

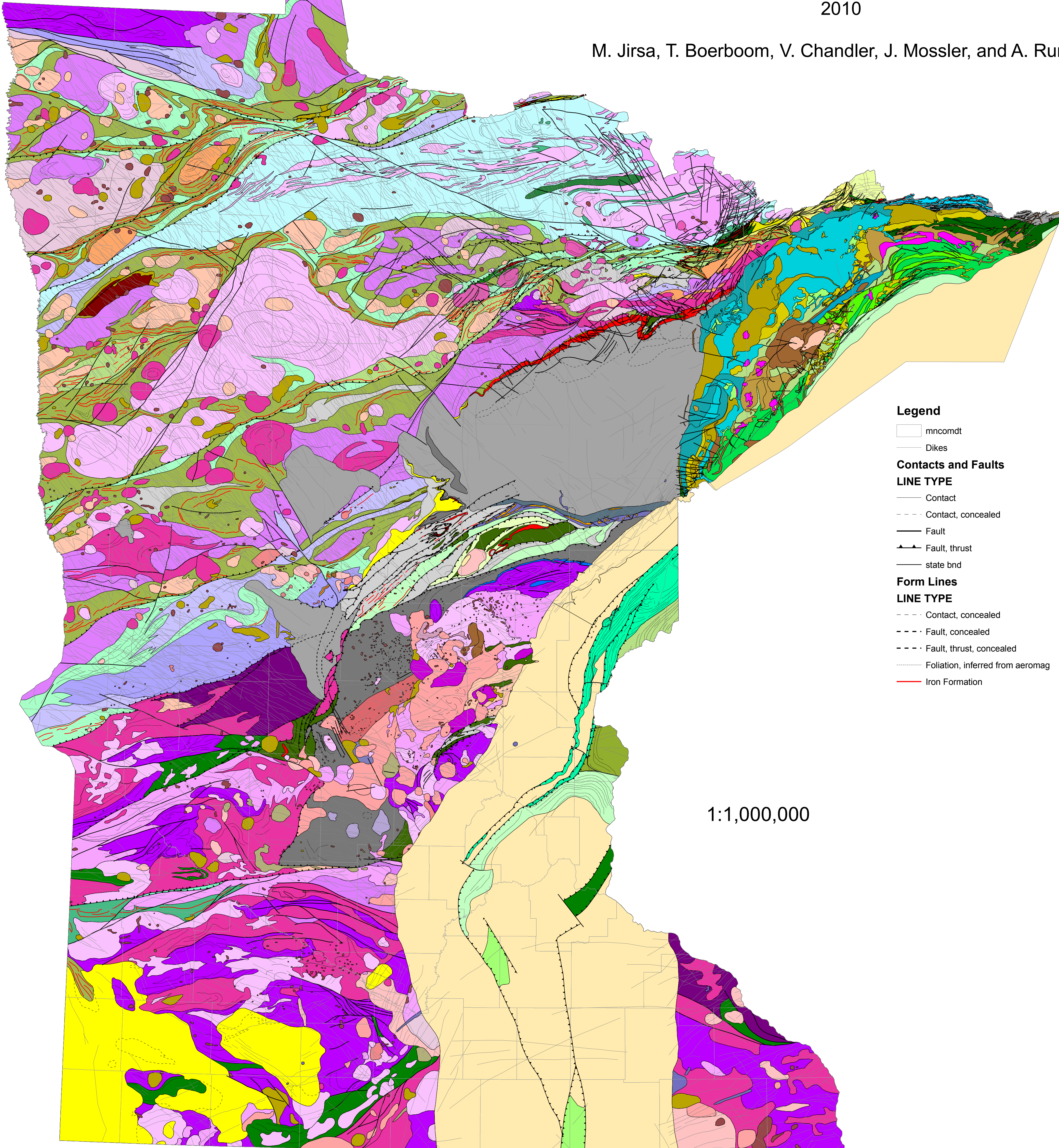
# Preliminary Precambrian Geologic Map of Minnesota

## Minnesota Geological Survey

### Open-File Report OFR10\_02

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#### Legend

- mncomdt
- Dikes
- Contacts and Faults**
- LINE TYPE**
- Contact
- Contact, concealed
- Fault
- Fault, thrust
- state bnd
- Form Lines**
- LINE TYPE**
- Contact, concealed
- Fault, concealed
- Fault, thrust, concealed
- Foliation, inferred from aeromag
- Iron Formation

