Layered rocks in the map area range in age from Late Proterozoic to Quaternary (Table 1). They include: Upper Proterozoic to Lower Cambrian (?) siliciclastics, carbonates and volcanics of the Hyland Group; Lower, Middle and Upper (?) Cambrian siliciclastics, carbonates and volcanics; slate, calcareous slate and argillaceous limestone of the Upper Cambrian to Lower Ordovician Kechika Group; siltstone, slate and minor limestone of the Middle Ordovician to Middle Devonian Road River Group; siltstone and slate of the Middle Devonian to Mississippian Earn Group; varicoloured chert of possible Mississippian to Permian age, and Tertiary to Quaternary basalt of the Tuya Formation. In addition to these units of known or presumed stratigraphic position, a package of slate, quartz sandstone and limestone of unknown age is termed the Aeroplane Lake panel. Rocks of the Cassiar Terrane, west of the Northern Rocky Mountain Trench fault, were examined in a very cursory manner and no subdivision will be attempted here.

PROTERozoic

CARBONATE AND QUARTZITE (Pcq)

The oldest rocks within the map area are exposed in the Gataga Mountain area. South of Gataga Mountain, in the core of the Gataga Mountain anticline (Figure 10), these rocks comprise a sequence of massive to thickly bedded quartzite, and minor slate to siltstone, up to several hundred metres thick, which apparently lie stratigraphically below the Gataga Volcanics (Photos 4, 5). They are cream to beige-weathering, light grey to grey, massive to thickly bedded quartzites and calcareous quartzite in stratigraphic contact with Gataga Volcanics. The quartzite contains thin interbeds of pale yellowish-green, laminated, possibly tuffaceous slate near its upper contact with the volcanics. The top of the quartzite sequence is marked by a relatively sharp, conformable contact with 2 to 3 metres of similar yellowish-green tuffaceous slate which gives way upward to massive volcanic fragmentals.

In the immediate hangingwall of the Gataga mountain thrust, east and northwest of Gataga mountain, Gataga volcanics sit stratigraphically above several hundred metres of interlayered, massive to thickly bedded limestone, dolomite and quartzite to sandy limestone. East of Gataga mountain, these rocks are exposed in the core of a northeast-erly inclined anticline which is cut off to the northwest by the thrust fault (photos 4, 5). These strata were originally correlated with cambrian siliciclastics and carbonates of unit CSc, based on lithologic similarities (Ferri et al. 1996a,
<table>
<thead>
<tr>
<th>ERA</th>
<th>PERIOD</th>
<th>ROCK UNIT</th>
<th>INFORMAL SUB-UNIT</th>
<th>MAP UNIT</th>
<th>THICKNESS (METRES)</th>
<th>LITHOLOGY</th>
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<tr>
<td>CENOZOIC</td>
<td>Quaternary or Tertiary</td>
<td>Tuya Formation</td>
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<td>Quartz porphyry.</td>
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<td>Boya Hill Intrusions</td>
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<td>EKp</td>
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<td>Feldspar and quartz feldspar porphyry dikes.</td>
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<td>Late Mississippian to Permian</td>
<td>Mount Christie Formation</td>
<td></td>
<td>MPCM</td>
<td>5</td>
<td>Chert.</td>
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<td></td>
<td>Middle Devonian to Early Mississippian</td>
<td>Earn Group</td>
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<td>DME</td>
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<td>Slate, siltstone, chert, minor sandstone, limestone, conglomerate, bedded barite.</td>
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<td></td>
<td>Early Silurian to Middle Devonian</td>
<td>Road River</td>
<td></td>
<td>SDRR</td>
<td>200-700+</td>
<td>Dolomitic siltstone, slate, limestone chert.</td>
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<td></td>
<td>Early Ordovician to Early Silurian</td>
<td>Group</td>
<td>Kidza Facies</td>
<td>ODf</td>
<td>?</td>
<td>Carbonaceous calcareous siltstone, silty limestone, siltstone, argillite, slate, sandstone, chert, conglomerate.</td>
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<td></td>
<td>Late Cambrian to Early Silurian</td>
<td>Kechika - Lower Road River gys</td>
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<td>COGR</td>
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<td>FG</td>
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<td>Kechara Group</td>
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<td>COK</td>
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<td>Conglomerate,</td>
<td></td>
<td>CEG</td>
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<td>Polymict conglomerate, minor slate, siltstone and sandstone.</td>
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<td></td>
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<td>limestone</td>
<td></td>
<td>CCmg</td>
<td>100</td>
<td>Maroon to pink limestone, conglomerate, silstone, sandstone.</td>
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<td></td>
<td>Early to Late</td>
<td>Lower to Upper Cambrian Siliciclastics and Carbonate</td>
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<td>CDlA</td>
<td>10 to 200</td>
<td>Quartzite.</td>
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<td></td>
<td>CDIB</td>
<td>1 to 50</td>
<td>Fossiliferous limestone.</td>
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<td></td>
<td>Cambrian</td>
<td></td>
<td>Csl</td>
<td>up to 1500</td>
<td>Slate, siltstone, sandstone, minor quartzite, limestone.</td>
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<td>Early to Middle Cambrian</td>
<td>Siliciclastics and Carbonate</td>
<td></td>
<td>Csc</td>
<td>400-700</td>
<td>Quartz sandstone, quartzite, limestone, dolostone.</td>
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<tr>
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<td>Early? Cambrian</td>
<td>Quartzite</td>
<td></td>
<td>CQ</td>
<td>200</td>
<td>Quartzite, impure quartzite, quartz sandstone, siltstone, limestone.</td>
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<tr>
<td></td>
<td>Cambrian to Mississippian</td>
<td>Cassiar Terrane</td>
<td></td>
<td>CA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>?</td>
<td>Aeroplane Lake Block</td>
<td></td>
<td>PPal</td>
<td>7</td>
<td>Limestone, phyllite and sandstone.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>PPac</td>
<td>7</td>
<td>Calcareous phyllite and schist.</td>
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<td>PPaS</td>
<td>7</td>
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<td>PALEOZOIC</td>
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<td>CPF</td>
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<td>Volcaniclastic, flows.</td>
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<tr>
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<td></td>
<td></td>
<td>CPc</td>
<td>100</td>
<td>Limestone, sandy limestone, minor quartzite.</td>
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<td></td>
<td>CPa</td>
<td>500</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper Gataga Volcanics</td>
<td></td>
<td>Mcvic volcanics, minor flows.</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
<td></td>
<td>CPe</td>
<td>100 to 200</td>
<td>Limestone to sandy limestone.</td>
</tr>
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<td>Cambrian or Late Proterozoic</td>
<td>Limestone and Sandy Limestone</td>
<td></td>
<td>CPc</td>
<td>2007</td>
<td>Slate with minor siltstone and sandstone.</td>
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<td>Slate and Siltstone</td>
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<td>CPa</td>
<td>2007</td>
<td>Slate with minor siltstone and sandstone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silstone, Slate and Sandstone</td>
<td></td>
<td>CPsm</td>
<td>0 to 300</td>
<td>Maroon to grey slate, siltstone and sandstone.</td>
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<td></td>
<td>Limestone</td>
<td></td>
<td>CPI</td>
<td>0 to 200</td>
<td>Limestone, dolomitic limestone.</td>
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<tr>
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<td>Mcvic volcanics, minor flows.</td>
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<tr>
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<tr>
<td></td>
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<td></td>
<td>Upper Gataga Volcanics</td>
<td></td>
<td>Mcvic volcanics, minor flows.</td>
</tr>
</tbody>
</table>
Figure 10. Main structural elements referenced in the text and their geographic locations.
Subsequent dating of the Gataga volcanics indicates they are Late Proterozoic in age.

