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ERRATA:

The publisher/department name in the bibliographic reference cited immediately below the title of each GS report should read **Manitoba Industry, Economic Development and Mines** instead of **Manitoba Industry, Trade and Mines**.

GS-28 Preliminary karst inventory of areas north and south of Grand Rapids, Manitoba (NTS 63B and 63G)

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Summary



The proposed Manitoba Lowlands national park site lies adjacent to the highly prospective Thompson Nickel Belt in the Grand Rapids area. For this study, inventories of karst features and field investigations were conducted in four areas north and south of Grand

Rapids. An inventory of karst features was done in the Honeymoon Lake area, in and around the town of Grand Rapids, and in the Devils Lake area to provide evidence of karst representation in areas other than along the subsurface extent of the Thompson Nickel Belt. Field investigations were conducted along the Grand Rapids–Vermilion River hydro line corridor (south of Grand Rapids) to demonstrate the possible presence of karst terrain.

This study demonstrated the availability of karst terrain within the proposed park boundaries, as well as in areas outside the proposed park boundaries where no significant conflicts with mineral exploration exist.

Introduction

The proposed Manitoba Lowlands national park site desires adequate karst representation in an area west of Highway 6 (north of Grand Rapids). Unfortunately, this area is highly prospective for mineral exploration due to the presence of the Thompson Nickel Belt (TNB). This study focused on an inventory of karst features adjacent and within the proposed park site, east of Highway 6. Also, an inventory of karst features was conducted in and around the town of Grand Rapids and north of Devils Lake (south of Grand Rapids). Lastly, field investigations were conducted south of Grand Rapids to determine if shallow bedrock exists that may provide evidence of karst terrain. This area could then meet the karst representation requirements for the park instead of the area along the TNB extension.

The study area is divided into four areas: Honeymoon Lake, in and around Grand Rapids, Devils Lake and the Grand Rapids–Vermilion River hydro line (Fig. GS-28-1). The focus of the study was

- an inventory of karst features in the Honeymoon Lake area, north of Grand Rapids, using data from previous trip expeditions;
- an inventory of karst features in and around Grand Rapids;
- an inventory of karst features in the Devils Lake area, south of Grand Rapids; and
- field investigations of near-surface outcrop and karst features along the Grand Rapids–Vermilion River hydro line near Sisib Lake, south of Grand Rapids.

Honeymoon Lake area

The first area extensively inventoried for this study was the Honeymoon Lake area (Fig. GS-28-1) which lies east of Highway 6 and west of the Silurian Escarpment (north of Grand Rapids), within the Silurian subcrop/outcrop belt. The area consists of Silurian dolomite with abundant surface and subsurface karst features and is generally referred to as the Grand Rapids Uplands (Sweet at al., 1988). Dolomitic pavement and near-surface bedrock (less than 3 m of overburden) covers approximately 50% of the land area in this region.

Karst exploration in the Honeymoon Lake first began in 1988 and 1989 by the Speleological Society of Manitoba (SSM) under the guidance and logistic support of W.D. McRitchie with the Manitoba Geological Survey (MGS) and Research Officer of the SSM. Numerous karst features, including caves, sinkholes, trenches and drainholes were located on airphotos during reconnaissance traverses. Only a fraction of this inventory was documented. Existing documentation includes two maps with the locations of 4 caves, 18 sinkholes and 3 trenches, as well as the plan and description of one newly discovered cave–Moose Arm Pit (Sweet et al., 1988). Other plans and descriptions of caves are presented in Voitovici and McRitchie (1989), Speleological Society of Manitoba (1992a) and McRitchie and Monson (2000).

Post 1989, SSM activity in this area was dramatically reduced and was limited to visits to the Moose Arm Pit. In

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Figure GS-28-1: Location map for the study area.

1994 and 1995, the MGS and the SSM cooperated in outcrop mapping close to the escarpment and in spring sampling (Bezys, 1993, 1994, 1995; McRitchie, 1994).

Initial investigations of karst features in the Honeymoon Lake area were done with the use of airphotos. Airphotos were interpreted for suspected karst features and subsequently verified by ground traverses. Detailed trip reports were made of each trip and were distributed to each SSM member. Most of these trip reports survived in the SSM archives. Some of them were published in *Speleonews*, the newsletter for the SSM. Nearly all airphotos used for these trips are preserved at the MGS.

