Progress of geological mapping at Paint Lake, Manitoba: identification of a new metasedimentary succession in the Thompson Nickel Belt

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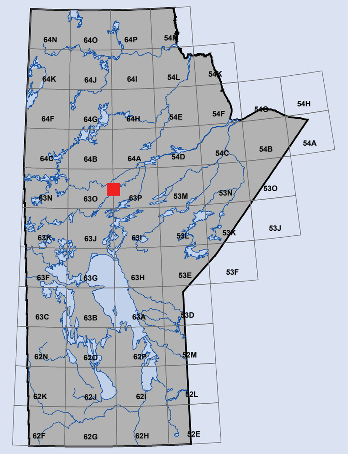


Summary

The Paint Lake area is underlain by predominantly multicomponent gneiss with significant exposures of enderbitic gneiss and layered mafic rocks along the west side of the lake. A sequence of possibly Archean supracrustal rocks, consisting dominantly of metagreywacke and metapsammite with minor iron formation, metapelite, and metavolcanic rocks, is present as disrupted bands along the east and west shores, and a relatively continuous belt through the central islands of the lake. A variably metasomatized peralkaline melasyenite intrusion with dykes of alkali feldspar granite has been identified in the south west corner of the lake. A carbonatite dyke swarm identified in the previous year has been extended along strike for over 21 km and may continue north of the currently mapped area. The dominant structures in the area consist of upright isoclinal, shallowly to moderately plunging folds that have deformed the regional foliation. Significant shear zones are manifested by metre-scale zones of mylonite to ultramylonite along the east shore of the lake.

Similarities of the supracrustal rocks at Paint Lake with rocks of the Ospwagan Group include:

1) extensive psammitic horizons which could be misinterpreted as Manasan Formation M1 quartzite or Setting Formation quartzite;

2) siliceous, calcareous units which could be confused with certain horizons of Thompson Formation;

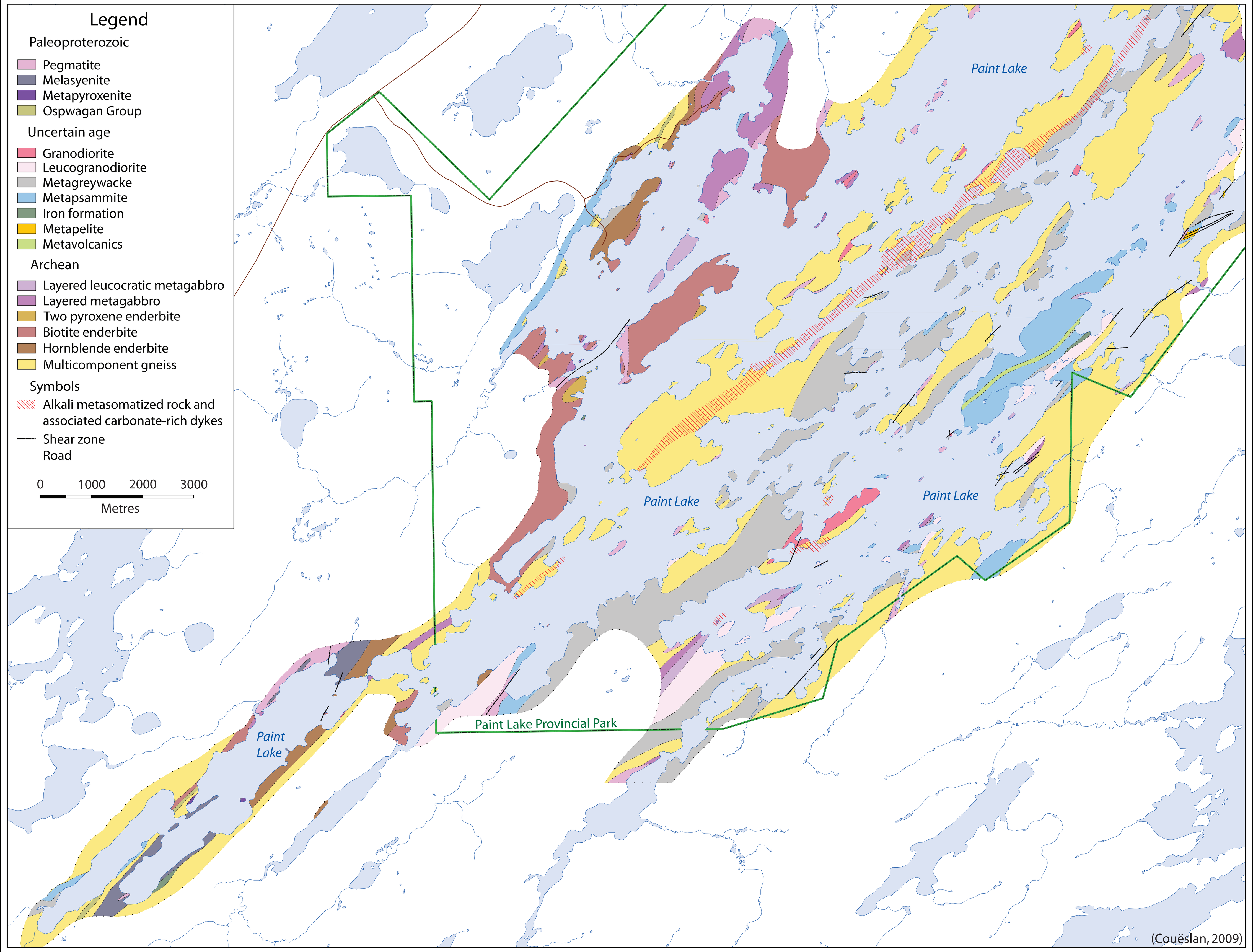
3) sillimanite- and garnet-rich horizons of metapelite similar to Pipe Formation P2 member;

