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The ca. 2680 Ma Raquette Lake Formation and correlative units across the Slave Province, Northwest Territories: evidence for a craton-scale overlap sequence

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Abstract: The geology and lithostratigraphy of the Raquette Lake Formation on the southeastern flank of the Sleepy Dragon Complex, Yellowknife Domain, are described. Twenty-seven sections across apparent stratigraphy have been measured and laterally correlated, and form the basis for a somewhat broadened definition of the Raquette Lake Formation and the correlative Detour Lake Formation. Both formations are included in a new group, the Ross Lake Group, the introduction of which better reflects currently known lithostratigraphic and chronostratigraphic relationships in the area. The Raquette Lake Formation unconformably overlies the Cameron River Basalt formation and the partly unroofed, synvolcanic Ross Lake Granodiorite. The sub-Raquette Lake unconformity is correlated with the third of four temporally distinct unconformities in the Point Lake area, 280 km to the north. Furthermore, similar lithostratigraphic units are described from west to east across the Slave Province suggesting existence of a ca. 2690–2680 Ma marker horizon that overlaps a putative basement suture.

Résumé : Le présent article décrit la géologie et la lithostratigraphie de la Formation de Raquette Lake située sur le versant sud-est du Complexe de Sleepy Dragon dans le Domaine de Yellowknife. Vingt-sept coupes traversant la stratigraphie apparente ont été mesurées et corrélées latéralement. Elles constituent le fondement d'une définition quelque peu élargie de la Formation de Raquette Lake et de la formation corrélative de Detour Lake. Les deux formations sont incluses dans un nouveau groupe, le Groupe Ross Lake, ce qui tient mieux compte des relations lithostratigraphiques et chronostratigraphiques actuellement connues dans la région. La Formation de Raquette Lake repose en discordance sur la formation du Basalte de Cameron River et la granodiorite synvolcanique en partie érodée de Ross Lake. Il existe une corrélation entre la discordance située sous la Formation de Raquette Lake et la troisième des quatre discordances distinctes dans le temps dans la région du lac Point, à 280 km au nord. En outre, des unités lithostratigraphiques semblables sont décrites d'ouest en est dans la Province des Esclaves, ce qui laisse supposer l'existence d'un horizon repère d'environ 2690 à 2680 Ma qui chevauche une suture présumée du substratum.

INTRODUCTION

The stratigraphy of granite-greenstone terranes is generally complex. Typically, it needs to be assembled piece by piece by demonstrating depositional contacts between all lithological units involved, up to some limiting structural contact, for example, a fundamental thrust or, more generally, a terrane boundary. Unconformities are of particular significance in this context as they tie major packages or basement and cover together in demonstrable primary relationships. Diagnostic features such as regolith and/or basal conglomerate commonly allow the true nature of unconformities to be recognized even though less robust evidence for primary depositional relationships may have been erased by intense deformation and metamorphism. Furthermore, unconformities and the basal units of overlying sequences are of special importance as they typically provide 'marker horizons' of broader regional significance than individual lithofacies at other stratigraphic levels. These general concepts are well illustrated by the ca. 2.7 Ga Yellowknife Supergroup of the Slave Province (Fig. 1) for which internal stratigraphic integrity and spatial extent have long been debated (e.g. Zimmer, 1999; Bleeker and Stern, 2000; Kusky, 2000). In developing the concept of a craton-wide stratigraphy (e.g. Henderson, 1981) and its primary ties to crystalline basement (e.g.

