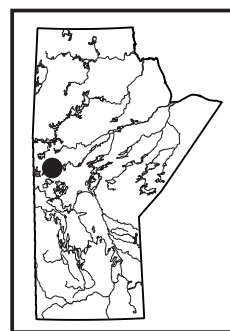


GS-8 Geological investigations in the Rail Lake–Sewell Lake area, Flin Flon–Snow Lake greenstone belt, west-central Manitoba (parts of NTS 63K10, 15)

by S. Gagné



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Summary

In June and July 2013, a four-week geological-mapping program was conducted in the Rail Lake–Sewell Lake area. The project region consists mainly of bimodal volcanic rocks of arc affinity, belonging to the Fourmile Island assemblage¹, that are host to five known volcanogenic massive-sulphide deposits and one orogenic gold deposit. Objectives of the geological investigations are to gain a better understanding of the geology of arc-related volcanic rocks, in order to provide insight for base-metal and gold exploration. Supracrustal rocks in the area trend north and are strongly overprinted by a north-trending subvertical foliation associated with the West Reed–North Star shear zone. To the west, the map area is bounded by a granodiorite intrusion. The central part of the map area is dominated by mafic volcanic rocks and synvolcanic gabbro dikes that are succeeded to the east by a sequence of felsic volcanic and volcanoclastic rocks. The eastern part of the map area is bounded by the extensive, north-trending, differentiated Josland sills. Within the West Reed–North Star shear zone, the rocks are strongly tectonized. Metamorphic grade increases northward from upper-greenschist facies to lower-amphibolite facies in supracrustal rocks.

Introduction

The central part of the Flin Flon belt is a collage composed of Paleoproterozoic (1.92–1.88 Ga) tectonostratigraphic assemblages and minor Archean crustal slices that were juxtaposed during a period of 1.88–1.87 Ga intraoceanic accretion (Lucas and Stern, 1994; Stern and Lucas, 1994) to form the ‘Amisk collage’ (Lucas et al., 1996). Paleoproterozoic assemblages within the Amisk collage are subdivided into juvenile arc, juvenile ocean floor, ocean-plateau/ocean-island basalt and evolved arc (Syme and Bailes, 1993; David and Syme, 1994; Reilly et al., 1994; Stern et al., 1995a, b; Lucas et al., 1996; Figure GS-8-1). The Amisk collage was basement to postaccretion magmatism, between 1.87 and 1.83 Ga, which produced voluminous calcalkaline plutons and rarely preserved calcalkaline to alkaline volcanic rocks (Lucas et al., 1996). Younger sedimentary and subordinate volcanoclastic and volcanic rocks (1.85–1.83 Ga

Missi and Burntwood groups) may represent depositional basins that formed contemporaneous with postaccretion (‘successor’) arc magmatism and deformation (Ansdell et al., 1995; Lucas et al., 1996).

Significant stratigraphic, geochemical and isotopic differences between the arc rocks in the Flin Flon and Snow Lake areas (Stern et al., 1995a) suggest that the two segments of the Flin Flon belt formed in distinct tectonic settings (Lucas et al., 1996). The Reed Lake region represents a critical area of the Flin Flon belt, as it lies at the boundary between the Amisk collage *sensu stricto* and the Snow Lake segment. The Reed Lake area also includes the Fourmile Island assemblage, an arc-type bimodal succession of volcanic and volcanoclastic rocks that hosts five significant volcanogenic massive-sulphide (VMS) deposits, including the recently discovered Reed Lake Cu-Zn deposit. Previous geological work (Leclair et al., 1997; Leclair and Viljoen, 1997) and geophysical data show that arc-related volcanic rocks extend south of Reed Lake beneath the Phanerozoic cover for a distance of more than 50 km. Therefore, gaining a better understanding of the geology of arc-related volcanic rocks of the exposed basement in the Reed Lake area will provide insight for base-metal exploration in the Reed Lake area and in the sub-Phanerozoic basement immediately south of Reed Lake. The Reed Lake area was the focus a four-week reconnaissance study (Figure GS-8-1) in the summer of 1995 (Syme et al., 1995b, a). The study enabled significant improvement in our understanding of the geology of the Reed Lake area. However, the geological investigation was limited to shoreline exposure on Reed Lake and roadcuts along the abandoned Chisel railbed, with some inland 1:50 000 scale bedrock mapping on the west side of Reed Lake (Morrison et al., 1996).

In order to increase our current knowledge of the geology of the Reed Lake area, a new multiyear project was initiated by the Manitoba Geological Survey in 2013. This project will include a compilation of earlier data and new detailed mapping of critical areas, with an emphasis on the volcanic rocks. The project also entails the acquisition of new whole-rock geochemical analyses, Sm-Nd isotopic data and U-Pb geochronology. In

¹ For the sake of consistency, the Manitoba Geological Survey has opted to make a universal change from capitalized to noncapitalized for the generic part of lithostructural feature names (formal stratigraphic and biostratigraphic nomenclature being the exceptions).

the first summer of the project, four weeks were spent mapping in the Rail Lake–Sewell Lake area (Figure GS-8-2).

The results from this geological mapping are presented as a 1:10 000 scale geological map (Gagné, 2013). This paper summarizes the preliminary results of the mapping program.

