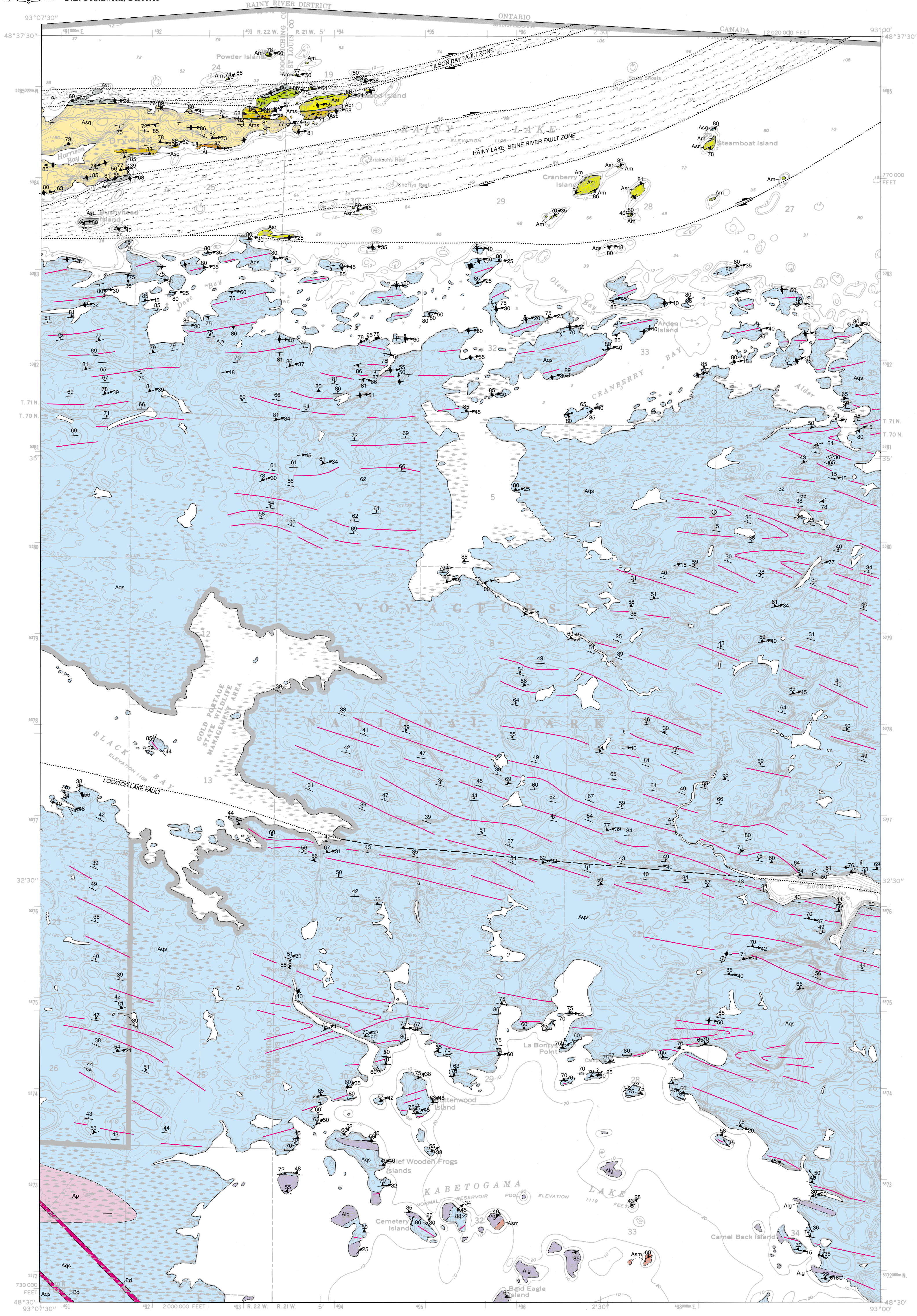
