

In Brief:

- Compilation of Quaternary stratigraphic and drift thickness data in northeastern Manitoba to facilitate drift prospecting efforts

Citation:

Hodder, T.J. and Gauthier, M.S. 2021: Quaternary stratigraphic and depth to bedrock data compilation for northeastern Manitoba; in Report of Activities 2021, Manitoba Agriculture and Resource Development, Manitoba Geological Survey, p. 66–70.

Summary

This project involves the compilation of all available Quaternary stratigraphic and depth to bedrock data for northeastern Manitoba. Modelling of the drift thickness using point data provides the first regional-scale overview of drift thickness of the region. Increased accessibility to Quaternary stratigraphic and depth to bedrock data will increase the effectiveness of drift prospecting approaches in this remote and thick drift covered region of Manitoba.

Introduction

Northeastern Manitoba contains thick Quaternary sediments, which were deposited during glacial and nonglacial periods over at least three repeated cycles (e.g., Nielsen et al., 1986; Dredge and McMartin, 2011). These sediments were first documented over 100 years ago during the pioneering work of Tyrrell (1913, 1916). Stratigraphic studies continue today, with several active Manitoba Geological Survey (MGS) projects in the region (Figure GS2021-7-1). To facilitate these investigations, a project was initiated to digitally compile all of the Quaternary stratigraphic data. The thick Quaternary sediments cover bedrock throughout most of the region, which prohibits direct observation of the bedrock geology but does offer many opportunities for drift prospecting. Effective drift prospecting approaches rely on understanding the ice-flow history and composition of glacial sediments to reconstruct dispersal patterns. The new Quaternary stratigraphic compilation helps with this. The MGS till composition studies have shown that drift thickness is a major factor to consider in drift prospecting, since thick sediments inhibit erosion of the local bedrock (e.g., Hodder et al., 2017).

To provide a regional overview of sediment thickness, this project will use the compiled stratigraphic and drillhole data to provide a working model of drift thickness in northeastern Manitoba.

Current work***Quaternary stratigraphic data compilation***

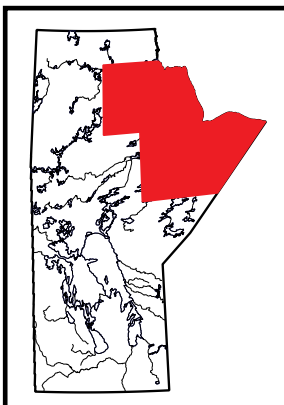
The purpose of this project is to compile all existing stratigraphic data collected in the region that can be georeferenced. The majority of this data was collected from natural exposures of sediments along active rivers in the region between 1967 and 2021 (Figure GS2021-7-1). Digital compilation for each section includes

- 1) sediment descriptions and depth measurements;
- 2) ice-flow data (where available), including both till clast-fabric and lodged striated cobble and boulder measurements; and
- 3) sample data with depths of collection (when available), for till, geochronology and paleoenvironmental samples.

The results of this compilation will be released as part of a forthcoming MGS open file publication and will be updated as new data sources are published.

Depth to bedrock compilation

The goal of this component of the project is to produce a regional-scale depiction of the drift thickness across northeastern Manitoba. A drift thickness map has been published for the southern half of Manitoba (Keller and Matile, 2021), but is not available for the north. The remoteness of the north means that point observations of depth to bedrock are not distributed equally and are concentrated in regions of mineral exploration or where rivers have incised down to bedrock (Figure GS2021-7-2a). This data gap creates large uncertainties that are not easy to accurately model.