Previous work

Reconnaissance mapping was completed at 1:50 000 scale during a joint Manitoba–Geological Survey of Canada project in the summer of 1995 (Syme et al., 1995b), and follow-up geochemical and structural studies were presented by Syme and Bailes (1996). Prior to 1995, the supracrustal rocks on Reed Lake were simply subdivided into mafic volcanic, volcanoclastic and sedimentary types (Stanton, 1945; Rousell, 1970).

Preliminary Map 1995F-1 (Syme et al., 1995b) was compiled from older maps and new data from the 1995 field season. The geology was based on Rousell (1970) and Stanton (1945), with extensive upgrades to the geology of the supracrustal rocks. Morrison and Whalen (1995) reported on mapping of the granitoid rocks in NTS 63K10, west of Reed Lake; a simplified version of their map was included in Preliminary Map 1995F-1 (Syme et al., 1995b) and their complete work was presented in Morrison et al. (1996). The inland area north and east of Reed Lake was not mapped.

Regional geology

The exposed Flin Flon belt contains several distinct juvenile-arc assemblages, which are separated by major faults or intervening ocean-floor rocks, Burntwood Group sedimentary or plutonic rocks, or a combination of these (Figure GS-8-1). These assemblages are internally complex, comprising numerous fault-bounded and folded volcanic suites (e.g., Bailes and Syme, 1989) that are typically bimodal, with dominantly andesite/basalt and rhyolite/dacite flows, and include a wide range of arc-related volcanic, volcanoclastic and intrusive rocks (Bailes and Syme, 1989; Syme and Bailes, 1993; Stern et al., 1995a; Lucas et al., 1996; Bailes and Galley, 2007). The juvenile ocean-floor assemblages are composed mainly of mid-ocean-ridge basalt (MORB)-like basalt and related kilometre-scale, layered, mafic-ultramafic plutonic complexes (Syme and Bailes, 1993; Stern et al., 1995b). Uranium-lead zircon ages for the ocean-floor assemblages in the exposed portion of the Flin Flon belt indicate that the ocean-floor magmatism was coeval with tholeiitic-arc volcanism at ca. 1.9 Ga (David et al., 1993; Stern et al., 1995b).

Voluminous plutons and coeval volcanism and deposition of sedimentary rocks of the successor arcs took place between 1.88 and 1.83 Ga. Large plutons, emplaced throughout the belt during three distinct magmatic stages,

are highly variable lithologically and geochemically. Volcanic, volcanoclastic and sedimentary rocks with dates of ca. 1.88–1.83 Ga have been documented across the central and eastern parts of the exposed Flin Flon belt, and are termed successor-basin deposits. They include the Schist-Wekusko assemblage, the Missi group and the Burntwood group. The fluvial-alluvial Missi group sedimentary deposits are characterized by thick packages of conglomerate, pebbly sandstone and massive sandstone. The marine turbidites of the Burntwood group include greywacke, siltstone, mudstone and rare conglomerate. In the low-grade metamorphic Flin Flon belt, these sedimentary rocks are generally in fault contact with other units.

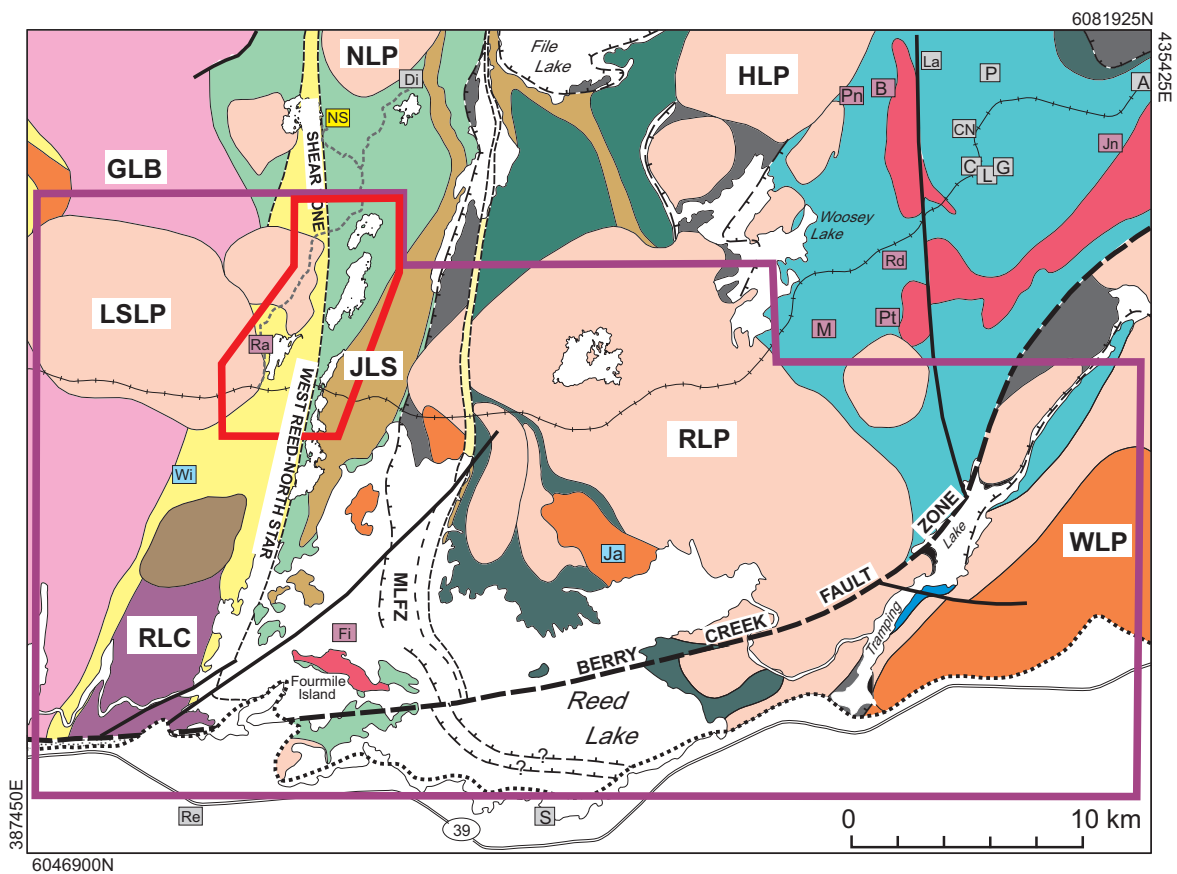
The Reed Lake region is characterized by a major (kilometres wide), regionally extensive tectonite belt, exposed on western Reed Lake (the West Reed–North Star shear zone; WRNS), that juxtaposes rocks of oceanic affinity on the west (Reed Lake mafic-ultramafic complex) with rocks of arc affinity on the east (Fourmile Island assemblage). The rocks east of the WRNS are further divided into two domains by the Morton Lake fault zone, which juxtaposes Fourmile Island assemblage in the footwall with the Northeast Reed assemblage, the composite Reed Lake pluton and the Snow Lake arc assemblage (Syme et al., 1995a, b; Syme and Bailes, 1996) in the hangingwall. The fault zone itself includes a slice of Burntwood group turbidites.

