite, fine-grained felsic, volcanogenic, and reworked volcanoclastic rocks.
- Mafic volcanic rocks. Dominantly basalt to andesite with rare interflow clastic rocks and hypabyssal bodies of mafic composition; also includes mixed sequences of mafic to felsic volcanic, volcanoclastic, and epiclastic rocks, and iron-formation.

- Iron-formation. Soudan Iron Formation of the Vermilion district as well as many other units of uncertain stratigraphic position.
- Various metasedimentary and volcanic rocks; intrusive bodies of granite, tonalite, and gabbro. Rocks lack magnetic signature because of regional low-grade alteration of oxides and ferromagnesian minerals.

MIDDLE ARCHEAN ROCKS

- Migmatitic gneiss and amphibolite; includes units of younger Archean granite, as well as units of Early Proterozoic gneiss and granite.

- Contact. Located principally by airborne magnetic surveys except in a very few places where exposed.
- Inferred trace of thrust fault or structural discontinuity that is interpreted to have involved thrust displacement; teeth on upper plate.
- Inferred trace of steeply dipping fault.

This map was constructed from a variety of large-scale geologic maps that have a substantial interpretive component. Therefore this map should not be enlarged electronically or photographically for use at other scales.