4) silicate facies iron formation similar to Pipe Formation;

5) concretion-bearing quartzite with interbedded metapelite similar to Setting Formation.

The Archean supracrustal rocks are likely derived from a more juvenile source than similar rocks of the Ospwagan Group. They are generally depleted in incompatible large ion lithophile elements such as Cs, Rb, K, and U, and enriched in Sr. This is likely a function of a difference in provenance between the two metasedimentary groups. The Archean metasediments are most likely the product of detritus derived from an arc/greenstone belt. The Ospwagan Group is most likely sourced from the peneplanation of the Superior craton which consists largely of Archean granitoid rocks.

Paint Lake Geology



1) Comparison of Archean supracrustal and Ospwagan Group lithologies

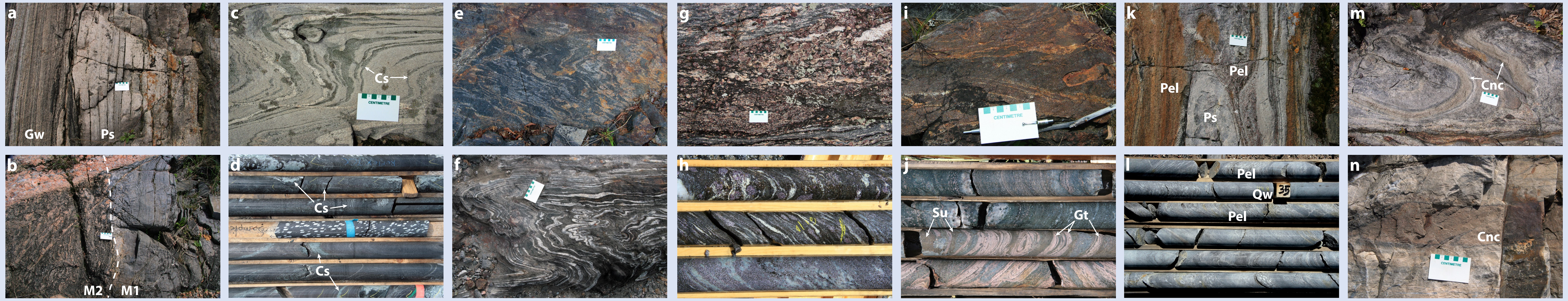


Figure 1 a) Archean metapsammite in contact with metagreywacke. b) Manasan Formation, M1 quartzite in contact with Manasan Formation, M2 semipelite. Scale card is in centimetres. Gw = metagreywacke; Ps = metapsammite.

