Abstract

Much of northern Minnesota is underlain by rocks that make up the so-called Superior Province of the Canadian Shield -- the ancient core of the North American continent. These Superior Province rocks originated in the Archean Eon, between 4.0 and 2.5 billion years ago. Altogether, more than 60% of Earth's crust formed during this time period, making Archean terranes worldwide particularly rich in mineral resources.

Even among other Archean terranes, the Superior Province is exceptionally rich in gold. The Canadian province of Ontario, immediately north of Minnesota, is host to over 300 significant gold deposits, with 18 currently producing mines. However, no economically significant gold deposit has yet been discovered in Minnesota, despite several periods of intense exploration activity in the 1980s and early 1990s.

This project utilized public datasets representing geology, geophysics, and geochemistry to predict the likelihood of new gold occurrences in northern Minnesota's Archean bedrock, using a geospatial information systems (GIS) modeling technique called weights of evidence. The study area was ranked on a relative scale from low gold potential (Not permissive) to high gold potential (Favorable).

Comparison of model results to past and present gold exploration activity suggests that weights-of-evidence modeling is a useful tool for generating new exploration targets in northern Minnesota. Many of the tracts ranked as Favorable do not appear to have ever been drilled, so the bedrock in these areas has yet to be evaluated. Also, because most of the datasets used were either first published or significantly updated between 2004 and 2012, this project is likely the first to use them in a predictive model, and offers a new perspective on gold prospectivity in the region.