Limestone is light grey to grey, fine grained and contains lenses of orange-weathering dolomite. Dolomite beds are grey and buff-grey weathering. Interlayered quartzite is well bedded to wavy or cross laminated and may be calcareous or dolomitic. These rocks grade into calcareous or dolomitic quartz sandstone to sandy limestone and dolostone. There are thin interlayers of olive green and maroon siltstone. Stratigraphic top indicators place rocks immediately below the Gataga Volcanics in an upright position. To the northeast, across the core of the anticline, these rocks are overturned where they are in contact with the Gataga Mountain thrust fault.

The upper contact of this panel, with the Gataga Volcanics, appears unremarkable and conformable. Dolostone at the top of the section gives way to several metres of green-grey or blue-grey shaly siltstone with orange weathering dolostone beds and lenses. This, in turn, grades upward into several metres of wavy or flaggy bedded, interlayered green-grey chert to siliceous siltstone or recrystallized chert and olive green-grey cherty slate with numerous egg-shaped nodules of dolostone. These lithologies pass into 1 to 2 metres of green-grey siltstone and black, paper slate immediately underlying the volcanics. At one of the few localities this contact is accessible, less than half a metre of scree obscures the contact between basal tuffaceous siltstones and tuffs of the Gataga Volcanics and underlying siltstone and black slate. Lithologies on either side of the contact appear undeformed and conformable.

**Age and Correlation**

The age of these rocks is inferred only from their stratigraphic position below the Upper Proterozoic Gataga Volcanics. The upper part of the volcanics has yielded a 690 Ma U-Pb age (see section below). Regional correlations suggest the Gataga Volcanics signal the initiation of Windermere sedimentation in this part of the Cordillera. The conformable nature of the underlying quartzites suggests they are part of the same depositional sequence as the Gataga Volcanics and hence are part of basal Windermere stratigraphy.

Within the Rocky Mountains, a possible correlative to this unit occurs several hundred kilometres along strike to the southwest, in the Deserters Range. Upper Proterozoic rocks in the Deserters Range are assigned to the Misinchinka Group and have been described in detail by Evenchick (1988). The basal part of Misinchinka stratigraphy contains several hundred metres of quartzite which rests nonconformably on 728 Ma age gneissic granite. This is overlain by 400 metres of interlayered quartzite and amphibolite. Evenchick (1988) suggested that the amphibolites represent flows, although the lack of any primary
structures or crosscutting relationships does not rule out their emplacement as sill-like bodies. The implied age, lithologic characteristics and intercalation with mafic igneous rocks suggests that basal quartzite of the Misinchinka Group in the Desereters Range may be correlative with quartzite stratigraphically below Gataga Volcanics, in the core of the Gataga Mountain anticline.

Lithologies east of Gataga Mountain suggest a warm, shallow-water shelf environment. Rapid lateral facies changes are evidenced by the disappearance of limestone and dolomite towards the core of the Gataga Mountain anticline. If these sediments, together with the overlying Gataga Volcanics, represent basal Windermere stratigraphy, the implied carbonate shelf environment is in sharp contrast to the documented glacial deposits present within basal Windermere sections in the southern and northern Cordillera (see Gabrielse and Campbell, 1991).

This apparent contradiction in depositional regimes raises several questions. One is the placement of carbonate underlying sediments of unit \( Gm \) as opposed to the documented glacial deposits present within basal Windermere sections in the southern and northern Cordillera. Perhaps the most likely explanation for the apparent upward transition of dolomite and quartzite into finer sediments typical of those at the very base of the volcanics. Furthermore, lithologies on either side of the contact show no evidence of deformation, although a major fault could easily be hidden within these incompetent lithologies.

The Gataga Volcanics have sections of tuff to lapilli tuff with abundant calcite in the matrix, probably of depositional origin. This would lend support to the inference that deposition of these volcanics and underlying sediments occurred in a warm and shallow shelf setting.

There is no disputing the presence of glacial deposits at the base of the windermere in certain parts of the cordillera. Dating of associated igneous rocks at these localities suggests that deposition took place 740 to 780 Ma ago, some 40 to 90 Ma prior to deposition of the Gataga Volcanics and underlying sediments of unit \( Pf \). Perhaps the most likely explanation is that these sediments and the overlying Gataga Volcanics represent a younger, post-basal windermere volcanic event which occurred during much different depositional conditions; a reasonable possibility considering the time span involved.