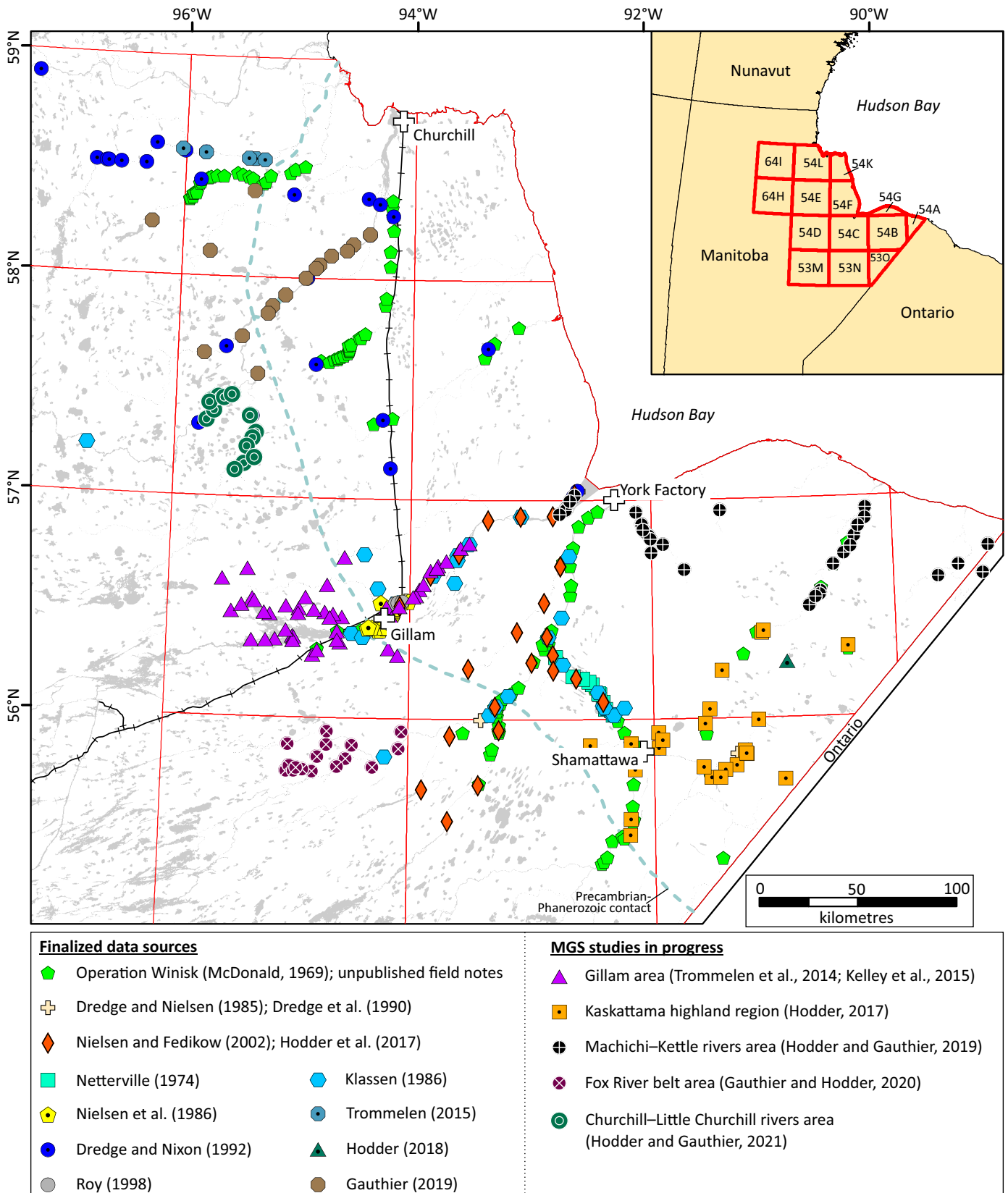


Figure GS2021-7-1: Locations of Quaternary sections from data sources included in the compilation for northeastern Manitoba. The red lines in the upper right index figure outline the areas of the 1:250 000 scale NTS maps and correspond to the red lines on the main map. Abbreviation: MGS, Manitoba Geological Survey.