c) Archean calcareous metapsammite with calcsilicate laminations. d) Siliceous Thompson Formation metasediments with calcsilicate layers and laminations from the Thompson Mine area. Cs = calcsilicate.

e) Archean silicate facies iron formation with intensely folded chert layers. f) Pipe Formation, P1 silicate facies iron formation at Pipe Mine. Scale card is in centimetres.

g) Archean metapelite with abundant sillimanite, garnet, and biotite. h) Pipe Formation, P2 metapelite sillimanite-garnet-biotite gneiss from the eastern TNB. Scale card is in centimetres.

i) Archean sulphide-bearing, orthopyroxene- and garnet-rich silicate facies iron formation. j) Similar orthopyroxene-bearing, sulphide- and garnet-rich silicate facies iron formation of Pipe Formation, P3 member from the Owl Lake area. Gt = garnet; Su = sulphide.

k) Archean interbedded metapsammite and metapelite. The metapelite is characterized by a light gossan stain. l) Cm-scale layering of quartzose wacke and metapelite in Setting Formation from the Thompson Mine area. Pel = metapelite; Ps = metapsammite; Qw = quartzose wacke.

m) Garnet-rich calcareous concretions in Archean metapsammite. A thin pelitic layer is visible at the bottom of the photo. n) Garnet-rich calcareous concretion in Setting Formation quartzite at Mystery Lake. A thin pelitic layer is visible at the top of the photo. Cnc = concretion.

2) Comparison of Archean supracrustal and Ospwagan Group trace element geochemistry