**GATAGA VOLCANICS**

A composite body of bimodal, mafic and felsic volcanic rocks crops out around Gataga Mountain where it forms much of the large, complex, northeasterly overturned Gataga Mountain anticline (Photos 4, 5). The volcanics are subdivided into two packages: a unit of alkaline mafic to intermediate volcaniclastics and flows (\( Pgm \)) and a sequence of felsic clastic volcanics (\( Pg \)). Unit \( Pfo \) comprises less than 10 per cent of the Gataga Volcanics and is found along the southwestern margin of unit \( Pgm \).

**Unit \( Pgm \)**

Typically, the volcaniclastics comprise pale to mid-green or greenish grey tuffs (Photo 6). Very fine to medium-grained ash tuff and lithic tuff may be massive and homogeneous, or bedded in units up to about 1 metre thick. Some rocks are more thinly bedded or laminated and were mapped as volcanic wacke or tuffaceous siltstone. Grading is present locally and crossbedding was tentatively identified in some outcrops. Rare lenses of creamy grey chert and calcareous siltstone or tuffaceous limestone are present within the tuffs. At one locality, the base of the volcanics appears to rest on a dolomitic limestone. Here, the first few metres of tuff are micaceous and pale grey rather than the usual green colour, probably due to carbonate and sericitic alteration at the contact.

Volcanic flows, up to tens of metres thick, are subordinate, forming about 25 per cent of the volcanic sequence. They are usually pale to mid-green and very fine to medium grained. Some are vesicular and amygdaloidal, others are finely porphyritic. Dark green spots in some volcanic rocks may be chloritized andesine. Basaltic andesite has textural features of pillow breccia and flow breccia are present locally (Photo 7); pillows can be a metre across and many show radiating pipe vesicles and zoning. Preliminary lithogeochemical analysis of the volcanics indicates that they are generally alkalic basalt (Figure 11).

Intermediate to felsic deposits were rarely encountered within unit \( Pgm \). On Gataga Mountain, a thin section of flow or crystal tuff of basaltic andesite has textural features suggesting welding. This volcanic sequence is interesting in that it contains phenocrysts of feldspar and 1 to 2 per cent quartz; the latter not typical of rocks with such compositions (Table 2).

One of the most common and distinctive lithologies is a coarse lapilli tuff or agglomerate which underlies large areas on the slopes west of Gataga Mountain. This rock is generally massive and contains rounded to angular fragments in a coarse-grained chloritic or ferrocarbonate matrix (Photo 8). The most common clasts, which are pale green or buff-grey, and very fine grained, are thought to be variably altered volcanic rock, possibly carbonatized or sericitized basaltic lava or tuff, although some material may contain olivine. Some are porphyritic. Less commonly, fragments consist of quartzite and siltstone, or rare limestone. Some clasts are maroon, suggesting partially subaerial sources. The largest clasts are 30 to 40 centimetres across, but most are much smaller. Overall, the deposit is poorly sorted or unsorted. The matrix is grey to green and generally weathers to a grey to rusty orange-brown colour due to the ferroan carbonate in the matrix. The rock is provisionally interpreted as a volcaniclastic (and epiclastic) deposit laid down in a carbonate environment. This is supported by the presence of pods or zones of limestone, orange-brown weathering dolostone and rusty calcareous
Photo 6. Lapilli to agglomeratic tuff of unit Pgon. 15 centimetre ruler for scale.

Photo 7. Pillows in volcanics of unit Pgon, near Gataga Mountain.
Figure 11. (a) Zr/TiO$_2$ versus SiO$_2$ for mafic volcanics of units PGm, PGf and TQT (after Winchester and Floyd, 1977). Samples from units PCv and CPv are too altered to plot on this diagram. Com/Pan: Comendite/Pantellerite; TrAn: Trachyandesite; Bas/Trach/Neph: Basanite/Trachybasanite/Nephelinite; Sub-AB: Sub-alkaline Basalt; AB: Alkali Basalt. (b) Nb/Y versus Zr/TiO$_2$ for mafic volcanics of units PGm, PGf, TQT, PCv and CPv (after Winchester and Floyd, 1977). Note clusters formed by mafic volcanics of PGm and PGf, TQT, PCv and CPv. Bsn/Nph: Basanite/Nephelinite; Alk-Bas: Alkali Basalt; TrachyAnd: Trachyandesite; Com/Pant: Comendite/Pantellerite. (c) Th-Hf-Nb triangular discrimination diagram from Wood (1980) using data from units PGm, PGf, TQT, PCv and CPv. Fields are: A: N-type MORB; B: E-type MORB and tholeiitic within-plate basalts and differentiates; C: alkaline within-plate basalts and differentiates; D: destructive plate margin basalts and differentiates; dashed line separates tholeiitic island-arc basalts (upper part) from calcalkaline basalts (lower part). Again, note clusters formed by mafic volcanics of PGm and PCv and CPv.
**TABLE 2**
MAJOR, MINOR, TRACE AND RARE EARTH ELEMENT ANALYSES OF SELECTED VOLCANIC ROCKS FROM UNITS PGm, PgV, CPV, PCV AND TQT

MAP NUMBERS REFER TO LOCALITIES PLOTTED ON FIGURES 2 [Section (a)] AND 3 [Section (b)]

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<tr>
<th>Sample</th>
<th>Unit</th>
<th>Easting</th>
<th>Northing</th>
<th>CaO</th>
<th>K2O</th>
<th>P2O5</th>
<th>SiO2</th>
<th>Al2O3</th>
<th>MgO</th>
<th>Na2O</th>
<th>Fe2O3</th>
<th>TiO2</th>
<th>MnO</th>
<th>Cr2O3</th>
<th>LOI</th>
<th>Total</th>
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<td>6499566</td>
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<tr>
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**Notes:**
- Major oxides, Ba, Rb, Sr, Zr analyzed by x-ray fluorescence at Cominco Laboratories, Vancouver, BC.
- REE analyzed by ICP-MS at Analytical Laboratories of Memorial University, St. John's, NF.
siltstone within the agglomerates, as well as in other parts of the volcanic sequence.