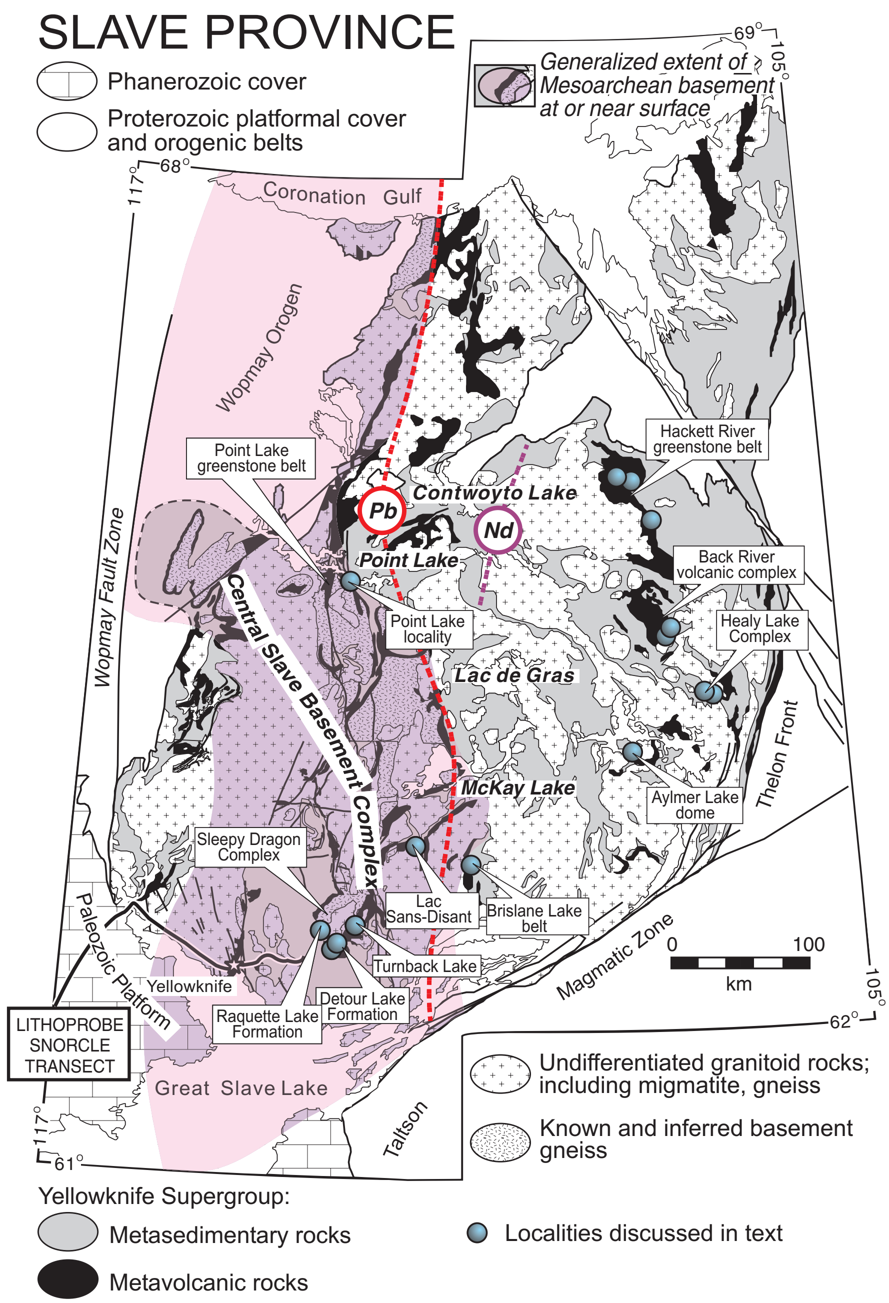

***Figure 1.** Geological map of the Slave Province highlighting localities discussed in the text.*

Baragar, 1966; McGlynn and Henderson, 1976; Henderson, 1985), previous workers were strongly influenced by one particular formation and its basal unconformity, the Raquette Lake Formation as exposed along the eastern shore of Upper Ross Lake, about 70 km east-northeast of Yellowknife.

Recent work has shown, however, that the Raquette Lake Formation does not represent a basal clastic succession to the Yellowknife Supergroup, but overlies an intravolcanic unconformity well up in the volcano-sedimentary stratigraphy of the Yellowknife Domain (Bleeker et al., 1997, 1999). Nevertheless, the Raquette Lake Formation and its underlying unconformity with the Ross Lake Granodiorite remain critical elements of the Yellowknife Supergroup stratigraphy and the geological understanding of the Yellowknife Domain.

In this contribution I present a preliminary lithostratigraphic analysis of this formation and discuss its relationships to under- and overlying units. I will argue that a correlative clastic unit and bounding unconformity can be recognized at Point Lake, as far as 280 km to the north of Raquette Lake, and that similar lithostratigraphic units can be recognized from west to east across the Slave Province, thus providing growing evidence for a craton-scale marker horizon that overlaps the putative suture between contrasting basement domains (Davis and Hegner, 1992; Bleeker et al., 1999, and references therein).

GENERAL OBSERVATIONS ON THE RAQUETTE LAKE FORMATION

The Raquette Lake Formation outcrops about 70 km east-northeast of Yellowknife, along the southwestern flank of the basement-cored dome of the Sleepy Dragon Complex (Fig. 1). Conglomerate and associated clastic rocks in this area were first described and mapped by J.F. Henderson (1938) and Fortier (1947). In subsequent years, J.B. Henderson (1985, p. 43) included these rocks in the Raquette Lake Formation, which he defined as "…a heterogeneous assemblage of discontinuous sandstone and conglomerate units that occur east of Upper Ross Lake and north of Raquette Lake, after which the formation is named." The best outcrops of the formation occur along the eastern shore of Upper Ross Lake and form a prominent, approximately 60 m high, somewhat rusty weathering ridge underlain by a variety of coarse clastic and volcaniclastic units, with varied amounts of intercalated, impure, grey-weathering carbonate rocks. In this type area, the formation is about 150 m thick and unconformably overlies the Ross Lake Granodiorite (Fig. 2, 3).

To the northwest, the Raquette Lake Formation overlaps unconformably on pillow basalt and intercalated mafic fragmental rocks of the Cameron River Basalt formation (Fig. 2, 3; *see also* Fig. 1 of Bleeker et al., 1997, for a map), whereas to the southeast, along the eastern shore of Victory Lake, it thins to perhaps as little as 10 m and tends to be poorly exposed. Farther southeast and east, the distinctive lithological units of the formation (e.g. conglomerate, carbonate rocks, minor felsic volcaniclastic rocks, black mudstone) can be traced to Detour Lake (Davidson, 1972; Lambert, 1988; this report), where they will be referred to as the correlative 'Detour Lake Formation'. At Detour Lake, this formation attains a thickness of about 200 m (Fig. 2) and can be followed from island to island around the southern F_2 fold closure of the Sleepy Dragon Complex (Bleeker, 1996). As does the Raquette Lake Formation farther to the northwest, the correlative Detour Lake Formation unconformably overlies a strongly foliated biotite granodiorite unit, which here is named the 'Detour Lake Granodiorite' (Fig. 2). This local basement unit appears distinct from the Ross Lake Granodiorite and remains undated.

DEFINITION OF THE RAQUETTE LAKE FORMATION AND RELATED STRATIGRAPHIC UNITS

On the basis of the present study I propose to redefine the Raquette Lake Formation in a slightly broader sense than Henderson's (1985) original definition to include all clastic, volcaniclastic, volcanic, and chemical sedimentary rocks, and their lateral equivalents, that unconformably overlie the Ross Lake Granodiorite and Cameron River Basalt formation and underlie the lowermost greywacke turbidite beds of the Burwash Formation. This definition includes the entire succession from a conglomerate or epiclastic-volcaniclastic member at the base of the formation up to, and including, a capping black mudstone unit underneath the first Burwash turbidite units (Fig. 2, 3). Also included in this definition are two distinct rhyolite units in the Upper Ross Lake area that are an integral part of the formation as defined above (Fig. 3). This definition applies equally well to the laterally equivalent sedimentary and volcaniclastic units of the Detour Lake Formation. Both formations are included in a new group, the Ross Lake Group, which is introduced to better harmonize present lithostratigraphic and chronostratigraphic understanding and to facilitate regional correlations.