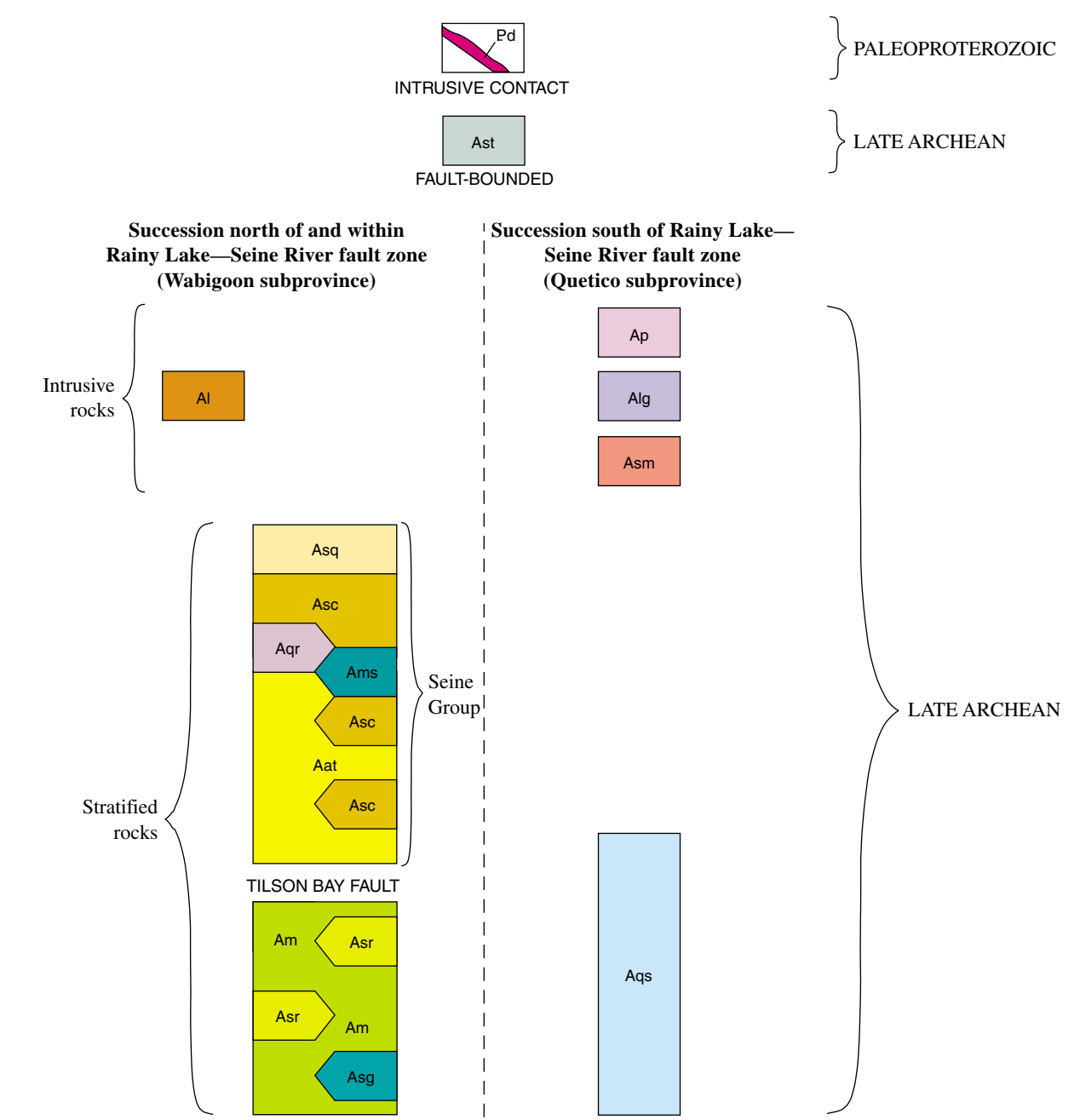