**Unit Pf**

A mappable body of felsic volcanics, up to 100 metres thick, that occurs a few kilometres southeast of Gataga Mountain, consists of pale grey, sericitic and siliceous, crystal-lithic dacitic or rhyolitic tuff to agglomerate. Phenocrysts are composed of plagioclase and quartz, with the former typically dominating. Locally, abundant calcite and dolomite are found in the matrix and appear to be, in part, primary. Chemical analysis of one sample from this suite indicated a rhyolitic composition (Figure 11). Mafic lithologies along the uppermost section of unit Pg are intercalated with felsic volcanics of unit Pf.

**Age and Correlation**

Initial mapping in the area tentatively assigned a Devonian and/or Mississippian age to this volcanic suite (Gabrielse, 1962a). These rocks were subsequently thought to be Middle Ordovician in age, based on inferred stratigraphic position and possible correlation with volcanics of known Middle Ordovician age elsewhere in the Rocky Mountains (Gabrielse and Yorath, 1991). Preliminary mapping by Ferri et al. (1996a, b) suggested a Cambrian age based on their assumed stratigraphic position below Cambrian siliciclastics and carbonates and above archaeocyathid-bearing limestones. Subsequent U-Pb age dating of the Gataga Volcanics yielded a Late Proterozoic age although it is quite possible that the stratigraphically higher Upper Gataga Volcanics are Middle Cambrian (see below).

Zircons were recovered from felsic volcaniclastics of unit Pf. Five zircon fractions were analyzed and a best-fit regression line through these populations gives an upper intercept of 688.9±4.6 Ma (see Appendix 1; Figure 12). This Late Proterozoic age indicates they are part of the Windermere succession, although typical Windermere sediments, seen elsewhere within the map area, have been removed by the profound 150 Ma unconformity at the top of the sequence.

The Late Proterozoic age of these volcanics, together with their rift-related geochemical signature, suggests they may be associated with initiation of Windermere sedimentation. Comparison of geochronological ages for igneous activity correlated with the inception of Windermere deposition across the Canadian Cordillera indicates an average age of approximately 750 Ma, some 60 Ma older than the Gataga Volcanics (Figures 13 and 14). The younger age of the Gataga Volcanics suggests it may be a separate event or that rifting was more protracted in this region. Stratigraphic arguments were presented earlier (see section on unit Pc) which suggests these volcanics probably represent a younger tectonic event.

Mafic volcanics are exposed at the base of the Windermere Supergroup at various points along the Canadian Cordillera (Figure 11). In the Coal River map area, Gabrielse and Blusson (1969) describe mafic volcanics similar to the Gataga Volcanics at the base of the Lower Cambrian (Unit 3). Although these authors suggest Coal River volcanic rocks are of Early Cambrian age, due to their resemblance with similar volcanics intercalated with sediments of known Cambrian age and their apparent concordance with overlying Lower Cambrian clastics, the relationship with succeeding sediments may be unconformable, suggesting they could be correlatives with the Gataga Volcanics.
The geochronological age of the Gataga Volcanics, as noted earlier, is younger than the average age of dated igneous rocks associated with Windermere basin initiation (Figure 14). Several hundred kilometres to the southwest, in the Deserters Range, amphibolite of possible volcanic origin sits stratigraphically above 200 metres of quartzite which, in turn, rests nonconformably on orthogneiss dated at 728 ±9/7 Ma (Evenchick et al., 1984; Evenchick, 1988). Although the orthogneiss is interpreted to be derived from igneous rocks associated with inception of Windermere sedimentation, the nonconformable nature of the succeeding sediments and volcanics suggests the latter are slightly younger. This, together with the errors on the respective geochronological ages, indicates that the amphibolite (mafic volcanics) in the Deserters Range is about the same geochronological ages, indicates that the amphibolite younger. This, together with the errors on the respective sediments and volcanics suggests the latter are slightly.

The Hyland Group, in its type area, has been subdivided into the Yusezyu and Narchilla formations (Gordey and Anderson, 1993). The Yusezyu Formation is dominated by coarse clastics, shale and minor limestone, whereas the Narchilla Formation contains thick sections of shale with lesser siltstone and sandstone. Poor exposure in the present map area does not allow subdivision of the Hyland Group. Lithologies typical of each formation were recognized, al-
though coarse clastics typical of the Yusezyu Formation are by far the most dominant lithologies exposed.

Rocks of probable Proterozoic age were observed in a handful of outcrops along the southwest slopes of the broad valley containing Netson Lake. These exposures consist mainly of grey to green, greasy phyllite with minor thin-bedded, very fine grained sandstone. Lesser interlayered light to dark grey and cream-coloured slate, siltstone (calcareous) and very fine sandstone were also encountered.

North of Horneline Creek, Hyland Group rocks are found along the eastern and western margins of the map area. These rocks were mapped along several creek valleys west of Aeroplane Lake, probably in a thrust panel, and Proterozoic coarse clastics are quite well exposed on the higher peaks and ridges east and northeast of Horneline Creek. The west side of Chee Mountain consists of a large thrust panel of Hyland Group rocks, which continues northwards across Boya Creek. Excellent exposures of Hyland Group gritty sandstones and conglomerates occur on the ridges radiating from Tatisno Mountain in the northern part of the map area. Isolated outcrops of clastics in the Liard Plain to the west, are also thought to be Late Proterozoic in age.

The Hyland Group on Chee Mountain is dominated by grey to olive green or red brown to maroon, well cleaved slate or phyllite to silty slate. Locally, slate forms sections up to several hundred metres thick. Almost as common as these pelitic rocks are thickly bedded to massive, grey-brown weathering, beige to grey quartz-feldspar sandstone to granule conglomerates, which crop out along the top of Chee Mountain and on creeks cutting its western flank. Some quartz grains display an opalescent blue colour, and feldspar constitutes 5 to 15 per cent of the coarser clastics. Sandstone is locally quite impure, approaching a

Photo 9. Feldspar-bearing grits of the Hyland Group exposed along the ridge containing Tatisno Mountain. The coarse and very immature nature of these sediments suggests they are part of Yusezyu Formation.