Karst inventory and ground traverses of the Honeymoon Lake area were conducted during the years of 1988 and 1989. A total of nine traverses, from 4 to 15 km long, were conducted during these two years, with anywhere from 3 to 15 participants. In 1994, Silurian outcrop mapping in this area was conducted by the MGS (Bezys, 1994). Springwater sampling was also done along the Silurian Escarpment in this area for geochemical investigations (McRitchie, 1994).

Table GS-28-1 provides a preliminary inventory of karst features mapped in the Honeymoon Lake area. Table GS-28-1 is only preliminary because the number of features investigated is probably greater than the number documented. Some airphotos are missing and there is evidence that additional traverses were conducted in this area but no field trip reports survive. Also, as indicated in Table GS-28-1, more than 100 airphoto-interpreted karst features exist that have not been field checked. There are also extensive areas that have not been airphoto interpreted or traversed.

Figure GS-28-2 depicts the location of the karst features in this area. The largest solution cave discovered in the Honeymoon Lake area is the Moose Arm Pit, one of the longest and largest caves in the Grand Rapids Uplands area (Speleological Society of Manitoba, 1992; McRitchie and Monson, 2000). The largest wave-cut cave is Agassiz Chamber within the Silurian Escarpment. As stated by McRitchie (1995), "the cave is a fine example of a wave washed cavern 10 metres high, 20 metres across, with circular bowl-shaped recesses cut into its back and side walls."

Grand Rapids area

The Grand Rapids study area encompasses the town of Grand Rapids and extends south to The Pas Moraine (Fig. GS-28-1). This area has limited near-surface bedrock exposure. The possibility of finding karst features in this area diminishes moving south towards the moraine. Grice (1970) reported sinkholes north of The Pas Moraine. He states, "There are many depression in the ground surface with widths of 0.5 to 60 m and depths of 0.1 to 5 m. Some are entirely in the silt and till overburden while others are partially or completely in rock and are definitely sinkholes. Many of the depressions contain impervious material while others have been observed to drain rapidly when filled with snow meltwater."

One unique feature is the Beaver Sinkhole. It is located on the west side of Highway 6, east of Morrison Lake, 19.5 km south of the Grand Rapids bridge. It is located 50 m from the highway and can be easily viewed from the highway. It was surveyed this year by the authors and an illustration is presented in Figure GS-28-3. It is a large sinkhole, 90 m wide and approximately 4 m deep. Its water levels fluctuate rapidly and at times it can be completely dry. At the time the sinkhole was surveyed, the drainhole was active. The drainhole dimensions are 0.70 m wide and 1.0 m deep with 0.60 m of water.

In the area east of the Beaver Sinkhole (east of Highway 6 and west of Lake Winnipeg), a large area containing near-surface bedrock exists. This area has not been investigated for karst features.

Devils Lake area

This Devils Lake area is located south of The Pas Moraine and west of Highway 6. The area has limited exposed near-surface bedrock and is heavily treed and wetland is common. It is estimated to contain 1 to 2% near-surface bedrock.

McRitchie conducted an initial investigation of karst features in the Devils Lake area in 1992 (McRitchie, 1992b, 1992c, 1993). In addition, two trips into this area were recorded by the SSM (Speleological Society of Manitoba, 1992b, 1992c, 1993). Four airphotos that were used in the inventory for this study were located in the MGS archives. The area covered by the 1992 and 1993 traverses in the Devils Lake area is shown in Figure GS-28-4. Features discovered include a cave, sinkholes, rock-bounded sinkholes, trenches and shafts. Garter snakes were also discovered in some of the pits. The traverses covered only a small fraction of the area of near-surface bedrock north of Devils Lake. Based on the results of these reconnaissance trips, one can assume that additional traverses could yield further discoveries.