The Flin Flon belt records a broad range of peak metamorphic conditions. In the Rail Lake–Sewell Lake area, mineral assemblages indicate upper-greenschist- to lower-amphibolite-facies metamorphism. However, in the interest of brevity, the prefix ‘meta-’ is not used in this report and the rocks are described in terms of their protoliths.

Local geology

The geology of the Rail Lake–Sewell Lake area is characterized by a thick sequence of bimodal volcanic and volcanoclastic rocks of the Fourmile Island assemblage (FIA). To the west, the FIA is strongly affected by deformation associated with the WRNS to the extent that protolith recognition is not possible. Outside the WRNS, the FIA consists of a succession of mafic, intermediate and felsic flows and volcanoclastic rocks intruded by various small subordinate igneous gabbroic and granitic phases. A granodiorite pluton intrudes the WRNS along the western portion of the map area, and the FIA is intruded by the Josland sills, a regionally extensive sequence of layered gabbro sills.

This section provides preliminary field descriptions of the main rock types encountered in the Rail Lake–Sewell Lake area. Unit codes in this report correspond to those on Preliminary Map PMAP2013-8 (Gagné, 2013). Figure GS-8-3 is a simplified version of this map.



<1.845 Ga PLUTONS

Felsic, mafic

1.84 Ga SUCCESSOR-BASIN DEPOSITS

Burntwood group turbidites
 Missi group sandstone, conglomerate

>1.845 Ga PLUTONS

Josland Lake gabbro sills
 Granodiorite

1.9 Ga ARC ASSEMBLAGES

Snow Lake arc assemblage
 Fourmile Island arc assemblage
 Synvolcanic felsic plutons

1.9 Ga OCEAN-FLOOR ASSEMBLAGE

Northeast Reed ocean-floor basalt (Reed basalt / File-Morton-Woosey basalt)
 Reed Lake mafic-ultramafic complex (layered gabbro-peridotite, massive gabbro)

Ordovician cover

Edge of Phanerozoic cover

West Reed–North Star shear zone

Shear-zone boundary

Fault

Morton Lake thrust

Reed Lake project area

2013 mapped area

VMS mine

VMS deposit

Gold deposit

Ni-Cu showing

Figure GS-8-2: Generalized geology of the Reed Lake–Morton Lake–Tramping Lake area (Syme et al., 1995a). The extent of the multiyear Reed lake project is outlined in purple and the location of the Rail Lake–Sewell Lake area is outlined in red. Intrusive rocks: GLB, Gants Lake batholith; RLC, Reed Lake mafic-ultramafic complex; JLS, Josland Lake sills; LSLP, Little Swan Lake pluton; NLP, Norris Lake pluton; RLP, Reed Lake pluton; HLP, Ham Lake pluton; WLP, Wekusko Lake pluton. Structural feature: MLFZ, Morton Lake fault zone. Mines (active or closed) and deposits: A, Anderson; B, Bomber; C, Chisel; CN, Chisel North; Di, Dickstone; FI, Fourmile Island; G, Ghost; Ja, Jackfish; Jn, Joannie; L, Lost; La, Lalar; M, Morgan; NS, North Star; P, Photo; Pn, Pen; Pt, Pot; Ra, Rail; Rd, Raindrop; Re, Reed; S, Spruce Point; Wi, Wine. Other: VMS, volcanogenic massive sulphide.