Photo 10. Feldspar-bearing conglomerate assigned to the Hyland Group, found along the eastern edge of the map area, east of Moose Lake. The roundness of the clasts, together with the lack of significant argillaceous matrix, indicates a cleaner or more reworked sediment than that shown in Photo 9. Width of photo approximately 60 cm.
wacke, with a greenish grey argillaceous matrix. The immature nature of these coarse clastics is also indicated by poor sorting and the subangular to subrounded clasts.

Slaty or phyllitic rocks are generally interbedded with the coarse siliciclastics, in sections from 0.1 to 20 centimetres thick. Some display ball and pillow or flame structures, and others locally contain rip-up clasts of darker slate or siltstone.

Dark grey to brown or orange-brown-weathering, dark grey, finely crystalline, massive to platy limestone up to 20 metres thick forms prominent outcrops along the top of Chee Mountain. It is not known if these exposures represent different horizons or the structural repetition of one section of limestone. The upland immediately northwest of Boya Creek, informally called Boya Hill, is underlain by rocks believed to belong to the Hyland Group, but may include rocks of Cambrian age. Typical grey to orange-weathering, coarse sandstone to granule conglomerate of the Hyland Group outcrops at the southwest end of Boya Hill. Clasts are predominantly quartz with lesser feldspar and mica. These rocks are associated with several ribs of medium to dark grey, massive to platy, sugary limestone and interlayered pale grey to greenish and maroon, massive and well cleaved slate. A large gossanous zone composed of iron carbonate and coarse, cream-coloured calcite and dolomite cuts across slate and limestone.

Southeast of Graveyard Lake, rocks assigned to the Hyland Group are very similar to those along Chee Mountain, except that they lack the distinctive dark grey limestone. They consist mainly of grey, green-grey or green phyllite or slate, with sections of grey to brownish grey, coarse sandstone to granule or pebble conglomerate with characteristic opalescent blue quartz, chalky white feldspar and angular argillite or siltstone clasts. Conglomerate clasts are subangular to subrounded and supported by a finer sandstone matrix. Interlayered with these coarse-grained rocks are massive to crosslaminated white to brownish quartzite, well laminated orange to brown weathering, grey to beige, well cleaved slate and siltstone, and dirty, orange to brown-weathering sandstone. The latter contains minor detrital mica and displays flute casts.

Hyland Group rocks along the upper part of the Red River and west of Aeroplane Lake are very similar to those described above. One difference includes the presence of several intervals of buff to orange-weathering, pale grey to cream, very finely crystalline and platy dolomitic limestone up to 10 metres thick.

Perhaps the best exposures of Hyland rocks in the map area are found on Tatisno Mountain. Interlayered, well cleaved, greenish-grey to grey or tan laminated slate to silty slate and fine-grained brown-weathering sandstone to quartzite predominate. These lithologies are punctuated by massive, tan weathering, beige to white, very coarse sandstone to pebble conglomerate in beds up to 2 metres thick (Photo 9). The clasts consist of angular to subangular quartz (some are polycrystalline with a well developed fabric), white feldspar, grey to dark grey argillite or siltstone, and rare mica. The compositions, angular shape and size of the clasts, together with scouring at the base of many beds, indicates that these are immature, high-energy deposits, most likely derived from an uplifted, steep, source terrain dominated by igneous and metamorphic rocks.

Northwest of Tatisno Mountain, several kilometres south and east of Nancy Lake in the Liard Plain, sparse outcrops of coarse sandstone and conglomerate are tentatively assigned to the Hyland Group. They consist of grey to tan-weathering, grey to cream, massive to thickly bedded, greywacke to conglomerate or breccia. The granule to pebble-sized conglomerate clasts are supported by a coarse to very coarse-grained sandstone to wacke matrix. Clasts are rounded to angular and composed of distinctive green chert, tan to grey or black chert or siliceous argillite, maroon argillite, quartz (locally blue), feldspar and tuffaceous granules.

**Age and Correlation**

The age of the Hyland Group is latest Proterozoic to Early Cambrian (Gordey and Anderson, 1993). The Yusezyu Formation is entirely Late Proterozoic, whereas the distribution and makeup of trace fossils in the Narchilla Formation suggests that the Precambrian - Cambrian boundary is contained in its upper part (Gordey and Anderson, op. cit., Fritz et al., 1983).

In the map area, assignment of rock packages to the Hyland Group is based primarily on the presence of distinctive coarse, immature, feldspar-bearing quartz clastics and on their stratigraphic position below rocks of Cambrian age. These coarse clastics are in turn associated with distinctive lithologies described from the type locality of the Hyland Group. These include sections of grey, green and maroon slate and dark grey, fine-grained limestone, which are typically found within the upper Hyland Group, particularly in the Narchilla Formation. It is only between Chee Mountain and Boya Hill that all lithologies characteristic of the entire Hyland Group are found, although they could not be confidently assigned to the formation level.

Along the east margin of the map area, and extending up to Tatisno Mountain, all exposed rocks that are assigned to the Hyland Group are probably entirely part of the Yusezyu Formation. In the south, these rocks are succeeded stratigraphically by siliciclastics and minor carbonates of assumed Cambrian age. Although this implies possible removal of the Narchilla Formation, a more probable explanation is that these Cambrian siliciclastics represent lateral or shallower water equivalents of the Narchilla Formation. The Narchilla Formation is known to be laterally equivalent to the Vampire Formation (Gordey and Anderson, 1993; Fritz, 1991) which is very similar to sections of unit Cs found in the map area.

In the Selwyn Mountains, Gordey and Anderson (1993) place the Hyland Group within a basinal or off-shelf setting and imply that these units form the base of the Selwyn Basin. Furthermore, Hyland Group lithologies suggest deposition from sediment gravity-flows and the overall stratigraphic sequence indicates deepening of the basin during Narchilla time (Gordey and Anderson, 1993). These rocks are lateral equivalents of coeval slope and shelf strata.
which, in the Mackenzie and Selwyn mountains, include the Vampire and Backbone Ranges formations, respectively.

