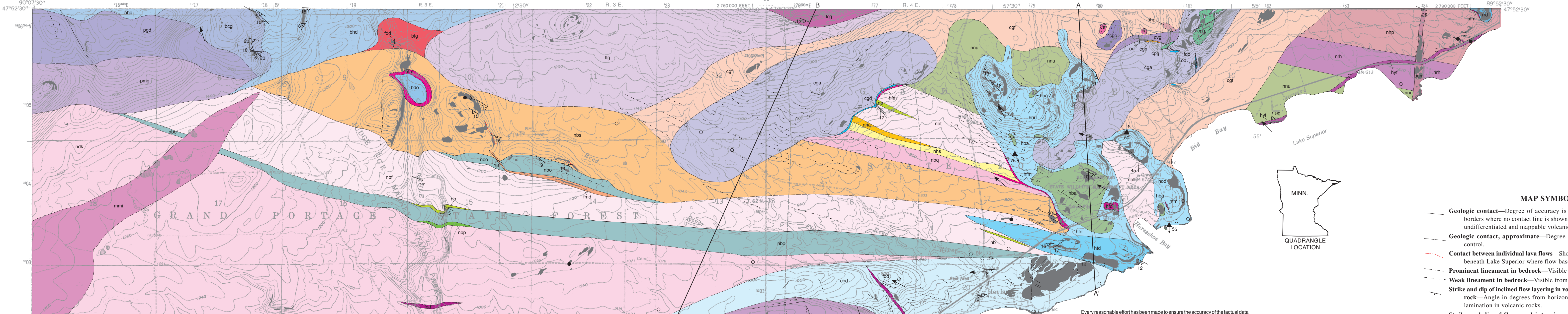
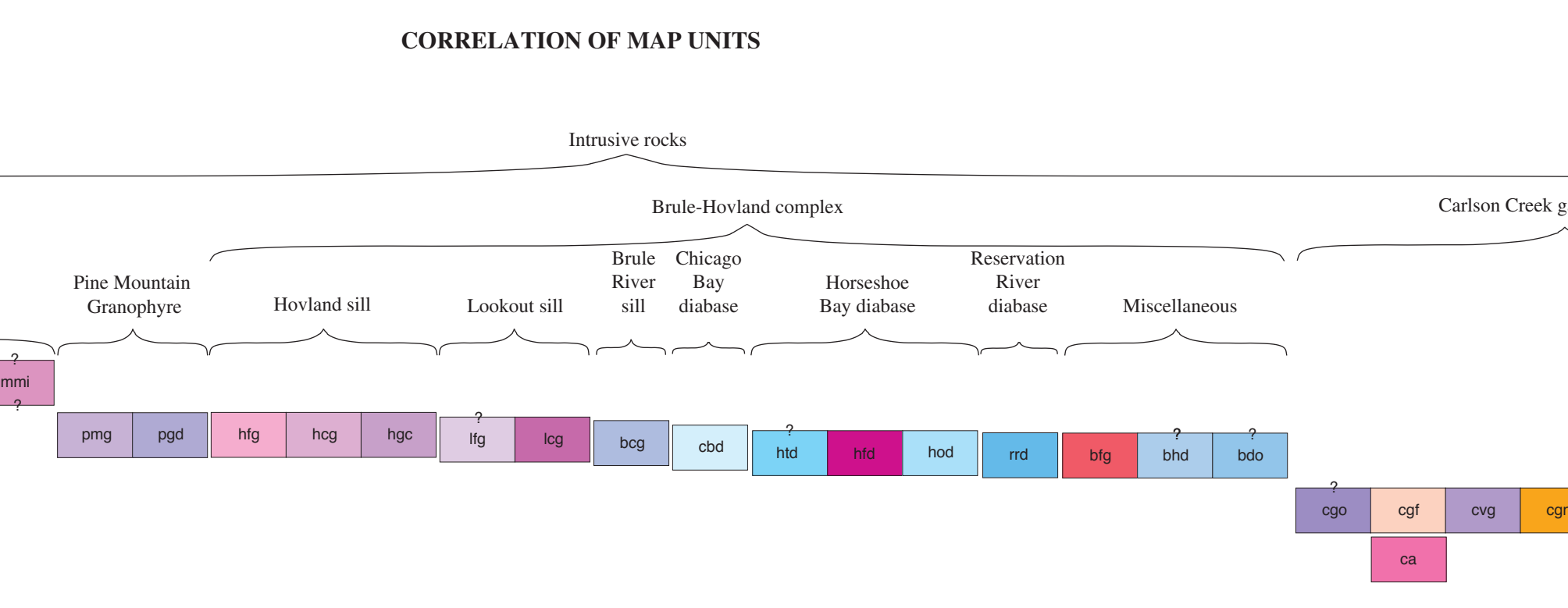