STRATIGRAPHY OF THE RAQUETTE LAKE FORMATION

Methodology

All the Sleepy Dragon Complex and its mantling supracrustal rocks, from Gordon Lake in the northwest to well south of Victory and Detour lakes, and northeast to Turnback and Amacher lakes, have been remapped by the author. During these investigations particular emphasis was paid to the contact relationships between basement and cover, and the contact between volcanic rocks and overlying turbidite units of the Burwash Formation. In the type areas of the Raquette Lake and Detour Lake formations, most if not all outcrops were visited and a large number of sections measured qualitatively (major rock types, present thicknesses to ± 1 m) across apparent stratigraphy. Where lithological detail and the degree of outcrop permitted, a subset of these was measured quantitatively (major and minor rock types, and thicknesses

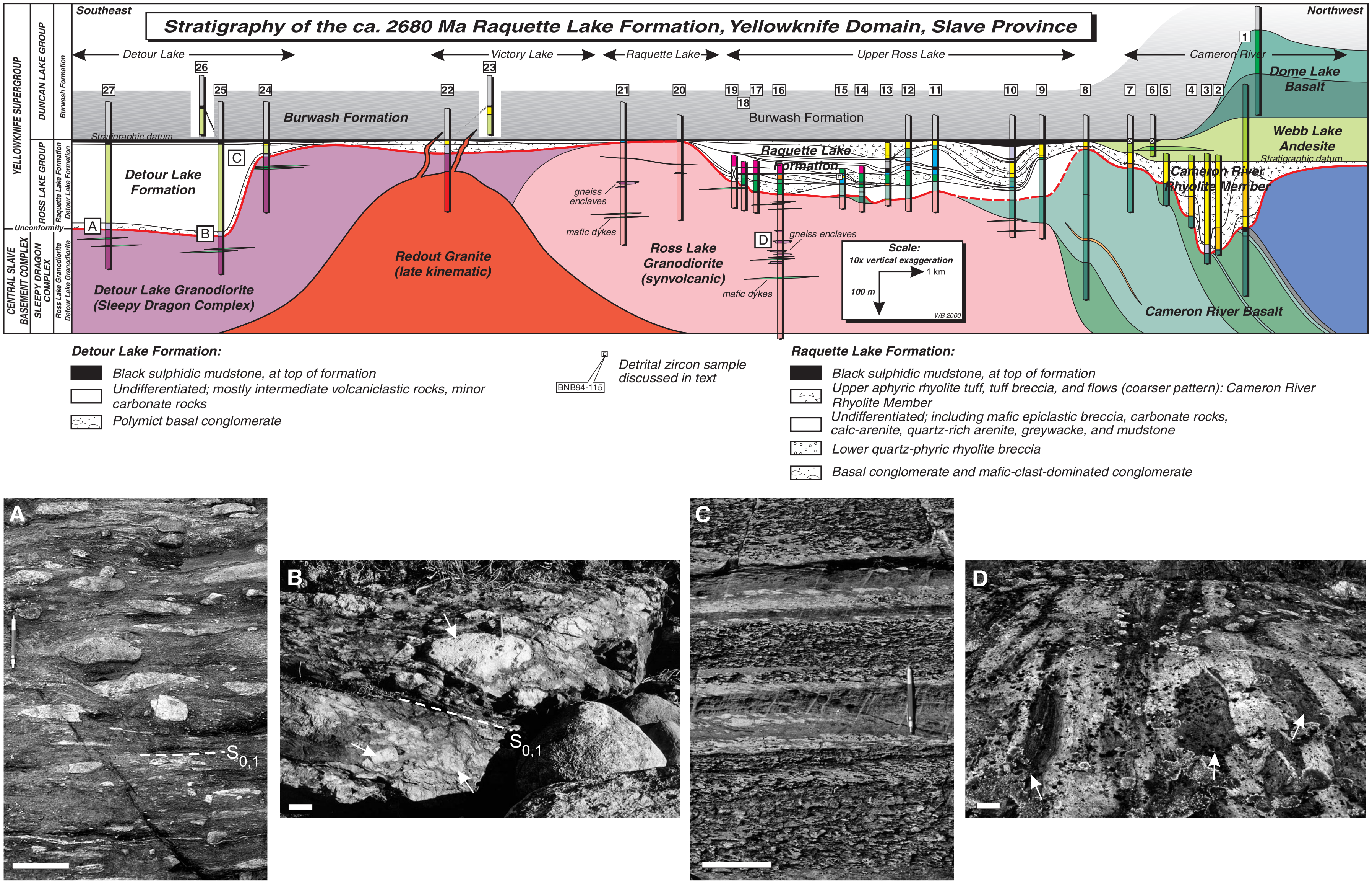

__Figure 2.__ Stratigraphic fence diagram of the Raquette Lake and Detour Lake formations based on geological mapping of the southwestern and southern flanks of the Sleepy Dragon Complex and 27 measured sections across apparent stratigraphy. Locations of field photographs (A to D) are shown on the section (pen or scale bar is 15 cm in all photographs). __A__) Highly deformed polymict basal conglomerate of the Detour Lake Formation on northeast Detour Lake. __B__) Similar to A); note large the granodiorite boulders (at arrows). __C__) Thinly layered intermediate volcaniclastic rocks that make up most of the Detour Lake Formation. __D__) Older gneissic enclaves (at arrows) in the Ross Lake Granodiorite.