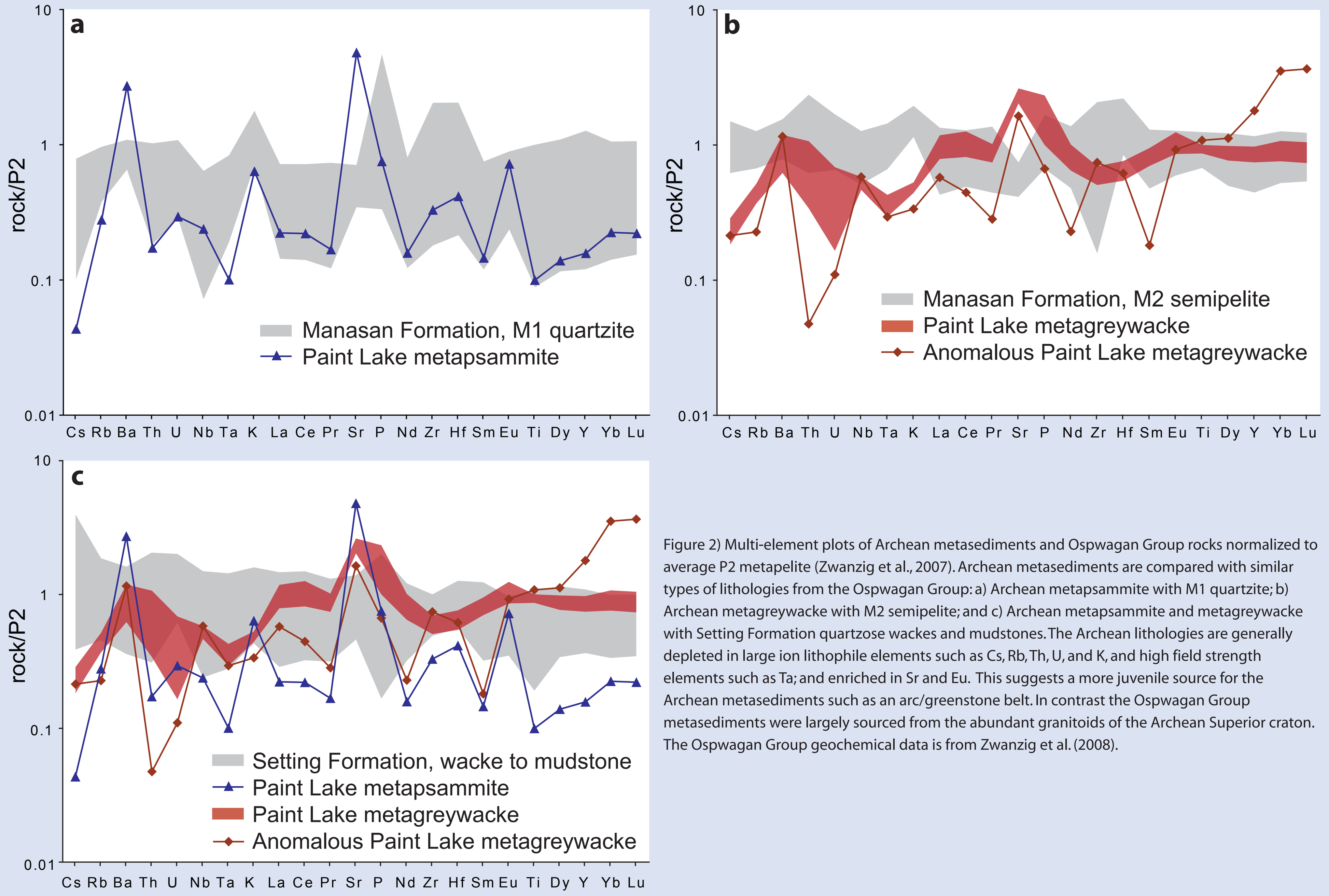


Figure 2) Multi-element plots of Archean metasediments and Ospwagan Group rocks normalized to average P2 metapelite (Zwanzig et al., 2007). Archean metasediments are compared with similar types of lithologies from the Ospwagan Group: a) Archean metapsammite with M1 quartzite; b) Archean metagreywacke with M2 semipelite; and c) Archean metapsammite and metagreywacke with Setting Formation quartzose wackes and mudstones. The Archean lithologies are generally depleted in large ion lithophile elements such as Cs, Rb, Th, U, and K, and high field strength elements such as Ta; and enriched in Sr and Eu. This suggests a more juvenile source for the Archean metasediments such as an arc/greenstone belt. In contrast the Ospwagan Group metasediments were largely sourced from the abundant granitoids of the Archean Superior craton. The Ospwagan Group geochemical data is from Zwanzig et al. (2008).