1:1,000,000

#### PRECAMBRIAN UNITS

- |  |     |   |
|--|-----|---|
|  | APd | APdDioritic to granodioritic intrusion of uncertain age                                       |
|  | APg | APgGranitic intrusion of uncertain age  |
|  | APm | APmGabbroic to dioritic intrusion and metamorphic equivalent                                  |
|  | APv | APvMafic volcanic and hypabyssal intrusive rocks of uncertain age                             |
|  | Aag | AagMafic to ultramafic hypabyssal intrusive complexes, gabbro, anorthosite, and related       |
|  | Acv | AcvCalc-alkalic volcanic, hypabyssal intrusive, and volcanoclastic rock                       |
|  | Adt | AdtDioritic to tonalitic pluton   |
|  | Agd | AgdGranodioritic intrusion, locally foliated  |
|  | Agl | AglLeucogranite, variably foliated  |
|  | Agm | AgmGranite to granodiorite, variably magnetic, locally magmatically foliated                  |
|  | Agn | AgnGranitic to granodioritic orthogneiss  |
|  | Agp | AgpGabbro, pyroxenite, peridotite, and lamprophyre intrusions, variably metamorphosed         |
|  | Agr | AgrGranitic intrusion   |
|  | Ags | AgsSchist and tonalite to granodiorite paragneiss   |
|  | Agt | AgtFoliated to gneissic tonalite, diorite and granodiorite                                    |
|  | Agu | AguGranitoid intrusion, undifferentiated or poorly constrained by core and outcrop            |
|  | Aif | AifIron-formation   |
|  | Akc | AkcKnife Lake Group volcanic conglomerate and breccia, alkalic, hornblende-bearing            |
|  | Aks | AksKnife Lake Group, volcanogenic lithic sandstone, siltstone, conglomerate, and slate        |
|  | Akv | AkvKnife Lake Group, volcanic flows, breccia, and tuff, typically hornblende-bearing          |
|  | Amd | AmdMRV subprovince granitoid gneiss with amphibolitic to dioritic enclaves                    |
|  | Amg | AmgMRV subprovince granitic orthogneiss and migmatite   |
|  | Ami | AmiMafic plug-like intrusions; typically magnetic, gravity expression unknown due to size     |
|  | Amm | AmmInterlayered mixed volcanic rocks, typically amphibolite grade metamorphism                |
|  | Amn | AmnMRV Intermediate to mafic gneiss (tonalitic, dioritic, amphibolitic)                       |
|  | Ams | AmsSchist of sedimentary protolith  |
|  | Amt | AmtMRV subprovince foliated to gneissic granodiorite to tonalite                              |
|  | Amv | AmvMafic metavolcanic rocks, undiff. minor volcanoclastic and hypabyssal intrusions           |
|  | Amy | AmyMylonite   |
|  | Aqa | AqaAmphibolite, schistose to gneissic, Quetico subprovince                                    |
|  | Aqq | AqqGranite-rich migmatite, locally magnetic, Quetico subprovince                              |
|  | Aql | AqlLa Croix Granite, locally pegmatitic, Quetico subprovince                                  |
|  | Aqm | AqmQuartz monzonite, monzonite, and granodiorite, non-magnetic                                |
|  | Aqp | AqpPorphyritic quartzfeldspathic intrusion  |
|  | Aqs | AqsBiotite schist, paragneiss, and schist-rich migmatite, Quetico subprovince                 |
|  | Aqt | AqtTonalite-granodiorite-rich migmatite, Quetico subprovince                                  |
|  | Asc | AscConglomerate and lithic sandstone  |
|  | Asd | AsdSyenitic, monzodioritic, and dioritic plutons; typically amphibole- and pyroxene-bearing   |
|  | Asg | AsgGraywacke and slate; typically greenschist facies metamorphism                             |
|  | Ast | AstSaganaga Tonalite  |
|  | Auv | AuvUltramafic to mafic volcanic and hypabyssal intrusive rocks                                |
|  | Avs | AvsVolcanic and volcanoclastic rocks, typically calc-alkalic affinity                         |
|  | Mau | MauDuluth Complex, anorthositic intrusions and inclusions, undifferentiated                   |
|  | Mbd | MbdBeaver Bay and other hypabyssal intrusions, diabasic and ferrodiorite                      |
|  | Mbf | MbfBeaver Bay and other hypabyssal intrusions, granophyre and granite                         |
|  | Mbg | MbgBeaver Bay and other hypabyssal intrusions, gabbro, ferrogabbro, gabbrointrusion           |
|  | Mbt | MbtBeaver Bay and other hypabyssal intrusions, troctolite                                     |
|  | Mbv | MbvNorth Branch mafic volcanic rocks  |
|  | Mcv | McvChengwatana volcanics, primarily mafic flows   |