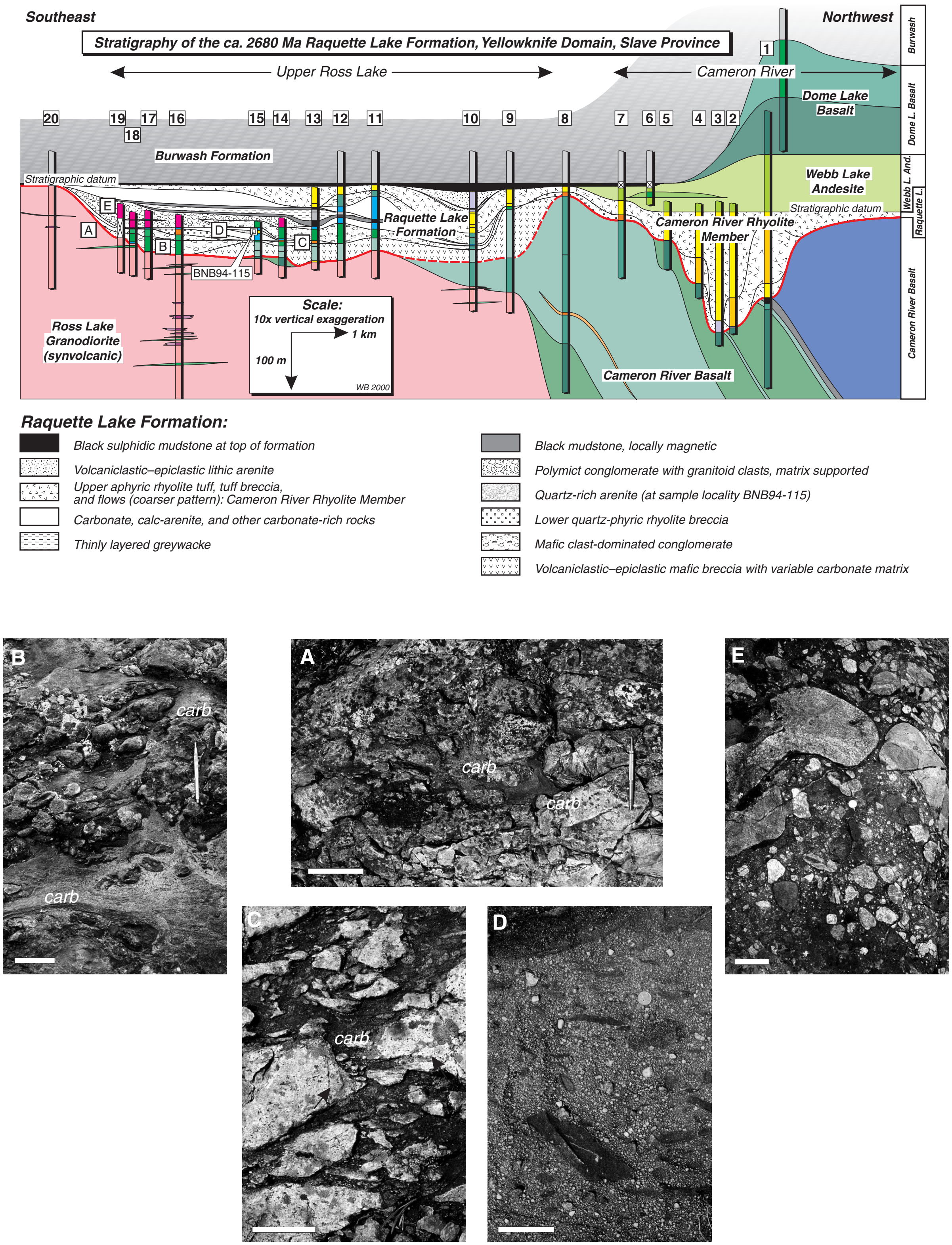

Figure 3. *Fence diagram of the Raquette Lake Formation, enlarged from Figure 2. Note the complex stratigraphy of the formation and the unconformable contact with both the Ross Lake Granodiorite and the Cameron River Basalt formation.* ***A****) Rubbly carbonate-cemented regolithic breccia of the Ross Lake Granodiorite underneath the unconformity (scale bar is 10 cm in all photographs except C).* ***B****) Grey impure marble and mafic clast conglomerate overlying the Ross Lake Granodiorite.* ***C****) Rhyolite breccia with carbonate matrix of the lower, quartz-phyric rhyolite horizon (scale bar is 5 cm; the arrows point at some of the large quartz phenocrysts).* ***D****) Typical calc-arenite consisting of poorly sorted quartz sand and pebbles, and angular sandstone clasts in a recrystallized carbonate matrix.* ***E)*** *Polymict conglomerate with angular to rounded granitoid clasts.*

to ±0.5 m). Twenty-seven sections have been compiled and laterally correlated to obtain a single fence diagram of the Raquette Lake and Detour Lake formations (Fig. 2, 3).

In the area of interest, the thick, competent, and single-layer nature of the crystalline basement has damped folding of the Sleepy Dragon Complex and its immediate cover rocks to regional-scale wavelengths. As a consequence, fold repetition and transposition were not found to be significant problems in building the stratigraphic section. Nevertheless, several 1 to 10 m scale parasitic folds were observed in the Raquette Lake Formation, but were easily avoided along the measured sections. Apparent stratigraphy as recorded in the individual sections is thus interpreted as a close approximation of the original lithostratigraphy. Present thicknesses, however, are to some extent the result of penetrative strain and should only be taken as an approximate (minimum) estimate of primary thicknesses.