# BEDROCK GEOLOGY



## CORRELATION OF MAP UNITS



## DESCRIPTION OF MAP UNITS

- Paleoproterozoic**
- Pd Diabase**—Fine- to coarse-grained, dark brown to black. Forms dikes of the Kenora-Kabotogama dike swarm (Southwick and Day, 1983) that cuts across and is chilled against all other rock units in the quadrangle. The largest dikes (50 to greater than 100 meters thick) are of gabbroic to dioritic composition and texture in the interior; their chilled basaltic margins are as thick as one to two meters. Thinner dikes tend to be finer grained and more uniformly basaltic in composition. The larger dikes are readily traced as prominent aeromagnetic highs. A dike in the swarm yields a baddeleyite U-Pb age of  $2.067 \pm 5$  Ma (Wirth and others, 1995; Buchan and others, 1996).
- Late Archean Rocks**
- Aat Schistose tectonic (fault rock) within and adjacent to major fault zones**—Phyllite and schist, scaly to platy; composed principally of phyllosilicates, quartz, and carbonate minerals; color ranges from tan to dark greenish gray. Variants include sericite-carbonate phyllite, biotite-rich phyllonite, and chlorite-rich phyllonite. Shear-related features include dextral S-C fabrics, boudinaged quartz veins, and thin shear bands that locally exhibit small-scale dextral fold patterns. Mineral lineations defined by chlorite and (or) biotite plunge steeply to moderately to the northeast.
  - Ap Pegmatite**—Coarse-grained to very coarse grained, light pinkish gray; texture varies abruptly. Consists predominantly of potassium-feldspar, quartz, muscovite, and plagioclase. Mafic minerals are rare to absent. Potassium-feldspar crystals are euhedral and as long as 25 centimeters. Northeast-oriented foliation, consistent with the regional trend, is defined by muscovite in the finer grained portions of the rock. Intrudes biotite schist south of the Rainy Lake-Seine River fault zone.
  - Alg Leucogranite**—Muscovite- and biotite-bearing, medium- to coarse-grained, strongly to moderately foliated. Weathers very light gray to almost white. Forms mappable lenticular intrusions within unit Aas, most of which are quasi-conformable to bedding and foliation in the wall rock, and numerous thin sills, dikes, and veinlets that are too small to show at map scale. The leucogranite is related petrogenetically to the pegmatite (map unit Ap), and is generally intruded by pegmatite.
  - Aam Schist-rich migmatite**—Dominantly biotite schist (unit Aat) that contains interlayers of leucogranite (unit Alg). Proportion of schist ranges from 25 to 75 percent. Leucogranite has a gneissic to pegmatitic texture. Small-scale isoclinal folding is common (Day and others, 1990).
  - Al Lamprophyre**—Medium- to coarse-grained, dark green, schistose. Composed principally of chlorite, biotite, and pyroxene. Contains conspicuous rounded fragments of quartz diorite that range in size from five millimeters to 25 centimeters in diameter. Forms a roughly east-oriented dike-like intrusion that cuts across bedding on the south side of Dryweed Island.
  - Asq Schistose feldspathic quartzite**—Medium-grained, light gray to tan. Framework grains are quartz and feldspar; they are angular to subrounded and slightly flattened in the regional foliation. The matrix most commonly consists of fine-grained sericite, quartz, and chlorite, although biotite and chlorite-rich beds are locally present. Beds range in thickness from five centimeters to one meter; subtle planar lamination and trough cross stratification are typical. Cross stratification consistently indicates tops to the south. Unit locally includes discontinuous lenses (ten centimeters to one meter thick) of schistose conglomerate that contains pebbles to cobble-sized clasts. Green rip-up clasts are locally present.
  - Asc Schistose conglomerate**—Polymictic, clast to matrix-supported, green to gray. Contains rounded to angular pebbles, cobbles, and boulders of mafic to felsic volcanic rocks, pebbles of chert, and rare clasts of felsic plutonic rocks and iron formation. Numerous angular to rounded quartz pebbles are common near the top of the unit on the southwest end of Drywood Island. Plutonic clasts are subspherical to elliptical, whereas volcanic clasts tend to be moderately to strongly elongated in the regional foliation. Pebbles, cobbles, and boulders of unit Aar, containing blue quartz-eyes, are the dominant clast type. The schistose matrix is composed of fine- to medium-grained biotite- or chlorite-rich lithic arenite that contains angular to subrounded granules of volcanic rock fragments, rare intrusive-rock fragments, plagioclase, quartz, and chert. Bedding is crude to massive. A subtle, overall fining-upward sequence is prevalent. Lenses of conglomerate interfinger with accretionary tuff beds of unit Aas.
  - Aar Schistose quartz-eye rhyolite**—Medium gray to light green, well foliated. Contains euhedral phenocrysts of plagioclase and distinctive, doubly terminated crystals of blue quartz.
  - Aas Schistose mafic volcanic wacke and tuff**—Dark-green, strongly foliated chlorite schist. Occurs in thin (1-5-meters thick) beds on Drywood Island and the eastern end of Dryweed Island. Forms discontinuous lenses within unit Aar, and between units Aat and Aar. The rock is schistose, fine to medium grained, and contains angular to subrounded sand grains of dominantly mafic volcanic rocks, plagioclase, quartz, and chert.
  - Aqs Schistose accretionary tuff and tuff breccia**—Gray to pink rock consisting of abundant accretionary clasts in a schistose to phyllitic matrix composed dominantly of chlorite. The clasts, flattened across the metamorphic cleavage and rotated by dextral shear, range from one to ten centimeters in longest dimension. Internally, they are fine grained and consist of a sugary pink rind that grades inward to a light green inner rind and pink core. Individual beds range in thickness from ten to two meters, are well graded, and consist dominantly of fining-southward sequences. Scour valleys are locally present and imply a south-topping direction.
  - Am Biotite schist**—Pammitic to pelitic, fine- to medium-grained, light- to dark-gray; derived from rhythmically bedded, texturally graded graywacke and shale, composed dominantly of plagioclase, quartz, biotite, and muscovite; contains minor garnet, sillimanite, kyanite, and hornblende in beds of appropriate bulk composition and metamorphic grade. Individual beds are typically 5-20 centimeters thick; some sandy beds are as thick as two meters. Isoclinal folding is indicated by reversals in the direction of stratigraphic younging, although outcrop-scale folds are rarely observed. This unit is the characteristic and dominant rock type in the northern part of the Quetico subprovince south of the Rainy Lake-Seine River fault zone.
  - Am Schistose mafic volcanic rocks**—Scaly to fairly massive, dark-green-gray; derived from mafic volcanic flows and interstratified tuff. Schistose fabric is intense along the Tilson Bay fault; rock grades tectonically into unit Aar, with local thin interbeds of low-grade sulfide-rich iron formation and highly altered fragmental rocks along fault (small island northeast of Drywood Island). The metabasalt flows and interbedded tuffaceous sequences are generally thin. Flows are fine-grained metabasalt composed of chlorite, green hornblende and plagioclase, plus varying amounts of biotite, magnetite, and ilmenite. They contain relict vestiges of pillow rinds and, rarely, complete pillows. Chlorite schist is the predominant rock type and was probably derived from mafic tuffaceous protoliths.