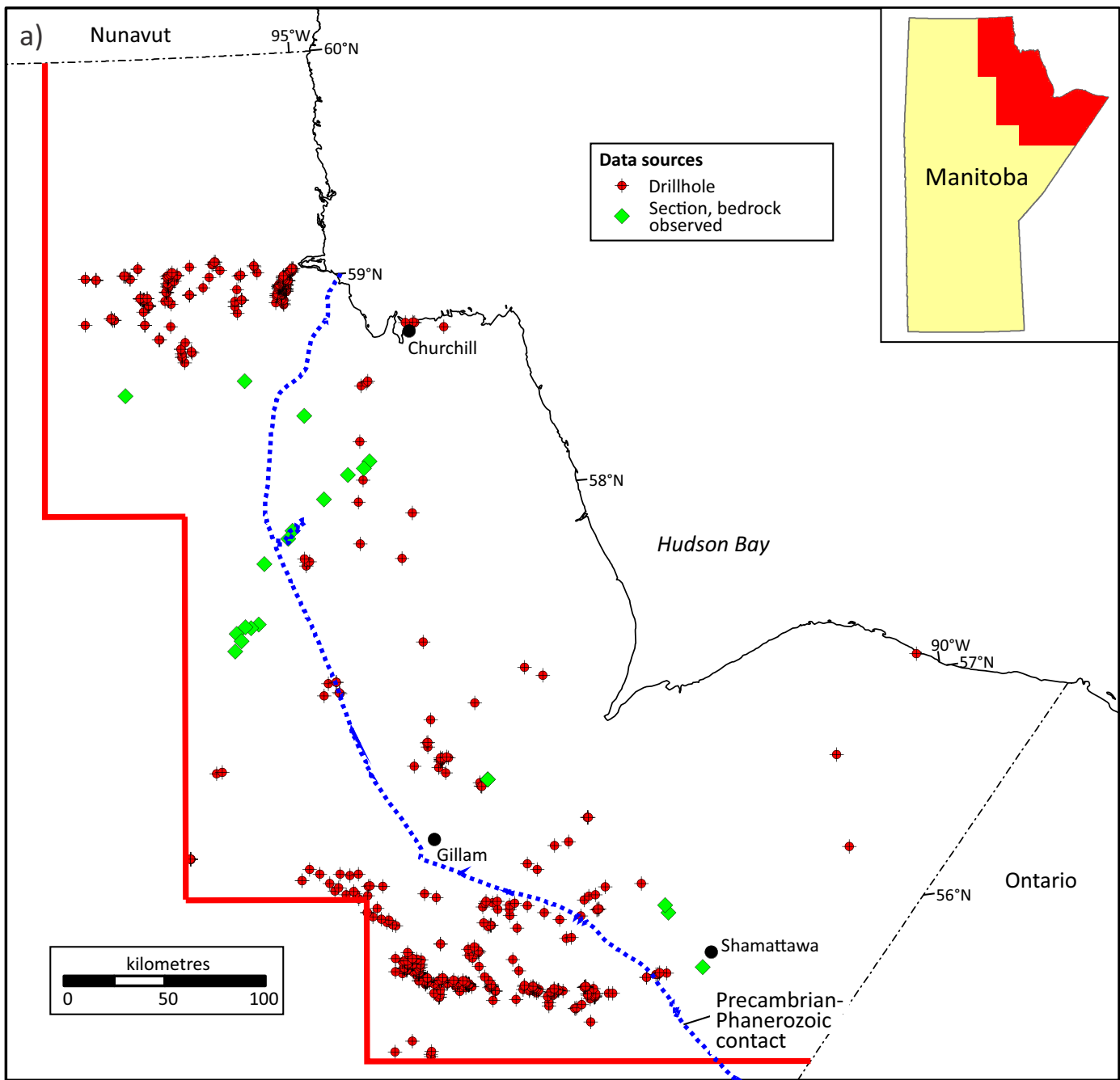


Figure GS2021-7-2: a) Drillhole and ground-based observations are used to construct **b)** (next page) a preliminary regional model of Quaternary sediment thickness in northeastern Manitoba.