Results

The measured sections cover a total strike length of >25 km (Fig. 2). The base of the Burwash Formation has been used as the main stratigraphic datum, although in the northernmost sections this contact is not well exposed. Hence, in these sections (1–5), the top of the Cameron River Rhyolite Member has been used as the datum. This procedure enhances the positive relief of the Dome Lake Basalt formation, which in part may be primary and reflect a cone of highly vesicular, viscous pillow lava and scoriae deposits (Lambert, 1988). This formation lenses out farther south, as does the underlying Webb Lake Andesite formation. Chronostratigraphically, these two uppermost volcanic formations of the Cameron River greenstone belt must correlate with the sulphidic black mudstone at the top of the Raquette Lake Formation.

Along the length of the section, the basal unconformity below the Raquette Lake and Detour Lake formations is variably expressed (Fig. 2). In the central part (sections 16–20), regolithic, carbonate-cemented breccia of the Ross Lake Granodiorite (Fig. 3A) is overlain by a well developed, mafic, clast-dominated conglomerate (Fig. 3B). Farther north however (sections 9–12), the Ross Lake Granodiorite is overlain by nondiagnostic mafic volcanic breccia with varied amounts of carbonate matrix, which grades into less equivocal conglomerate upsection. Farther north again (sections 9–10), pre-Raquette Lake erosion failed to unroof the synvolcanic Ross Lake Granodiorite and mafic breccia units with upwardly increasing carbonate content directly overlie pillow basalt flows and breccia of the Cameron River Basalt formation. In these sections, the basal contact of the Raquette Lake Formation is not easily pinpointed. In the northernmost sections (from section 8 northward), rhyolite units of the Raquette Lake Formation, accompanied by minor carbonate and lithic arenite, overlie the Cameron River Basalt units along an undulating contact that cuts the Cameron River Basalt stratigraphy at a moderate angle. The apparent downcutting of the sub-Raquette Lake Formation unconformity to the south is consistent with the progressive unroofing of the Ross Lake Granodiorite in sections farther south.

Southward from section 19, the Raquette Lake Formation rapidly thins over what is interpreted as a basement high of the Ross Lake Granodiorite. Only a thin carapace of impure carbonate rocks, minor felsic tuff, and black mudstone was noted here. Farther south (sections 24–27), the supracrustal section thickens again in the form of the Detour Lake Formation. The latter is characterized by a sparsely exposed, polymict basal conglomerate (Fig. 2A, B) and thin uppermost members of impure carbonate, felsic tuff, sulphidic chert, layers of silicate-facies banded iron-formation, and sulphidic black mudstone. The main part of the Detour Lake Formation, however, consists of intermediate volcaniclastic breccia, with varied amounts of carbonate cement (Fig. 2C). Regional metamorphism and particularly contact metamorphism attributed to the nearby Redout Granite have transformed these impure silicate-carbonate deposits locally into skarn-like rock.

DESCRIPTION OF ROCK UNITS

Space limitations do not allow a detailed description of all the rock units observed. Only some of the main units will be described here.

Mafic conglomerate

Several lenses of mafic clast-dominated conglomerate occur within the Raquette Lake Formation. One of these (Fig. 3B) occurs at the base of the section immediately overlying regolith of the Ross Lake Granodiorite (Fig. 3A). Other mafic-dominated conglomerate units occur higher and farther north in the section. Most of the clasts are fine- to medium-grained mafic rocks that mimic the lithological diversity of the underlying Cameron River Basalt, although coarser grained varieties seem somewhat overrepresented relative to the underlying volcanic pile. The nature in which the mafic conglomerate lenses are stacked (Fig. 3) suggests that they were derived from Cameron River Basalt basement that was exposed toward the north.

Lower quartz-phyric rhyolite

A thin orange- to white-weathering rhyolite horizon is present near the base of the Raquette Lake Formation. It consists mostly of carbonate-cemented rhyolite breccia (Fig. 3C) with massive lenses that may be larger blocks of the unit. The rhyolite breccia grades locally into calc-arenite (*see* below). This lower rhyolite is conspicuously quartz-phyric with 1 to 5% of 4 to 8 mm quartz phenocrysts, some with square, high-temperature quartz habits. Feldspar phenocrysts are less common or less well preserved, but were observed in a few localities. Along strike to the north, this unit is tentatively correlated with a carbonate-cemented quartz-phyric rhyolite breccia at the base of the formation (sections 7–8).

Carbonate rocks, calc-arenite, and quartz arenite

Perhaps the most characteristic rock type of the Raquette Lake Formation is a grey- to tan-weathering, impure carbonate rock to carbonate-rich arenite. Although relatively pure carbonate and quartz-arenite end members have been observed, more common is an impure arenite with rounded to angular quartz and lithic clasts embedded in a deformed and recrystallized carbonate matrix (Fig. 3D). Where best preserved, laminae of quartz and lithic sand or granules outline crossbeds, thus demonstrating the clastic nature of these rocks and the high energy of their depositional environment. In some cases, carbonate constitutes at least 50% of such rocks, suggesting that carbonate was also a clastic component and not limited to postdepositional cement. Such rocks are described as calc-arenite (*see also* Lambert, 1988). The calc-arenite grades into more quartz-rich sandstone, carbonate-cemented conglomerate, and carbonate-cemented rhyolite breccia. Most of these rock types occur in intercalated lensoid bodies. One particular quartz-rich lens appears to form a lensoid channel fill in the middle of the section (section 15) and approaches a quartz arenite in composition. Bleeker et al. (1997) presented detrital zircon data from this arenite, showing both ca. 2935 Ma grains derived from Sleepy Dragon-type tonalite basement and ca. 2683 Ma grains defining a maximum age of deposition for the arenite. It is suspected that these young grains were derived by penecontemporaneous reworking of the lower quartz-phyric rhyolite unit of the Raquette Lake Formation. If true, this would suggest that the Raquette Lake Formation is ca. 2683 Ma in age, at least near its base. The top of the formation may be considerably younger and could be constrained by dating the upper of the two rhyolite members.