|  | Mdg | MdgDiabase to gabbro intrusion, defined largely from geophysical maps                         |
|  | Meg | MegDuluth Complex, Early gabbro series, gabbroic cumulates                                    |
|  | Mfg | MfgDuluth Complex, Felsic series, granophyre, ferromonzodiorite, leucogabbro                  |
|  | Mfv | MfvClam Falls volcanics   |
|  | Mlc | MlcDuluth Complex, Layered series, cyclic zone, gabbro to troctolite                          |
|  | Mld | MldLogan Intrusions, diabase and gabbro sills and dikes                                       |
|  | Mlf | MlfDuluth Complex, Layered series, upper contact zone, ferromonzodiorite                      |
|  | Mlg | MlgDuluth Complex, Layered series, lower contact zone, gabbro                                 |
|  | Mit | MitDuluth Complex, Layered series, troctolitic zone, troctolite                               |
|  | Mmd | MmdDuluth Complex, miscellaneous intrusions, diabase, gabbro, ferromonzodiorite sills, dikes  |
|  | Mmf | MmfDuluth Complex, miscellaneous intrusions, felsic rocks, granophyre, granodiorite           |
|  | Mmg | MmgDuluth Complex, miscellaneous intrusions, gabbro   |
|  | Mmi | MmiMafic intrusion, most are reversely polarized  |
|  | Mms | MmsNopeming and Puckwunge Sandstones  |
|  | Mmv | MmvMinong Volcanic rocks  |
|  | Mnb | MnbNorth Shore Volcanic Group-upper sequences, primarily mafic volcanic rocks                 |
|  | Mnl | MnlNorth Shore Volcanic Group-lower sequences, primarily mafic volcanic rocks                 |
|  | Mnr | MnrNorth Shore Volcanic Group-upper sequences, rhyolite and icelandite                        |
|  | Mns | MnsInterflow sandstone, siltstone, and conglomerate   |
|  | Mnu | MnuNorth Shore Volcanic Group-upper sequences, undifferentiated mafic to felsic lavas         |
|  | Mpv | MpvPowder Mill volcanic rocks   |
|  | Msl | MslSchroeder-Lutsen basalts   |
|  | Mss | MssSandstone, siltstone, conglomerate; Fond du Lac Fm., Hinckley Ss, and other rift-flanking* |
|  | Mvu | MvuUndifferentiated volcanic rocks and volcanic hornfels                                      |
|  | PMm | PMmGabbro and diabase intrusions of uncertain age   |
|  | Pac | PacAnimikie Group, Virginia Formation slate with thin limestone interbeds                     |
|  | Pag | PagSlate and graywacke, twice deformed  |
|  | Pai | PaiAnimikie Group, iron-formation, locally includes basal conglomerate                        |
|  | Paq | PaqAnimikie Group, Pokegama Quartzite, local conglomerate and siliceous mudstone              |
|  | Pas | PasAnimikie Group, Virginia, Thompson, and Rove Formations, mudstone and graywacke            |
|  | Pdg | PdgGranodiorite; variably foliated  |
|  | Pdt | PdtHillman tonalite   |
|  | Pga | PgaGabbroic, noritic, and anorthositic intrusion  |
|  | Pgd | PgdGray granodioritic to dioritic intrusion   |
|  | Pgm | PgmGranitic intrusions, variably magnetic   |
|  | Pgn | PgnSartell granitoid gneiss   |
|  | Pgp | PgpGabbro, pyroxenite, diorite, and lamprophyre intrusion                                     |
|  | Pgr | PgrGranite, red to pink, variably porphyritic, massive  |
|  | Pgs | PgsGraywacke and slate with graphitic and sulfidic zones, twice deformed                      |
|  | Pgt | PgtHillman tonalite with abundant biotite schist of graywacke protolith                       |
|  | Pgu | PguGranite, undifferentiated  |
|  | Pif | PifIron-formation, interbedded locally with mafic volcanic and hypabyssal intrusive rocks     |
|  | Pls | PlsLittle Falls Formation, graywacke, mudstone, and schist and slate                          |
|  | Pmd | PmdMille Lacs Group, Denham Formation; sandstone, marble, schist                              |
|  | Pmi | PmiMafic intrusions; pyroxenite, peridotite, gabbro, lamprophyre; mainly via aeromag          |
|  | Pml | PmlMille Lacs granite   |
|  | Pmq | PmqMille Lacs Group; Dam Lake Quartzite   |
|  | Pms | PmsSedimentary rocks, mudstone, quartzite, graywacke, phyllite, graphitic argillite           |
|  | Pmv | PmvMafic metavolcanic and hypabyssal intrusive rocks interbedded with argillite, slate, gray* |
|  | Pmy | PmyMylonitic, gneissic and schistose rocks of plutonic and volcanic protolith                 |
|  | Psi | PsiSulfidic iron formation associated with graphitic argillite and slate, twice-deformed      |
|  | Psq | PsqSioux quartzite  |
|  | Pvs | PvsInterlayered metasedimentary and metavolcanic rocks of Mille Lacs Group                    |