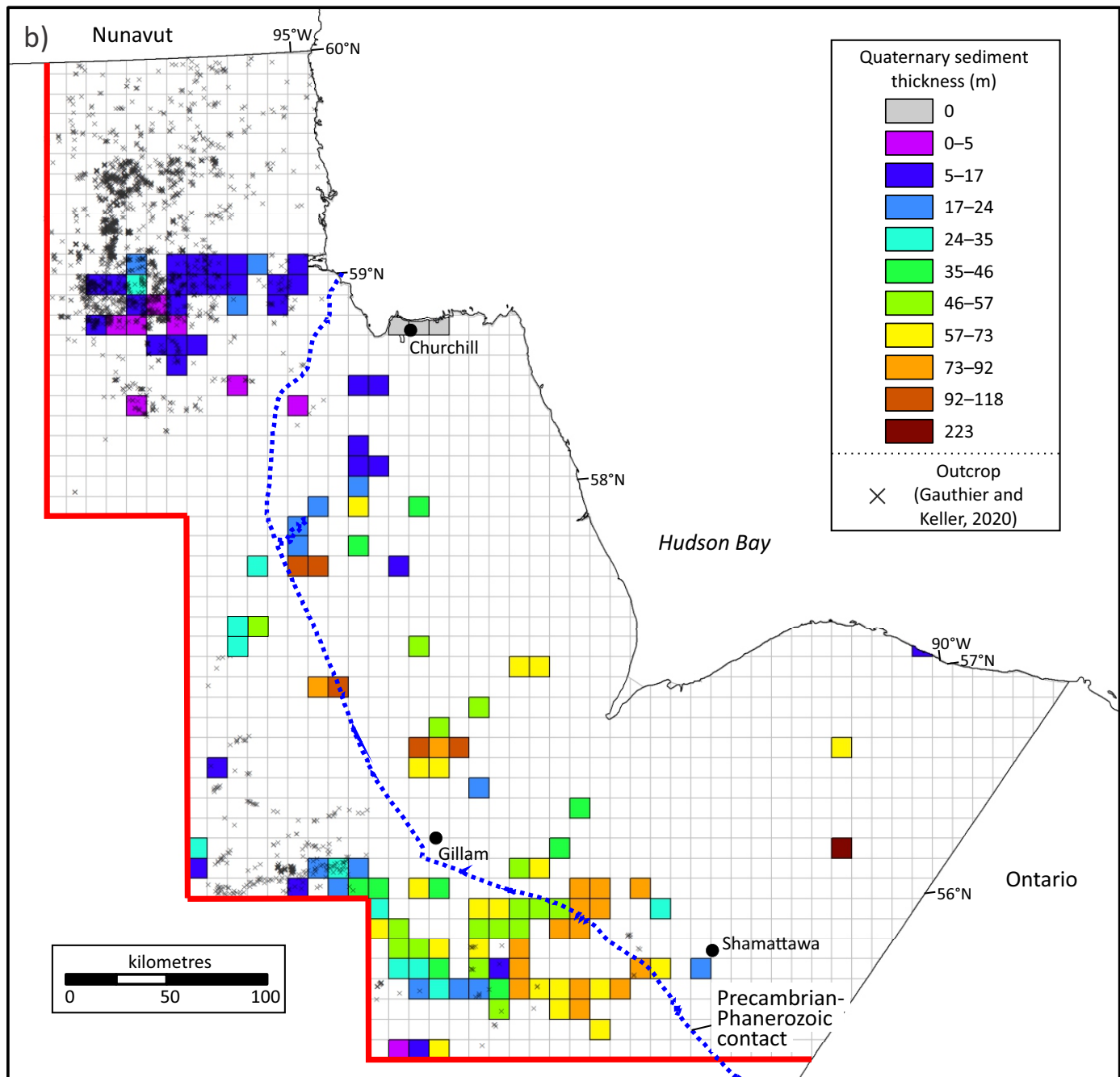
To avoid erroneous interpolation, a raster-based approach, using a 10 by 10 km grid, was chosen (Figure GS2021-7-2b). Grid cells that do not contain drift thickness data were masked during analysis. For grid cells that contain more than one data point, the average of all the data points was calculated and assigned to the cell. All point data used to model the sediment thickness will be released as part of a forthcoming MGS open file publication.

Next step in the modelling process is to incorporate numerous sediment thickness observations, documented during fieldwork, where bedrock was not observed (Fig-

ure GS2021-7-1). These observations will provide a minimum limiting measurement of sediment thickness for the regions without drillhole coverage.

Economic considerations

The presence of thick drift across the northeastern region of Manitoba inhibits ground observation of the bedrock and increases the need for effective drift-prospecting methods. This project increases accessibility to Quaternary stratigraphic and depth to bedrock data—both critical datasets for drift exploration in the region.



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