



Scale 1:250,000
Beck from U.S. Geological Survey, 1964-65

LINEAMENT MAP HIBBING SHEET, MINNESOTA 1982

Compiled by James F. Neuhouser and G.B. Murray

INTRODUCTION

All of the lineaments in the area of the Hibbing sheet in northern Minnesota (Fig. 1) are in one area or another related to glacial and postglacial processes that occurred in Pleistocene and Holocene time. The bedrock maps are relatively only northwestern and central parts of the sheet (Fig. 2), where mapping by successive generations of geologists has produced many small lineaments. It does not contain materials from the validity of the lineament patterns portrayed.

PROCEDURES

The lineaments shown on this map are alignments of topographic features, such as hills, ridge lines, streams, and others, or some combination of these features, that are visible on high-altitude, shaded-relief photographs from 1969 by Mark David Anderson, Senior, for the State of Minnesota. Procedures for identifying the topographic lineaments shown on this map were similar to those developed by Cooper (1978) and used by Murray (1981) for the Two Harbors sheet.

DISCUSSION

Comparison of Figures 2 and 4 indicates that the great majority of bedrock exposures occur in areas of drift associated with the Roubidoux. The southern arm of the Vermilion moraine complex divides this area into two distinct physiographic provinces (Wright, 1972). North of the moraine complex is the Roubidoux Lake area (Fig. 3), where glacial activity was largely erosional, producing topographic depressions and ridges that obscure surface bedrock and structural differences between known geology and topographic lineaments. This has been described in some detail by Cooper and others (1981) and Murray and Neuhouser (1982). In contrast, south of the moraine complex, in the Chisholm-Erskine physiographic area (Fig. 3), glacial activity was largely depositional, although sporadic bedrock outcrops suggest that the drift is not continuous. This terrain is characterized by low, east-trending moraine separated by north dips, and most of the lineaments trend toward the north and correspond to numerous small stream valleys incised into the drift deposits.

CONCLUSIONS

The Roubidoux Lake area divides the northern quarter of the sheet. Forming the Vermilion moraine complex, an eastward-trending moraine and recessed moorings. The line of this advance extends the northern edge of the Two Harbors field and left a thin, discontinuous sheet of boulders 60 cm in diameter. The Roubidoux moraine complex is the northern part of the sheet. At about the same time, the Superior lobe advanced southward, crossing the northeastern corner of the Hibbing sheet. It left associated deposits of the light-colored moraine, which mark the edge of this lobe, sharply against the southern edge of the Two Harbors field.

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SUMMARY

Lineaments in the Hibbing sheet are all in some way related to glacial or postglacial processes. Nevertheless there is a striking correspondence between topographic lineaments and bedrock structures where the latter are covered by only a thin veneer of glacial moraine. Further analysis of the lineaments in these areas in light of the high-resolution aeromagnetic data now available (Minnesota Geological Survey, 1980) should provide considerable new information regarding structural details in adjacent areas where the Pleistocene deposits are more continuous and the bedrock is only sporadically exposed. Topographic and lineament alignments in areas of thick drift are of normal value if bedrock interpretation, but they provide a means of delineating many of the glacial and postglacial deposits that occur in the Hibbing sheet.

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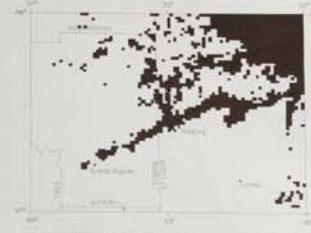


Figure 1. Index map showing location of study area.

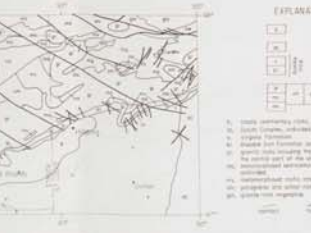


Figure 2. Distribution of natural and man-made exposures of bedrock in the Hibbing sheet (modified from Murray, 1981b).



Figure 3. Generalized bedrock geologic map of the Hibbing sheet (modified from Murray and Neuhouser, 1982).

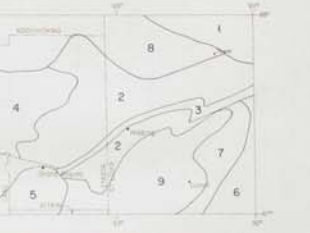


Figure 4. Generalized surficial geologic map of the Hibbing sheet (modified from Murray and Neuhouser, 1982).



Figure 5. Physiographic areas of Wright (1972) in the Hibbing sheet. 1, border hills area; 2, Chisholm-Erskine area; 3, Grants Range; 4, Bemidji area; 5, Sugar Hill area; 6, Lake Superior; 7, Two Harbors area; 8, Aurora Hills area; 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.