BEDROCK GEOLOGY OF THE MARR ISLAND AND HOVLAND QUADRANGLES, COOK COUNTY, MINNESOTA

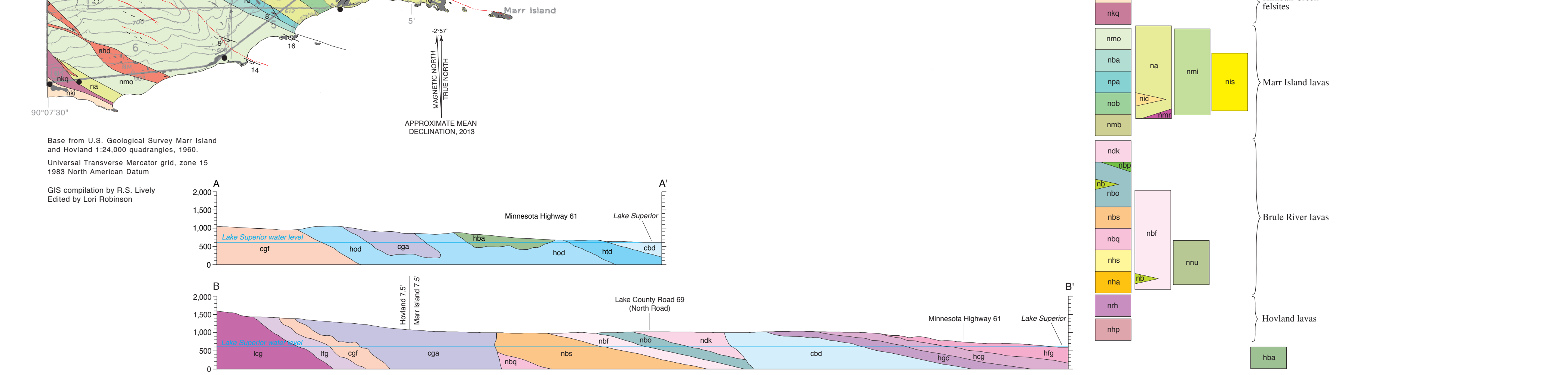
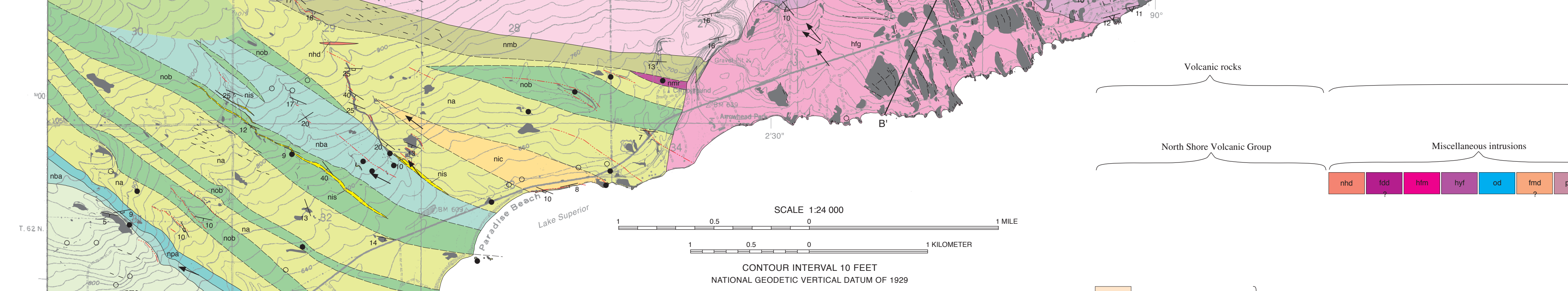
By Terrence J. Boerboom Minnesota Geological Survey and John C. Green Department of Geological Sciences University of Minnesota Duluth 2013



MAP SYMBOLS: Geologic contact, Geologic contact (approximate), Contact beneath individual lava flows, Weak lineament in bedrock, Strike and dip of inclined flow, Strike and dip of flow, Strike and dip of flow and intrusion, Strike and dip of magmatic igneous intrusion, Strike and dip of mafic igneous intrusion, Trend and plunge of columnar jointing, Bedrock outcrop, Location of geochemical sample, Disks (dike unit well).



Every measurement that has been made to ensure the accuracy of the field data on which this map is based... The authors do not warrant or guarantee that the data are free from errors... The authors do not warrant or guarantee that the data are free from errors...



DESCRIPTION OF MAP UNITS BEAVER BAY COMPLEX INTRUSIVE SUPERSITE

Beaver Bay Complex Intrusive Supersite: This unit is composed of a number of separate, poorly mapped intrusions that are dominantly mafic in composition... Brule-Howland complex: The Brule-Howland complex is a large, east-west trending mass that extends over 50 miles (80 kilometers) to the west of this map area... Howland sills: The Howland sills, and underlying syenite gabbros, is a gently dipping (approximately 15° south) subvolcanic body composed of a basal noncumulate ferrogabbro, a middle zone of coarse-foliated granophyric ferrogabbro, and an upper coarse-grained feldspar cpx. Overall the sill is estimated to be at least 984 feet (300 meters) thick... Upper Northeast sequence: Normal magnetic polarity, mafic to felsic volcanic rocks and minor interflow sandstones... Lower Northeast sequence: Involcanic igneous rocks and fine-grained basalts... Marr Island lavas: An informal lithostratigraphic term that includes the Kimball Creek rhyolite, the Kadance lavas, and a thin basal flow of fine-grained andesite... Howland sills: The Howland sills, and underlying syenite gabbros, is a gently dipping (approximately 15° south) subvolcanic body composed of a basal noncumulate ferrogabbro, a middle zone of coarse-foliated granophyric ferrogabbro, and an upper coarse-grained feldspar cpx.

MAP SYMBOLS

MAP SYMBOLS: Geologic contact, Geologic contact (approximate), Contact beneath individual lava flows, Weak lineament in bedrock, Strike and dip of inclined flow, Strike and dip of flow, Strike and dip of flow and intrusion, Strike and dip of magmatic igneous intrusion, Strike and dip of mafic igneous intrusion, Trend and plunge of columnar jointing, Bedrock outcrop, Location of geochemical sample, Disks (dike unit well). Table 1: Geochemical analyses of samples from the Marr Island and Howland quadrangles. Table 2: RARE EARTH ELEMENTS, parts per million.

INDEX TO 7.5-MINUTE BEDROCK QUADRANGLES ALONG THE NORTH SHORE OF LAKE SUPERIOR IN THE MISCELLANEOUS MAP SERIES