Historically, the coarse, feldspar-bearing clastics of the Hyland Group have been correlated with similar, widespread lithologies of the Windermere Supergroup. This correlation would equate the Hyland Group with the Misinchinka Group of the Northern Rocky Mountains, the Miette Group of the Southern Rocky Mountains and the Ingenika Group of the northern Omineca Belt (Figure 13). Godsey and Anderson (1993) argue that the entire Hyland Group may be Eocambrian and slightly younger than true Windermere grits. Although this may be true for the exposed parts of the Hyland Group in the type locality, the base of the Yusezyu Formation is not seen and could be somewhat older. Geochronology of the Gataga Volcanics indirectly suggests a minimum Late Proterozoic age for the base of the Hyland Group, which is consistent with basal Windermere rocks of the Misinchinka Group further south.

CAMBRIAN OR LATE PROTEROZOIC

Approximately 5 kilometres southeast of Terminus Mountain is found a unit of mafic volcanics that lies stratigraphically above and is spatially associated with the Gataga Volcanics (Figure 2). These volcanics are here informally referred to as the Upper Gataga Volcanics. Originally, these rocks were grouped with the Gataga Volcanics due to their macroscopic and chemical similarities (Ferri et al. 1996a, b). The Gataga Volcanics were initially believed to be Cambrian in age due, in part, to the apparent stratigraphic relationships between the Upper Gataga Volcanics and surrounding sediments (Ferri et al., 1996a, b). Subsequent dating of the Gataga Volcanics has shown them to be Late Proterozoic, implying a similar age for the Upper Gataga Volcanics.

If the Upper Gataga Volcanics and Gataga Volcanics represent the same eruptive event, then the relationships seen between the package containing the Upper Gataga Volcanics and surrounding units of known Cambrian age are complicated by faulting. Alternatively, the Upper Gataga Volcanics may be the product of a separate, younger volcanic event. This would indicate the presence of a profound unconformity between the two volcanic packages of some 150 Ma. Furthermore, the alkaline nature of these volcanics would indicate a Cambrian extensional event. This interpretation is supported regionally, and within the map area, by Cambrian age sedimentary deposits most likely related to extensional tectonism (unit CGG; Taylor et al., 1979; Fritz, 1979; Gabrielse and Yorath, 1991).

In summary, there is stratigraphic evidence to suggest that the Upper Gataga Volcanics are Cambrian. Yet a Late Proterozoic age is also suggested by their chemical similarity and close spatial association with the Gataga Volcanics. As such, a provisional Cambrian or Proterozoic age is suggested for these volcanics and associated units until more information is obtained which establishes their age unequivocally.

Similar complexities are encountered when assigning a stratigraphic age to siliciclastics, carbonates and minor volcanics along Boya Hill. These rocks bear similarities to both Cambrian and Late Proterozoic sequences within the map area.

GATAGA MOUNTAIN AREA

Limestone (CPI)

A few hundred metres of buff to grey-cream weathering, grey platy to massive limestone to dolomitic limestone cap the northwestern, down-plunge termination of the Gataga Volcanics. It is cut off on the northeast side of the Gataga Mountain anticline by the Gataga Mountain thrust. On the western limb of the anticline it thins southeastward until it is unmappable at the present scale, although a thin carbonate up to 10 metres thick is sometime encountered between unit CPsm and the Gataga Volcanics. The limestone is typically well bedded and laminated to crosslaminated. It contains lenses of grey chert or beds of maroon and/or green to grey slate, siltstone or very fine sandstone as in unit CPsm. It is also interlayered with lithologies of unit CPsm at its upper contact.

Siltstone, Slate and Sandstone (CPsm)

Massive to thinly bedded maroon or grey-green to grey slate, siltstone or very fine laminated sandstone conformably overlie limestone of CPI. Lithologies are typically maroon in colour, although the unit commonly contains sections of interlayered green and grey slate to siltstone or very fine sandstone (Photo 11). Malachite staining was seen at one locality. The unit thins and disappears on the eastern limb of the Gataga Mountain anticline. It also disappears, together with the Upper Gataga Volcanics, northeastwards within the core of the anticline. It is believed this is a facies relationship whereby lithologies of unit CPsm are replaced by those of unit CPS. On the northeast limb of the anticline, unit CPsm is assumed to be cut off, together with CPv, by the Gataga Mountain thrust fault.

Slate and Siltstone (CPS)

A package of slate with minor siltstone and sandstone is exposed north of the eastern extension of the Upper Gataga Volcanics, across a syncline cored by carbonate of unit CPC. This sequence is composed primarily of grey to rusty brown weathering, grey to greenish grey slate and banded slate with rare thin lenses or laminae of light grey quartz sandstone to coarse siltstone with micaceous partings. These lithologies appear to grade upward into carbonate of CPC. They can be traced northwesward where they are believed to underlie lithologies of unit CSC.

Limestone and Sandy Limestone (CPC)

Several hundred metres of massive, cream-weathering, grey limestone to sandy limestone and minor dolomitic limestone occur in the core of a syncline at the northern limit of the Gataga Volcanics. At the base, this carbonate section is locally composed of buff to orange-weathering, platy to flaggy limestone. Local thin layers of green slate and sections of thin-bedded grey to grey-brown quartzite and calcareous quartzite also occur, as well as algal-like structures at the south end of its exposure.
Upper Gataga Volcanics ($\text{CPv}$)

Stratigraphically above the Gataga Volcanics, and separated from them by several hundred metres of limestone and fine siliciclastics of units $\text{CPsm}$ and $\text{CPl}$, are mafic volcanics with similar textural and chemical characteristics. These rocks also interfinger with siliciclastics and carbonates of units $\text{CPl}$, $\text{CPsm}$ and $\text{CPs}$, which bear strong similarities to lithologies of known Early and Middle Cambrian age found elsewhere in the map area.