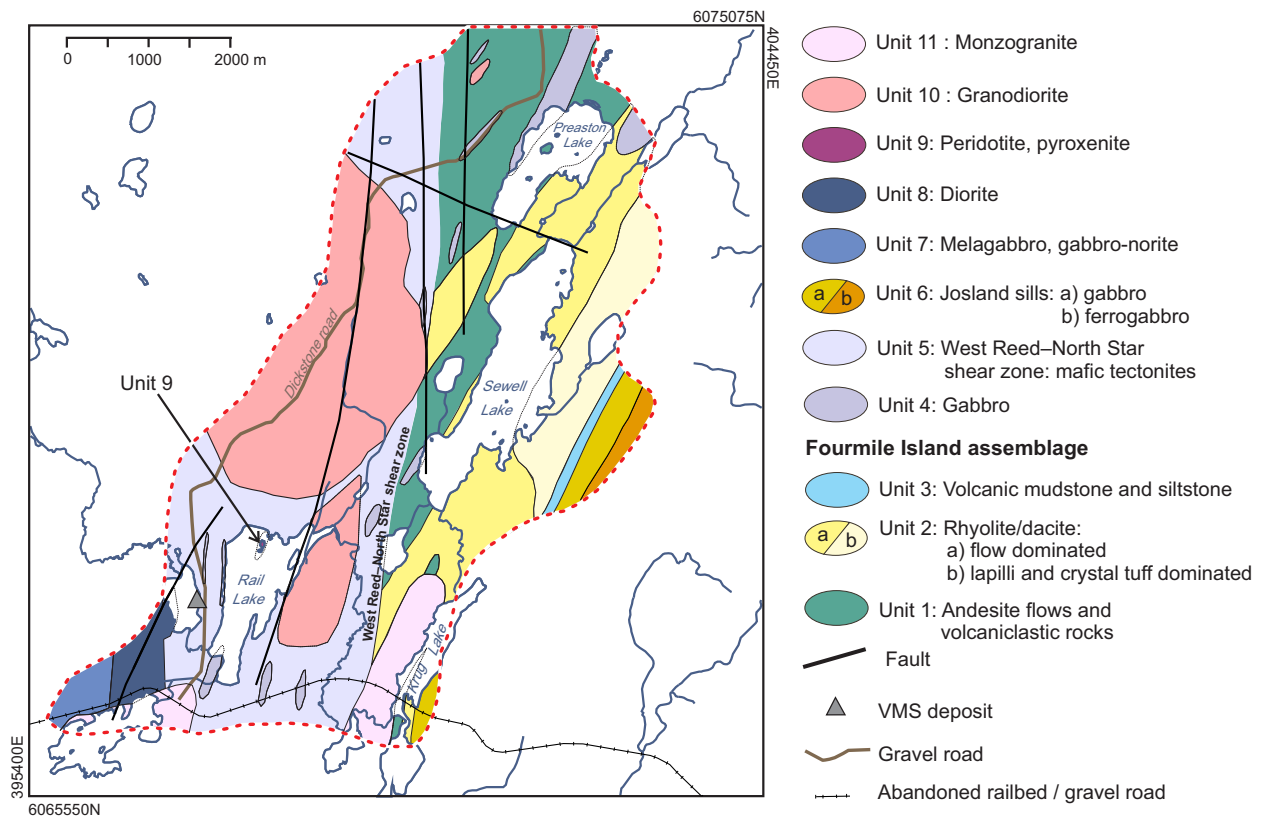


Figure GS-8-3: Simplified geology of the Rail Lake–Sewell Lake area. Abbreviation: VMS, volcanogenic massive sulfide.

Fourmile Island assemblage

Volcanic rocks of the Fourmile Island assemblage occur on western Reed Lake. They are bounded to the west by a wide zone of heterogeneous tectonite (West Reed–North Star shear zone, WRNS). The FIA within the map area includes at least 2000 m of subaqueous volcanic stratigraphy, which mostly corresponds to the lower sequence. The younging direction throughout the sequence is to the east.

Andesitic flows and volcanoclastic rocks (unit 1)

Unit 1 consists mostly of a thick succession of andesitic pillowed flows with weak to moderate epidote alteration (Figure GS-8-4a). The unit was first described by Bailes (1980; referred to as the Preston formation) in the Dickstone mine area. Epidote patches generally range from 5 to 20 cm but are locally up to 45 cm. Pillowed flows are accompanied by lesser amounts of massive flows, interleaved horizons of mafic volcanoclastic rocks and gabbroic dikes. The andesite weathers dull brown to light green or medium green. The pillows range in diameter from 0.2 to 3.0 m but average between 0.6 and 1.0 m, with relatively thin selvages (3–6 mm). The pillowed flows are generally aphyric but locally contain 2–5% plagioclase phenocrysts (1–4 mm). Amygdules are common (4–5%),

vary from 2 to 25 mm in diameter and are generally filled with either quartz or epidote. Due to the poor quality of outcrop, only a few younging directions were observed. Facing direction observations were based on pillow asymmetry and indicate an upright sequence younging to the east. The unit also contains a significant proportion (10–20%) of volcanoclastic facies, mostly representing flow-top and amoeboid pillow breccia (Figure GS-8-4b) with some minor occurrences of mafic crystal and lapilli tuff. Shallow-level synvolcanic andesitic feeder dikes that range in width from 0.3 to 2 m are also observed locally. The synvolcanic andesitic dikes commonly show flow banding and have small (1–3 mm) vesicles near the dike margins (Figure GS-8-4c). Late gabbro dikes that range in width from 0.2 to tens of metres also commonly intrude this unit. The largest of the gabbro intrusions have been included on the preliminary map and form unit 4.