Polymict conglomerate

Granitoid clast-bearing polymict conglomerate (Fig. 3E) is a minor, but important, component of the Raquette Lake Formation and underlies much of the escarpment immediately north of Raquette Lake. It consists typically of a grey to rusty weathering, carbonate-rich, sandy matrix, with a poorly sorted heterolithic clast population. Angular to rounded granitoid clasts are typically 1 to 10 cm in diameter, but may reach 50 cm. Quartz and volcanic rocks are also present among the clasts. Most of these rocks are matrix supported and appear to form one or two prograding lenses shedding of the Ross Lake Granodiorite basement high (Fig. 3).

Upper aphyric rhyolite: the Cameron River Rhyolite Member

A conspicuous, pale yellow- to white-weathering rhyolite horizon is present in almost all sections near the top of the Raquette Lake Formation. Although massive and siliceous, faint outlines of clasts and an absence of definite flow features indicate that most of this unit consists of tuff breccia and tuff. This felsic volcanic member appears to form a large blanket deposit across much of the Raquette Lake Formation. Along its base, volcaniclastic to epiclastic felsic rocks are intercalated with carbonate-rich sedimentary rocks. In the northernmost sections, bodies of massive rhyolite with preserved flow banding indicate the presence of rhyolite lava flows, probably preserving parts of a felsic dome. As this upper rhyolite member is best exposed along the Cameron River northwest of Upper Ross Lake (e.g. Henderson, 1938, 1941), it has been named the Cameron River Rhyolite Member (Bleeker et al., 1997). It is distinct from the lower rhyolite in that it is aphyric to sparsely phyric with rare small quartz phenocrysts. Attempts to date this important marker horizon have failed thus far because of insufficient and poor quality zircon recovery.

Black mudstone

A 1 to 10 m thick black mudstone unit is developed at the top of the Raquette Lake Formation and marks a sediment-starved interval prior to the onset of turbidite sedimentation of the Burwash Formation. This carbonaceous mudstone is commonly sulphidic and locally hosts siliceous layers of thinly bedded sulphidic chert.

It is evident from results presented above that the rhyolite units are integral parts of the Raquette Lake Formation and should be included in its definition — hence the broader definition as presented in this report. Indeed the association of calc-arenite and carbonate rocks with felsic volcanic and volcaniclastic rocks is common throughout the Slave Province, and most of these deposits are situated in stratigraphic settings comparable to that described here, i.e. at the top of volcanic piles immediately underneath regional turbidite blankets.

A CORRELATIVE SECTION AT POINT LAKE?

Systematic mapping of a west-to-east transect across the superbly exposed Point Lake greenstone belt has revealed four temporally distinct unconformities rather than the one well known unconformity at the base of the ca. 2.6 Ga Keskarrah Formation (Fig. 4).

1. The basal unconformity of the Point Lake greenstone belt along its western margin, developed on high-grade gneiss and overlain by the distinctive quartzite and banded iron-formation succession of the Central Slave Cover Group (Bleeker et al., 1999, 2000). At least part of this gneissic basement consists of ca. 2.95 Ga tonalite (J. Ketchum, pers. comm., 2000) and the unconformity is believed to be ca. 2.85-2.90 Ga.

2. A younger unconformity at the base of pillow lava of the Peltier Formation and developed on nongneissic and only weakly metamorphosed Augustus Granite. This unconformity is locally marked by polymict breccia, conglomerate, and quartz-rich sedimentary rocks (*see also* Henderson, 1988; W. Bleeker and J. Ketchum, unpub. field data, 2000).

3. A well preserved unconformity developed on the easternmost body of the Augustus Granite (Fig. 4A) and overlain by rusty weathering polymict conglomerate (Fig. 4B),

sandstone (Fig. 4C), minor volcanic rocks with associated carbonate rocks and chert, and finally turbidite of the Contwoyto Formation (*see also* Henderson, 1988, 1998).

4. And finally, the long established unconformity at the base of ca. 2.6 Ga conglomerate and sandstone of the Keskarrah Formation (Henderson, 1988, 1998).

Unconformity '3' and associated conglomerate units had been recognized by earlier workers, but were correlated with the much younger sub-Keskarrah Formation unconformity (Henderson, 1998). After reviewing the field relationships on eastern Point Lake, I reject this correlation on structural, general stratigraphic, and petrographic observations. I reinterpret this east-facing unconformity and its overlying clastic rocks to represent the sub-Contwoyto Formation unconformity and shallow-water deposits analogous to the Raquette Lake Formation 280 km to the south. The general characteristics of this unconformity and overlying clastic package are as follows:

- a well developed unconformity overlying locally regolithic Augustus Granite; minor relief is present along this contact (Henderson, 1998; J.B. Henderson, pers. comm., 2000);