The volcanics on the west flank of the Gataga Mountain anticline, some 10 kilometres northwest of Gataga Mountain, are probably only a few hundred metres thick. The best exposures are along the higher ridges and in creek valleys cutting the section. The volcanics consists of light green to buff or brown-weathering, green volcanioclastics and dark green, massive basalt. Volcanioclastics are dominated by massive to laminated crystal and crystal-lithic tuffs which are interlayered with lesser lapilli tuff and volcanic breccia. Larger volcanic clasts are composed of green aphanitic to amygdaloidal basalt. The volcanioclastics are locally calcareous and interbedded with grey micritic limestone. Dark green, aphanitic to finely porphyritic (pyroxene?) and commonly amygdaloidal basalt forms sections several metres thick. The northern termination of this unit consists of fine to medium-grained gabbro(?) together with volcanioclastics which locally interfinger with maroon and green slates of unit $\text{CPsm}$.

Only two geochemical analyses were obtained from volcanics of this unit (Table 2). Classification of these volcanics based on major elements is questionable due to sea floor alteration and metamorphism. Although classification schemes based on less immobile trace elements indicate the volcanics, as with the Gataga Volcanics, are alkaline, they also suggest they are somewhat more so, being of basanite or nephelinite composition (Figure 11).

Age and Correlation of Units $\text{CPl}$, $\text{CPsm}$, $\text{CPs}$, $\text{CPC}$ and $\text{CPv}$

The relationship between limestone of $\text{CPl}$ and the underlying Gataga Volcanics is not known. This limestone is interlayered with lithologies of unit $\text{CPsm}$ which is inferred to be either Cambrian or Late Proterozoic in age. Maroon and green slate, typical of $\text{CPsm}$, are interlayered with thin beds of volcanics near the northern termination of unit $\text{CPv}$. These two units are assumed to terminate against an inferred thrust fault. This fault was not observed, but is required in order to accommodate the map configuration which has the Upper Gataga Volcanics apparently sitting stratigraphically above archaeocyathid-bearing limestones of unit $\text{CSc}$. Northwestward, along the hangingwall of the inferred
thrust, which carries units CPsm and CPv, distinctive maroon clastics and carbonates of Ccgm are exposed stratigraphically above unit Cl. These maroon sediments would be on strike with unit CPsm if not for the inferred thrust fault.

Lithologically, rocks of CPs are very similar to sections of Cs siliciclastics seen elsewhere in the map area. At the north end of the syncline cored by unit CPC, slates of CPs appear to grade into grey or grey-brown quartzite and calcareous quartzite, which in turn pass upwards into carbonate and sandy carbonate of CPC. At this locality, these same quartzites sit stratigraphically above volcanics of CPv. Mapping indicates that lithologies of CPsm, together with those of CPv, lens-out into those of CPs along the core of the syncline containing unit CPC. Furthermore, rocks of CPC bear strong resemblance to Cambrian carbonate sequences of either CSC or CC.

In summary, the age of the Upper Gataga Volcanics, and for that matter the other units discussed in this section, is equivocal. Associating these volcanics directly with the Gataga Volcanics would require a Late Proterozoic age. Yet stratigraphic relationships between these volcanics, and sedimentary sequences above and below them, suggest a Cambrian age. Correlation of unit CPsm with conglomerate and maroon rocks of unit Ccgm would be appealing and consistent with tectonic environments suggested by each group of rocks. Coarse clastic rocks of Ccgm, together with rapid facies changes of associated units (see section on Ccgm; Figure 15), indicate block faulting, probably related to extensional tectonism. Alkaline volcanism of the Upper Gataga Volcanics would be entirely compatible with this scenario.

If these rocks are Cambrian in age, correlatives may be found in the nearby Coal River sheet. Several possibilities are documented, with the thickest consisting of over 125 metres of green, fine grained vesicular volcanics flows and breccias which underlie sandy dolomite of Early Cambrian age (Gabrielse and Blusson, 1969).

**BOYA HILL**

Rocks along the main part of Boya Hill are variously hornfelsed, hydrothermally altered and mineralized. These siliciclastics and carbonates share similarities with both Cambrian and Upper Proterozoic sequences. The correlation of these sediments is further complicated by the presence of interbedded alkaline volcanics which may be equivalent to either the Gataga or Upper Gataga volcanics, the latter believed to be Cambrian in age. As such, these rocks are given a provisional Proterozoic or Cambrian age.

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**Figure 15.** Correlation of various Cambrian units in the southern part of the map area.
until further information is gathered which will conclusively assign a stratigraphic position.

The sequence on Boya Hill has been subdivided into three units; a lower succession of siliciclastics and minor carbonates (PCs) and a succeeding section of carbonate (PCC). Volcanics of unit PCv form lenses within sediments of PCs.

**Unit PCC**

This unit is quite monotonous and consists primarily of grey, massive to thickly bedded, equigranular, medium-grained crystalline limestone or sandy limestone. It forms the most prominent exposures along the top of the ridge. It is extensively recrystallized to marble near small felsic intrusions and is massive to thinly bedded and medium to coarsely crystalline. Marble locally contains bands of green to pink calcisilicate skarn, in places cut by sulphide veins. Carbonate grades into limy sandstone along the eastern part of the ridge where sandy horizons stand out as resistive ribs within limestone or marble.

**Unit PCs**

These rocks are well exposed on the southwest-facing slopes and consist primarily of interlayered brown-weathering, grey to dark grey slate, slaty siltstone to fine quartz sandstone or greywacke, pale to medium grey chert and limestone (Photo 12). Limestone forms discontinuous beds or lenses up to 10 centimetres thick. Laminated grey chert and fine-grained limestone locally form conspicuous well bedded, regularly intercalated sequences.

Exposures on the northwest-facing slopes of Boya Hill include interlayered laminated to cross laminated quartz sandstone, siltstone and slaty siltstone; chert; interlayered chert and quartz sandstone or quartzite; and recrystallized limestone.

**Unit PCv**

The thickest section of volcanics is found southwest of the Main Face where they form a structurally offset unit several hundred metres thick. These are interpreted to join with thin horizons of volcanics along the Main Face, although the latter may constitute a separate horizon or lens. Typically they are buff to orange-brown weathering, green to brown tuff and lapilli tuff. Clasts consist of feldspar(?) crystals and feldspar porphyry. The rock is very calcareous, suggesting intense alteration; in thin section it is evident that the original clastic components have been pseudomorphed by calcite and quartz. Peatfield (1979a) and Moreton (1984) also describe agglomerates, amygdaloidal flows and intermixed slates and chert in the area.