Felsic volcanic and volcanoclastic rocks (unit 2)

Felsic volcanic and volcanoclastic rocks (Dickstone formation of Bailes, 1980) within the Rail Lake–Sewell Lake area comprise a mix of dacitic and rhyolitic flows with abundant volcanoclastic material. This extensive package of felsic rocks stretches all the way from the south end of Sewell Lake to north of Preston Lake. The

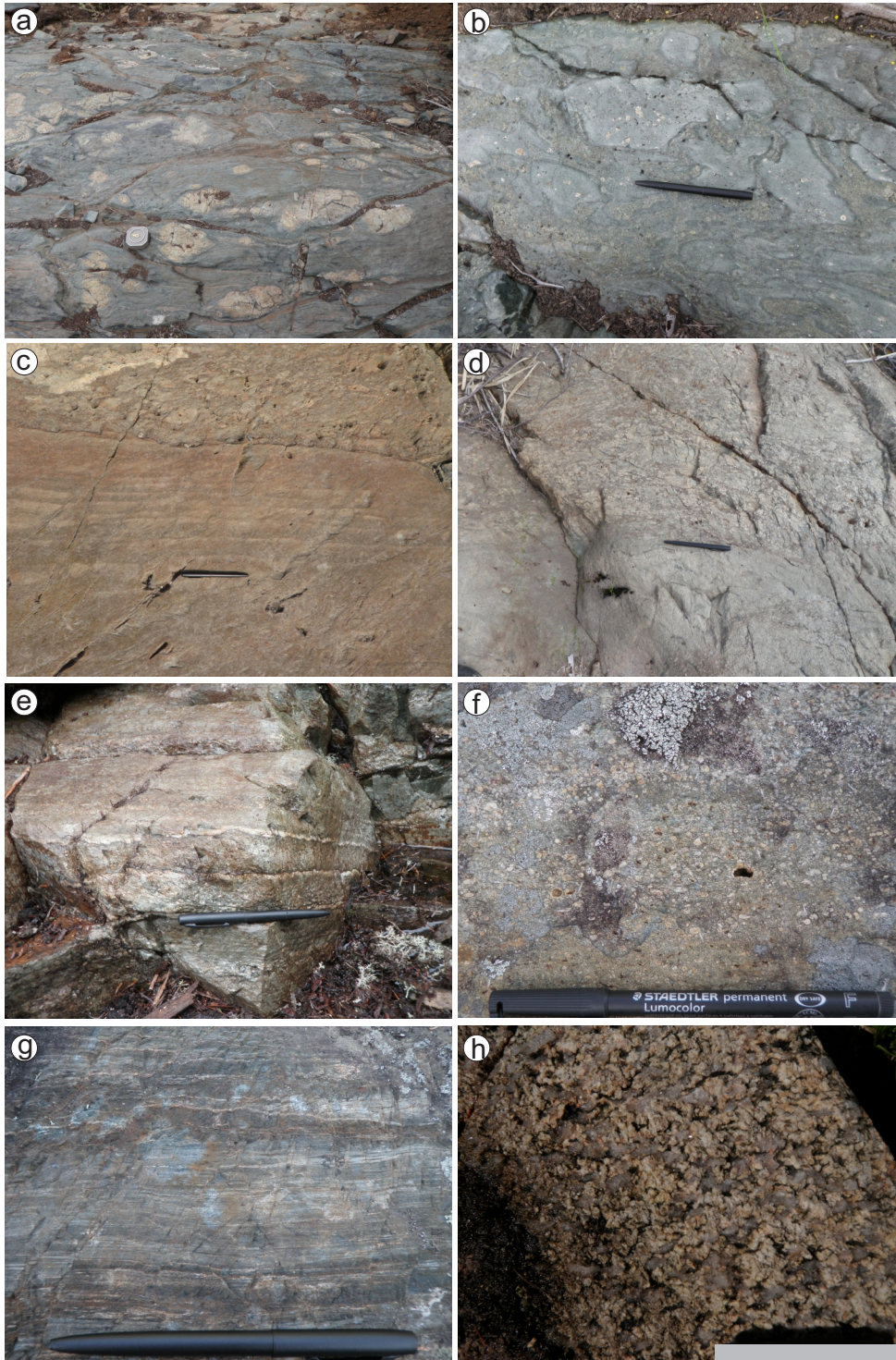


Figure GS-8-4: Outcrop photographs of representative rock types from the Rail Lake–Sewell Lake area: **a)** andesitic pillows with 7-10% epidote patches up to 25 cm in diameter, unit 1, 600 m northwest of Preston Lake (Brunton® compass is 7 cm); **b)** andesitic amoeboid pillow breccia with 3% quartz-epidote-filled amygdules, unit 1, north shore of Preston Lake (pen is 13 cm); **c)** synvolcanic andesitic dike with flow banding and small vesicles along margin, cutting through a horizon of flow-top breccia, unit 1, north shore of Preston Lake (pen is 13 cm); **d)** small lobe of aphyric dacite (lower portion of photo; contact parallel to pen) and associated dacitic breccia, unit 2a, west shore of Preston Lake (pen is 13 cm); **e)** thinly bedded felsic tuff showing normal grading, unit 2c, 450 m east of Sewell Lake (pen is 13 cm); **f)** quartz- and plagioclase-rich felsic crystal tuff with hollowed amygdules, unit 2c, northeast shore of Sewell Lake (pen is 13 cm); **g)** laminated mafic mylonite, unit 5, 150 m west of Rail Lake (pen 13 cm); **h)** medium-grained, homogeneous, equigranular granodiorite, unit 10, km 5.0 on the Dickstone road (grey bar is 4 cm).