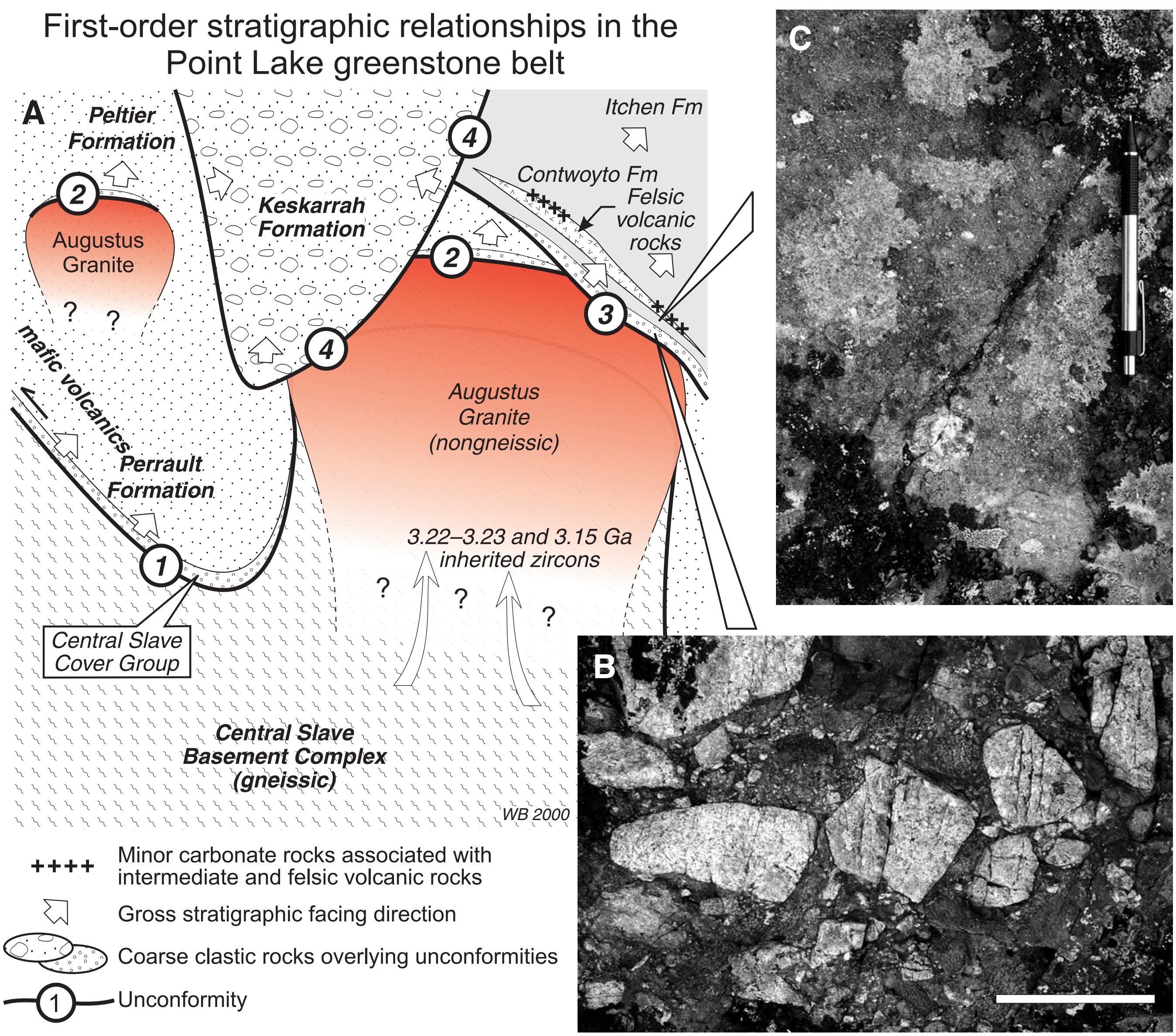

Figure 4A) *Schematic section of stratigraphic relationships in the Point Lake area, highlighting the four temporally distinct unconformities discussed in the text. Each unconformity is overlain by coarse clastic rocks. Unconformity '3' is of particular interest here and is thought to correlate with the sub-Raquette Lake unconformity 280 km to the south.* ***B***) *Conglomerate with angular to rounded Augustus Granite cobbles overlying unconformity '3' (scale bar is 15 cm).* ***C***) *Pebbly, greywacke-like sandstone overlying the basal conglomerate of B) (pen is 15 cm).*

- a thin (5–20 m) blanket of angular to well rounded polymict conglomerate (Fig. 4B), varying from matrix to clast supported; typically rusty weathering, and locally with minor carbonate in the matrix; this conglomerate is petrographically distinct from the better sorted, clast-supported conglomerate of the Keskarrah Formation;
- several hundred metres of massive to locally crossbedded, brownish-weathering, greywacke-like pebbly sandstone (Fig. 4C), which bears little resemblance to quartz- and lithic-rich, pale grey-weathering arenite of the Keskarrah Formation;
- a thin interval of black mudstone, chert, carbonate rocks, and thin felsic tuff; and
- basinal turbidite units of the Contwoyto Formation.

Although the presence of significant structures cannot be ruled out in this section (*see* Henderson, 1988), the above rock units form a rational upward-fining and upward-deepening lithostragraphy at the base of the Contwoyto Formation turbidite pile. The thin felsic tuff units observed just underneath the transition to the basinal turbidite units likely correlate with significant intermediate and felsic volcanic rocks present along strike to the north and referred to by Henderson (1988, 1998) as the 'Samandré' and 'Beauparlant' formations. Hence, further work should be able to precisely date this critical stratigraphic package and test the correlation with the Raquette Lake Formation. Again, carbonate deposits are noted along the contact of these volcanic rocks and the Contwoyto turbidite units (Henderson, 1988).

OTHER CORRELATIVE SECTIONS?

Figure 1 highlights localities across the Slave province where rocks lithostratigraphically similar to those described here have been observed along the contact of regional volcanic piles and overlying turbidite units.