3) Other significant discoveries from 2009

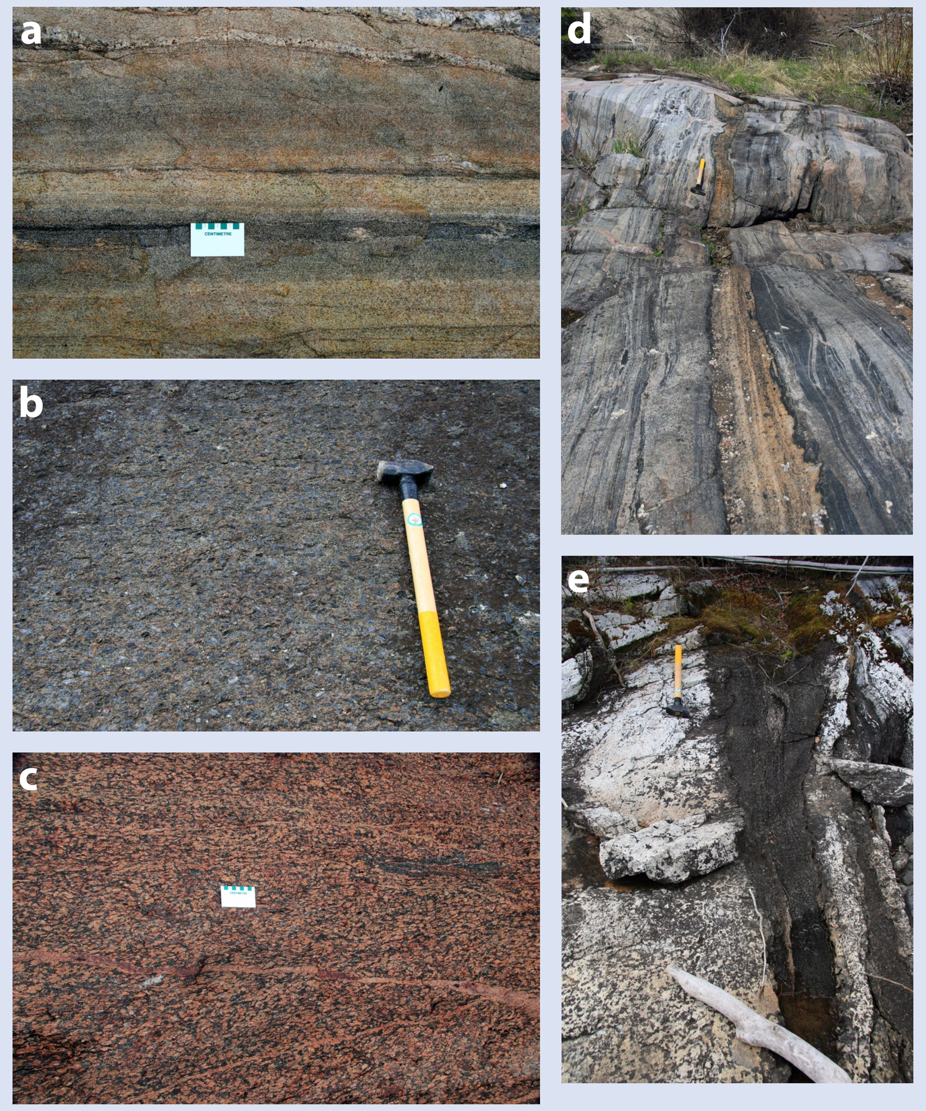


Figure 3 a) Possible metavolcanics occur interbedded with metapsammite as gradationally banded mafic, intermediate, and felsic gneiss. b) A peralkaline melasyenite occurs in the SW corner of the lake and is typically metasomatized to a purplish pink to brick red colour (c). d) A swarm of pink carbonatite dykes has been extended over 21 km through the central islands of the lake. e) A possibly related series of grey silicate-carbonate dykes have also been discovered. Further information on the carbonate-rich rocks of Paint Lake can be found on the adjacent poster by Chakhmouradian et al. entitled Evidence for Carbonatite Magmatism at Paint Lake, Manitoba. Scale card is in centimetres.

4) Economic Considerations

The similarities between the Archean supracrustal rocks and the nickel deposit-hosting Ospwagan Group supracrustal rocks could create additional difficulty for exploration in the region. The potential exists for the mistaken identification of Ospwagan Group rocks in areas of low nickel potential. Trace element geochemistry may be useful as a tool to discriminate between the Archean supracrustals and the metasediments of the Ospwagan Group.

Alternatively, the presence of sulphide-bearing iron formation and metagreywacke in Archean supracrustal sequences could potentially make for new exploration targets. Ultramafic bodies intruding into these sulphide-bearing metasediments could utilize the available sulphur to fractionate Ni-sulphides. This is similar to the model interpreted for Ni-deposit hosting ultramafic bodies emplaced in Ospwagan Group rocks elsewhere in the TNB.

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References

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