felsic volcanic and volcanoclastic rocks have been subdivided into two subunits based on facies. Subunit 2a consists mostly of massive to flow-banded dacite and rhyolite flows. The dacite is commonly aphyric to locally plagioclase phyrlic, whereas the rhyolite is typically plagioclase and quartz phyrlic. Lobe and tongue facies with 0.3–1.5 m thick lobes of felsic volcanic and associated breccia are also commonly observed within unit 2a (Figure GS-8-4d).

Subunit 2b consists of plagioclase- and quartz-phyric dacitic to rhyolitic tuff and lapilli tuff. These rocks vary from massive horizons of crystal-rich felsic tuff (Figure GS-8-4e) to thinly bedded ash tuff with 5–10% lithic lapilli (Figure GS-8-4f).

Volcanic mudstone and siltstone (unit 3)

This thin sequence of volcanic mudstone and siltstone (the Yakymiw formation of Bailes, 1980a) comprises laminated mudstone, siltstone and fine-grained sandstone, with interbeds of pebbly greywacke. Within the map area, only mudstone and the siltstone horizon were observed in outcrop due to thick lichen cover and scarce outcrop. At a regional scale, this unit forms a tight synformal structure that is intruded along its core by differentiated Josland sills. The contact between unit 3 and the underlying felsic volcanoclastic rocks was not observed.

Mafic tectonite: West Reed–North Star shear zone (unit 5)

Along the western margin of the map area, the WRNS consists of a wide zone of laminated, mylonitic mafic tectonite (Figure GS-8-4g). The transition from intact mafic volcanic rocks of unit 1 to laminated mafic tectonite is fairly abrupt and generally occurs over 50–100 m. Intense deformation within the shear zone makes determination of protolith difficult. In lower strain domains, possible remnant pillow selvages indicate that the protolith for this unit was, at least locally, mafic flows. It is likely that at least some of the mafic tectonite was derived from unit 1 along its eastern margin. Although the tectonite is dominantly mafic, horizons (0.3–10 m) of highly deformed felsic rocks are common (10%).

Intrusive rocks

Gabbro (unit 4)

Unit 4 consists of medium-grained (2–4 mm) and equigranular gabbro that shows a granoblastic texture and varies from massive to weakly foliated, except near the WRNS, where it shows well-developed mineral foliation. It locally has a weakly to moderately developed mineral lineation. The gabbro clearly intrudes rocks from both units 1 and 2. In the western part of the map area, the gabbro is tectonized by the WRNS.

Layered gabbro sills; Josland sills (unit 6)

Unit 3 is intruded by a thick, compositionally zoned and highly fractionated mafic sill. The sill is part of the 1886 ± 3 Ma Josland Lake suite (Zwanzig et al., 2001), described in detail by Bailes (1980). This intrusion represents the along-strike extension of the >17 km long Josland Lake sill mapped in the File Lake–Morton Lake area. The Josland Lake intrusions are a distinctive suite of zoned, strongly fractionated, tholeiitic gabbro sills displaying extreme iron enrichment (Bailes, 1980). In the File Lake area, Bailes (1980) described three laterally continuous zones: a lower gabbro zone, a middle ferrogabbro zone and an upper granophyric to porphyritic quartz ferrodiorite and tonalite zone. In the eastern portion of the Rail Lake–Sewell Lake area, only the lower and middle zones of the Josland sill were encountered.

Melagabbro to gabbronorite (unit 7)

This unit is found in the southwestern portion of the map area and consists mostly of melagabbro to gabbronorite. The rock is generally medium grained (2–4 mm) and equigranular, has a granoblastic texture and varies from massive to weakly foliated. It locally contains small segregations of plagioclase crystals.

Diorite (unit 8)

This unit consists mostly of medium- to coarse-grained, equigranular, massive to weakly foliated diorite with a few angular inclusions of fine-grained mafic rock (basalt?). Its occurrence is restricted to the southwest corner of the map area.

Peridotite and pyroxenite (unit 9)

This unit is only found in the northern part of Rail Lake. The pyroxenite was observed at a few locations along the northeast shore of Rail Lake, whereas the peridotite was recognized on a few small islands and a peninsula on the north shore of Rail Lake. The pyroxenite is generally massive to weakly foliated, equigranular and medium to coarse grained. The peridotite has a distinctive red-brown weathered surface and is intensely altered, with olivine almost completely replaced by serpentine pseudomorphs, and pyroxene almost completely altered to chlorite.

Granodiorite (unit 10)

This unit defines a homogeneous pluton along the west side of the map area. The granodiorite intrudes the WRNS and clearly postdates the bulk of the deformation. The rock is generally homogeneous, equigranular and medium to coarse grained, and varies from massive to weakly foliated (Figure GS-8-4h). It is light to medium grey on fresh surfaces and weathers light grey to buff. Biotite is the main mafic mineral (2–7%; 1–3 mm),

although it commonly contains up to 10 % hornblende (1–5 mm). Magnetite locally occurs as an accessory mineral (1%). Along its margin, the granodiorite commonly contains xenoliths of the host WRNS mafic tectonite and foliated gabbro.