Around the Sleepy Dragon Complex

The diagnostic assemblage of intermediate to felsic volcaniclastic rocks, carbonate rocks, and minor sulphidic chert and black mudstone reappears south of Detour Lake, on the limbs of large, volcanic-cored anticlines that flank the Sleepy Dragon Complex. Furthermore, the diagnostic rock types of the Raquette and Detour Lake formations can be followed from Detour Lake to the northeast along the contact between volcanic rocks and the overlying Burwash Formation, albeit discontinuously because of abundant intrusions of Redout Granite, all the way to the north end of Turnback Lake (Davidson, 1972; Lambert, 1988; this report). There, intercalated felsic volcanic and volcaniclastic rocks and carbonate rocks are again well exposed. Similar deposits are suspected to occur farther north along the Beaulieu River greenstone belt.

Lac Sans-Disant

Felsic volcaniclastic and carbonate rocks have been noted at the top of the greenstone belt overlying the Step'n Duck Complex (Bleeker et al., 1999) northeast of Beniah Lake, at Lac Sans-Disant, immediately below the overlying turbidite deposits.

Brislane Lake

Similar deposits were also observed at an identical stratigraphic level at Brislane Lake. The associated felsic volcaniclastic rocks have been dated at 2678 ± 13 Ma (Frith et al., 1991).

Aylmer Lake volcanic mantled dome

A long traverse across and along the northwestern and western flanks of the volcanic mantled dome south of Aylmer Lake confirmed the presence of felsic volcaniclastic and associated carbonate rocks overlain by a thin, sulphidic, cherty horizon at the top of the mafic-dominated volcanic pile. These felsic volcanic and associated carbonate rocks, which were mentioned briefly in an industry assessment report, occur immediately underneath regional turbidite units that can be correlated with the Burwash Formation.

Healey Lake

Several traverses were made across the Healey Lake Complex and its mantling volcanic rocks in the eastern Slave Province. On the southwest flank of the complex, highly deformed volcaniclastic rocks become progressively more felsic toward the top of the volcanic pile and are overlain by about 10 to 20 m of calc-arenite (Fig. 5), which in turn is overlain by a thin, sulphidic chert horizon at the contact with the regional turbidite units. Similar calc-arenite units, with preserved crossbedding, were observed on both limbs of a flanking anticline cored by volcanic rocks farther west. The only relevant and indirect age constraint is a 2679 ±3 Ma U-Pb age for a synvolcanic diorite unit within the crystalline core of the Healey Lake Complex (van Breemen et al., 1987).

Back River area

Extensive carbonate deposits and carbonate-cemented felsic volcanic breccia overlie the Back River volcanic complex, immediately underneath the overlying regional turbidite units (Lambert, 1998). Iron-formation is present at the contact. Lambert (1998) described carbonate ooliths and stromatolites from the uppermost carbonate rocks. A rhyolite complex near the top of the volcanic pile was dated at 2692 ± 2 Ma (van Breemen et al., 1987).

***Figure 5. A**) Thinly layered calc-arenite overlying the volcanic belt along the southwestern flank of the Healy Lake Complex. The view is toward the southeast along the stratigraphic top of the greenstone belt. Low ground to the southwest (right; mostly lake) is underlain by the regional turbidite units.* ***B**) Close-up of the calc-arenite, showing well preserved crossbedding (at arrows) of quartz and lithic sand in a carbonate-rich matrix.*

Hackett River area

Carbonate rocks are also common at the top of the Hackett River greenstone belt and are commonly associated with felsic volcaniclastic rocks (Frith, 1987). Felsic volcanic rocks near the top of the volcanic pile were dated at two different localities and yield ages of ca. 2690 Ma (Mortensen et al., 1988).

CONCLUSIONS

The Raquette Lake Formation unconformably overlies the southwestern flank of the Sleepy Dragon Complex 70 km northeast of Yellowknife. It was deposited at approximately 2680 Ma across an intravolcanic unconformity that developed in part on the domed synvolcanic intrusion of the Ross Lake Granodiorite.

Twenty-seven lithostratigraphic sections were recorded through the Raquette Lake Formation and the correlative Detour Lake Formation along strike. These sections have been compiled and laterally correlated to obtain a single stratigraphic fence diagram documenting the complex stratigraphy of the Raquette and Detour Lake formations and their relationships with adjacent units. These data, and the underlying field mapping, provide the basis for a broadened definition of the Raquette Lake Formation to include all units overlying its basal unconformity up to and including a black mudstone unit on the contact with the Burwash Formation turbidite units. This definition includes a variety of clastic, volcaniclastic, volcanic, and chemical sedimentary rocks, and two distinct rhyolite horizons. Black mudstone at the top of the formation probably marks an interval of starved sedimentation and basin deepening just before the onset of sedimentation of the Burwash Formation turbidite. Along strike to the north, this interval correlates with the Webb Lake Andesite and Dome Lake Basalt formations (Lambert, 1988). The Raquette Lake and Detour Lake formations, and the overlying Webb Lake Andesite and Dome Lake Basalt are included in a new group, the Ross Lake Group.

It is proposed that the sub-Raquette Lake unconformity correlates with the third of four temporally distinct unconformities in the Point Lake greenstone belt. This testable hypothesis would allow detailed long-distance correlations in the Yellowknife Supergroup across the extent of the central Slave basement complex (Bleeker et al., 1999). Lithological associations similar to the Raquette Lake Formation have also been observed from west to east across the Slave Province and may reflect a craton-scale 'marker horizon' of ca. 2690–2680 Ma that overlaps the putative basement suture at depth (*see* Davis and Hegner, 1992; Bleeker et al., 1999, and references therein). If true, volcanic rocks of the Hackett River belt, the type locality of Kusky's (1989) 'Hackett River arc', must have formed in proximity to the other localities described and, therefore, cannot be exotic. Precise U-Pb dating, detrital zircon characterization, and further stratigraphic and sedimentological analysis of the rocks described in this paper will be key tools in testing the validity of this craton-scale 'marker horizon'.

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