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	Fossils		7											~	0		7				17
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	Wave-cut	caves						2				~			~						4
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Karst features	Airphoto	interpreted					7	ø	15	S	24	ო		~		~	37			14	115
	Other ¹		-				7	4		7							ю	~			18
	Trenches		-	-	2	2	ę	2	-											-	13
	Sinkholes		12	2	17	7	14	26	5	12	24	4		17		7			-	7	155
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Traverse	Source		McRitchie (1988a)	McRitchie (1988a)	McRitchie (1988b)	McRitchie (1988b)	McRitchie (1988c)	McRitchie (1989)	McRitchie (1989)	McRitchie (1989)	McRitchie (1989)	McRitchie (1995a)	Bezys (1994)	McRitchie (1994)	McRitchie (1994)	McRitchie (1994)	McRitchie (1995b)	McRitchie (1995b)	McRitchie (1995b)	airphotos	
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	Distance	(km)	11.4	4.0	9.7	14.0	6.0	13.2	5.0	10.0	15.0						11.0	5.0			
	Date		19-May-88	22-May-88	12-Aug-88	13-Aug-88	15-Oct-88	18-May-89	20-May-89	21-May-89	22-May-89	05-Jun-94	09-Jun-94	13-Jun-94	14-Jun-94	15-Jun-94	16-Jul-94	17-Jul-94	27-Aug-94	unknown	Total

Table GS-28-1: Karst and related features in the Honeymoon Lake area.

² formation names on airphotos, no station number ³ crevasses, non-labelled outcrop, etc. ¹ drainhole in swamp, joints, etc.



Figure GS-28-2a: Detailed karst and related features of the Honeymoon Lake area: caves and sinkholes.



Figure GS-28-2b: Detailed karst and related features of the Honeymoon Lake area: trenches and karst features.



Figure GS-28-3: Illustration of Beaver Sinkhole.

Grand Rapids-Vermilion River hydro line

Field investigations along the Grand Rapids–Vermilion River hydro line were conducted in the summer of 2003 to investigate areas of near-surface bedrock and karst features. All terrain vehicle and helicopter provided access along the north-south hydro line, situated south of The Pas Moraine and west of Highway 6.

Elevation data (United States Geological Survey, 2002) for hydro towers 60 to 182, south of Highway 60 and The Pas Moraine, was used to generate a surface profile along the hydro line. Drill data from the installation of the anchors for the towers (four per tower) was used to determine the depth to bedrock. Towers 60 to 82 and several between 83 and 182 were without drill data. Depth to bedrock was calculated as an average of the four anchor depths to create a bedrock surface profile. This profile, in conjunction with the surface profile, provides an estimation of areas with near-surface bedrock (Fig. GS-28-5). Each location estimated to have near-surface bedrock was investigated in the field. The results of the field investigations at locations 3 and 6 are depicted on Figure GS-28-6.

Several sinkholes were found close to the hydro line in areas of shallow bedrock as well as clump-willow fens with drainholes similar to those inventoried by McRitchie (1992a) in the Devils Lake area. One small circular sinkhole was found, along with one large, irregular sinkhole with abundant moose bones. This sinkhole has been named Moose Bone Sinkhole. The map and profile of a willow-clump fen is outlined in Figure GS-28-7. Airphotos surrounding the areas of shallow bedrock were further assessed in the office for other karst features. Springs were also identified by air, east and west of the hydro line, but were not investigated.

Conclusions

A preliminary inventory of karst features was conducted in areas north and south of Grand Rapids. A large area of prospective karst terrain south of Grand Rapids was investigated and was found to contain near-surface bedrock, karst features and springs. Further fieldwork in this area is recommended.

Economic considerations

An inventory of karst features within a portion of the proposed Manitoba Lowlands national park site was conducted to demonstrate the abundance of features that are available within the park site, east of the eastern limits of

Figure GS-28-4: Devils Lake study area with traversed areas and areas of near-surface bedrock (modified from Bannatyne, 1988).

the TNB. As well, field investigations were conducted south of Grand Rapids along the Grand Rapids–Vermilion River hydro line to investigate the possibility of karst features. Field investigations confirmed the presence of near-surface bedrock and karst features in an area where there is no conflict with mineral exploration interests.

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Figure GS-28-5: Areas with near-surface bedrock along the Grand Rapids–Vermilion River hydro line.

Figure GS-28-6: Locations 3 and 6 (see Fig. GS-28-5) with outcrop stations and karst features.

Figure GS-28-7: Map and profile of a willow-clump fen karst feature with a drainhole.

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