Monzogranite (unit 11)

A buff to light grey monzogranite, weathering beige to grey-brown, is exposed on the west shore of Krug Lake. The monzogranite is generally homogeneous, equigranular and medium to coarse grained, with minor biotite (1–4%; 1–2 mm in size). The rock varies from massive to weakly foliated. No xenoliths were observed.

Structural geology and metamorphism

The Rail Lake–Sewell Lake area is a polydeformed, low-grade part of the Flin Flon belt. Further field and laboratory study of the area's structures, as well as targeted U-Pb geochronology, are required to correlate local structures and deformation events with the regional tectonic framework. The sequence of deformation presented here is based largely on crosscutting relations observed on outcrops.

Abundant moss and lichen cover in the map area hindered recognition of primary features in the FIA metavolcanic and volcanoclastic rocks. Due to the poor exposure, only a few bedding and pillow-facing directions could be observed. However, graded beds and pillow asymmetry consistently indicate an overall easterly upright facing direction for the rocks of the FIA. This is in agreement with the interpretation of Bailes (1980) for the vicinity of the Dickstone mine, which lies along strike a few kilometres north of the mapped area. The FIA represents an east-facing homoclinal sequence.

The oldest deformation structure observed in the map area is a weak to moderately developed mineral foliation (S_1) that also represents a plane of flattening (Figure GS-8-5a). Elongated clasts from volcanoclastic horizons generally lie parallel to the foliation plane. The S_1 foliation is recognized outside the WRNS in the eastern portion of the map area, where it typically trends north-northeast (020–035°N) with a steep dip (70–85°). This early fabric is axial planar to a large syncline that folds the FIA rocks along the east side of Morton Lake. Where bedding can be identified, it shows a broader range of dip (50–85°) than S_1 , probably as a result of parasitic folding on the limb of a regional syncline. A down-dip lineation in the FIA rocks generally lies parallel to S_1 . The lineation is defined by elongated lapilli and stretched amygdules, as well as aligned amphibole. A maximum age for the D_1 event is provided by the 1886 Ma age of the Josland sill, which intruded along the axial plane of the Morton Lake syncline but was unaffected by folding (Zwanzig et al., 2001).

The second episode of deformation (D_2) was a strong ductile deformation that led to the formation of the WRNS and is characterized by a protomylonitic to mylonitic fabric (S_2) that consistently strikes north with subvertical dip (Figure GS-8-5b, c, d). Although best developed within the WRNS, the S_2 fabric is also developed in rocks near Sewell Lake and to the west, outside the WRNS, and forms a weak to moderate, north-striking, subvertical mineral foliation that overprints S_1 (20–30° degrees counter-clockwise) and becomes more prominent westward (Figure GS-8-5c). Inside the WRNS, the mineral and stretching lineations are shallower (50–70°) and typically plunge to the south. The S_1 fabric is interpreted to have been transposed parallel to S_2 within the limits of the WRNS because, close to the shear zone, it is deflected in an anticlockwise sense into the shear-zone trend. Shear-sense indicators indicate mainly dextral movement along the shear zone, although there are many indications of later sinistral slip. The maximum age of the formation of the WRNS can be constrained by the crosscutting relation of the granodiorite pluton along the Dickstone road, a sample of which has been collected for U-Pb dating.

The WRNS was reactivated during D_3 deformation, resulting in local Z-folds (Figure GS-8-5d) that vary from tight chevron to isoclinal and do not have an axial-planar penetrative fabric. The D_3 deformation appears to record sinistral transpression along the north-northeast-trending WRNS.

A series of late, narrow brittle faults (D_4) developed parallel to the WRNS in the map area (Figure GS-8-5e). These brittle faults are not overprinted by a penetrative foliation and clearly cut S_1 and S_2 foliations. The north-trending faults shown on Figure GS-8-3 are interpreted to be D_4 brittle features. Chloritic alteration is locally observed along the walls of the larger brittle faults.

Later, northwest-trending, subvertical spaced cleavage (S_5 ; Figure GS-8-5f) represents the last episode of deformation (D_5) recognized in the Rail Lake–Sewell Lake area. This spaced cleavage is observed throughout the area both within and outside the WRNS, and offsets D_1 to D_4 deformation structures. It does not have an associated penetrative fabric and varies from closely (3–5 cm) to widely (20–30 cm) spaced, with a dextral offset.