## DESCRIPTION OF MAP SYMBOLS

- Inferred contact**
- Inferred fault**—Short dashed where concealed by water; arrows show relative direction of movement.
- Shear zone**—Symbol dotted where concealed by water.
- Strike and dip of quartz vein**
  - Inclined
  - Vertical
- Strike and dip of bedding**—Where known, direction of top indicated by ball.
  - Horizontal
  - Inclined
  - Vertical
  - Overturned
- Bearing and plunge of lineation**—May be combined with other planar symbols.
  - Inclined
  - Vertical
- Strike and dip of dominant S1 foliation**
  - Inclined
  - Vertical
- Strike and dip of parallel bedding and foliation**—Where known, direction of top indicated by ball.
  - Inclined
  - Vertical
  - Overturned
- Strike and dip of joints**
  - Inclined
  - Vertical
- Bearing and plunge of minor folds**
  - Synform
  - Antiform
  - Axes of M/W folds
- Strike and dip of minor S2 foliation**
  - Inclined
  - Vertical
- Strike and dip of small-scale dike**
  - Inclined
  - Vertical
- Strike and dip of small-scale fault or shear zone**
  - Inclined
- Form lines indicating general trend of bedding**
- Abandoned prospect pit**

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Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based; however, the Minnesota Geological Survey does not warrant or guarantee that there are no errors. Users may wish to verify critical information; sources include both the references listed here and information on file at the offices of the Minnesota Geological Survey in St. Paul. In addition, effort has been made to ensure that the interpretation conforms to sound geologic and cartographic principles. No claim is made that the interpretation shown is rigorously correct, however, and it should not be used to guide engineering-scale decisions without site-specific verification.

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# BEDROCK GEOLOGY OF THE CRANBERRY BAY QUADRANGLE, KOOCHICHING AND ST. LOUIS COUNTIES, NORTH-CENTRAL MINNESOTA

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