Economic considerations

The Fourmile Island assemblage hosts five significant VMS deposits within the Reed Lake area. The Rail deposit occurs near the south end of the area and the Dickstone deposit is found 5 km north of the area. The precise geological setting of the Rail deposit is unclear because it sits in the middle of the WRNS; however, the Dickstone deposit is known to occur near the contact between the Preston and Dickstone formations (units 1 and 2 in this report). The presence of the Rail deposit and the fact that the host horizon of the Dickstone deposit can be traced

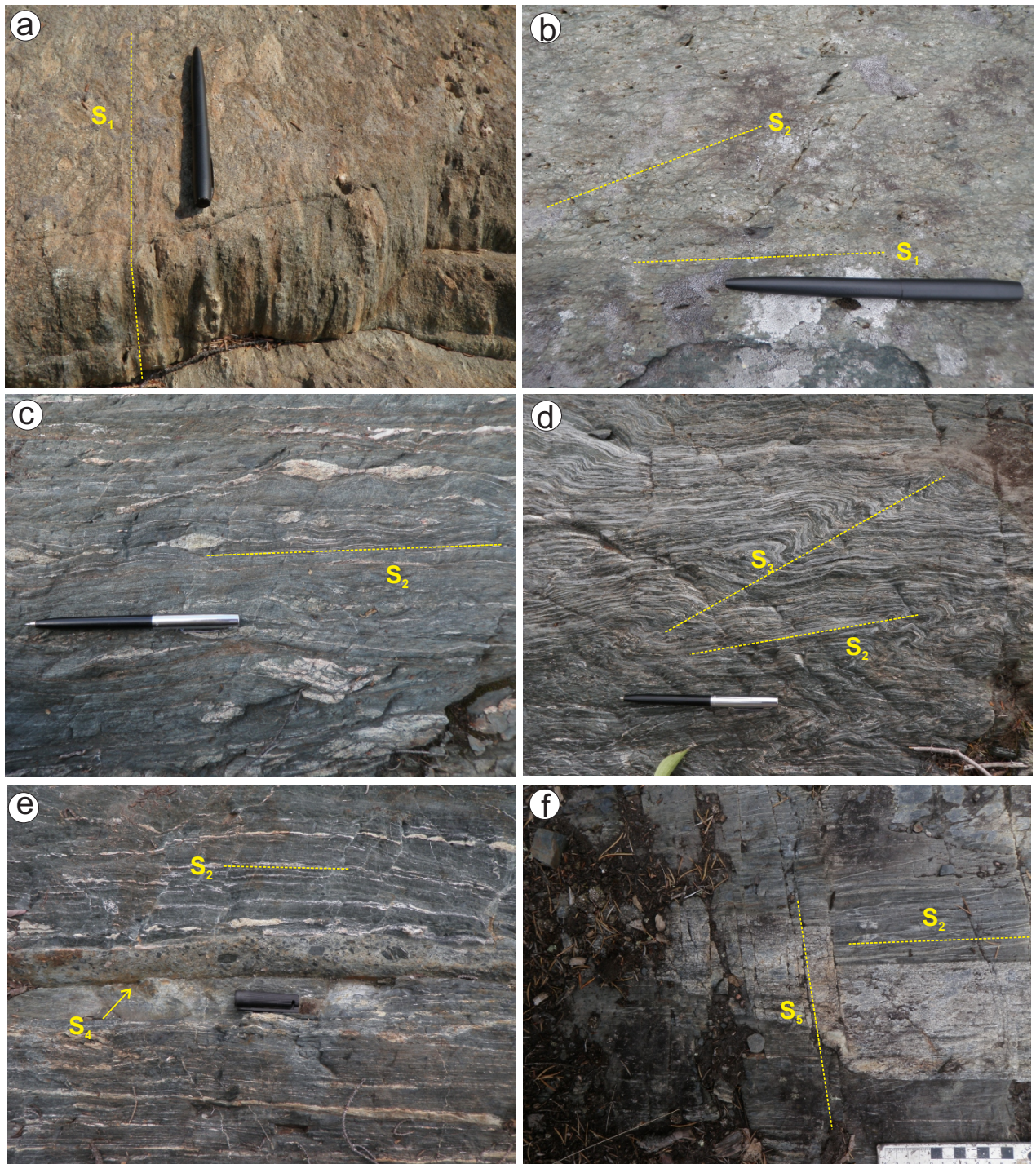


Figure GS-8-5: Outcrop photographs of structures from the Rail Lake–Sewell Lake area: **a)** andesitic flow-top breccia with moderate S_1 fabric, unit 1, northwest shoreline of Preston Lake (pen is 13 cm); **b)** dacitic tuff with S_1 and oblique S_2 fabric, unit 2b, west shore of Sewell Lake (pen is 13 cm); **c)** mylonitic foliation (S_2) and asymmetric quartz boudins showing sinistral shear along foliation, unit 4, 200 m northwest of Rail Lake (pen is 13 cm); **d)** mylonitic foliation (S_2) and F_3 Z-folds, unit 5, 500 m north of Rail Lake (pen is 13 cm); **e)** mylonitic foliation (S_2) and late-foliation parallel brittle faulting (S_4), unit 5, 600 m west of Sewell Lake (pen cap is 4 cm); **f)** mylonitic foliation (S_2) and late spaced cleavage (S_3), unit 5, west shore of Rail Lake (pen is 13 cm).

uninterrupted from the Dickstone mine through most of the map area suggest that the Rail Lake–Sewell Lake region has significant potential for discovery of further VMS deposits. Weak to moderate sericite-chlorite alteration was observed within felsic volcanic rocks along the shoreline of Sewell Lake and on some small islands, with alteration being strongest in the island exposures.

Although no gold occurrences have been reported from the Rail Lake–Sewell Lake area, the WRNS hosts several significant gold showings in the North Star Lake area, 3 km north of the map area. Because the same structures that host gold mineralization in the North Star Lake area straddle the Rail Lake–Sewell Lake region, it likely also has significant potential for shear-hosted (i.e., orogenic) gold mineralization.

Acknowledgments

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