Chemical analysis is limited to one sample which indicates these rocks were originally alkalic mafic volcanics (Figure 11).

**Correlations of Units PCs, PCC and PCv**

The general stratigraphic or structural order put forward by Peatfield (1979a) is supported by our mapping. It places the coarser siliciclastic rocks at the base of the section, followed by an interlayered limestone, slate and chert package, which also contains the volcanic subunit. Thick to massive limestone and slate comprise the top of the section. Sandy limestone at the summit of Boya Hill is similar to known Cambrian limestone mapped farther south, although the interlayered chert seen in several localities is not typical of Cambrian sections and may be related to hornfelsing.

The chemistry and overall character of PCv volcanics are similar to those on Gataga Mountain, suggesting a direct correlation. Furthermore, chemical discrimination diagrams in Figure 11 show that the single analysis from these volcanics plots with the weakly defined cluster delineated by data from the Upper Gataga Volcanics. The age of the Gataga Volcanics has been accurately determined as Late Proterozoic (690 Ma), whereas the age of the Upper Gataga Volcanics is equivocal. There is evidence suggesting these latter volcanics are Cambrian (see Section on Upper Gataga Volcanics). This then implies that sediments enclosing unit PCv are, in part or entirely, Late Proterozoic or Cambrian in age. Lithologies of unit PCs bear some resemblance to sandy carbonate and quartzite below the Gataga Volcanics at the base of Gataga Mountain, though the latter forms thicker, more massive beds.

In conclusion, although lithologies along the main part of Boya Hill are entirely consistent with those of Cambrian units elsewhere within the map area, the presence of alkalic mafic volcanics suggests that these sediments may be in part or entirely of Late Proterozoic age.
UPPER PROTEROZOIC AND/OR LOWER PALEOZOIC?

AEROPLANE LAKE PANEL

The term ‘Aeroplane Lake panel’ was first proposed for a suite of rocks found primarily along the ridge tops between Aeroplane Lake and the Kechika River (Ferri et al., 1997a, b). Very little has been added to our understanding of these rocks since we first described them; the initial description of these rocks is still applicable and is presented in the following paragraphs.

Low-grade metamorphic rocks underlying the highland east of Aeroplane Lake and extending down through the lower parts of Davie Creek and toward the Turnagain River are of unknown affinity. Compositionally, some sections bear a strong resemblance to the Kechika Group, and others to clastics and carbonates of Cambrian and Proterozoic age, respectively. In some places these lithologies occur along strike or are intermixed with each other, precluding a simple assignment. Their stratigraphic placement is further complicated by metamorphic recrystallization that has masked primary features in some areas, and by the presence of a second phase of deformation that is not generally seen elsewhere in the map area. The presence of these elevated metamorphic conditions, in conjunction with polyphase deformation, indirectly suggests deeper stratigraphic levels, although younger stratigraphy could also have similarly affected by way of tectonic burial during deformation. The panel has been divided into three packages: 1) calcareous phyllite and schist; 2) siliceous schist and quartz sandstone; 3) limestone, phyllite and sandstone.

Calcareous Phyllite and Schist (P Pac)

Crenulated, finely laminated to banded calcareous phyllites and graphitic phyllites, which locally approach schists in texture, are exposed along the lower part of Davie Creek. Phyllite and schist are thinly interlayered with silty limestone which is locally recrystallized to marble. These higher grade, crenulated rocks continue northwestward into the ridge east of Aeroplane Lake where lower grade, thinly interlayered slate, calcareous slate and grey limestone, very similar to the Kechika Group, are exposed. Directly east of Aeroplane Lake, these calcareous rocks pass along strike into grey to greenish grey phyllites, interlayered with sandy phyllites or with thin laminae of quartz sandstone (Photo 13).

On the eastern slope of this ridge, siliciclastics consist of interlayered dark grey to grey, banded, crenulated graphitic slate, calcareous slate, siltstone, and greenish grey, micaceous quartz sandstone, some of which is feldspathic. Sections up to 10 metres thick of beige to brown-weathering dark grey, finely crystalline, platy to massive limestone with thin phyllite partings occur within the siliciclastics. However, overall this package is much less calcareous than sections to the west.

Photo 13. Noncalcareous carbonaceous to micaceous phyllite belonging to unit P Pac (Aeroplane Lake panel) east of Aeroplane Lake.

SILICEOUS SCHIST AND QUARTZ SANDSTONE (Pas)

Dark grey to grey, crenulated phyllite to schist crops out along the lower part of Davie Creek. These rocks are found immediately along strike with brown-grey to blue-grey weathering, silvery grey slate and phyllite, that is interlayered with micaceous quartz sandstone, wacke and siltstone. Siltstone may be graphitic and is interlayered with dark grey, platy limestone. Sections on Davie Creek texturally approach a schist and contain small porphyroblasts of biotite and a carbonate mineral (ankerite?).

Limestone, Phyllite and Sandstone (Pal)

Limestone is the dominant rock type in this unit of the Aeroplane Lake panel. It crops out along the southern crest of the ridge east of the lake, where it forms sections up to 15 metres thick. It is a coarsely crystalline marble, strongly mottled, and contains small phlogopite crystals (Photo 14). Minor pelitic horizons are now composed of crenulated muscovite-chlorite schist and greenish grey calcisilicate. These rocks can be traced into areas of less metamorphosed grey to dark grey, massive to platy limestone with thin phyllite partings. Well layered platy limestone is commonly strongly deformed, displaying several phases of deformation including an early layer-parallel fabric with associated
small intrafolial folds, and a later series of upright folds. Sections of dark bluish grey micaceous quartz-feldspar sandstone to granule conglomerate are found associated with these calcareous rocks.

Age and Correlation

As mentioned above, these rocks, particularly unit PPac, have characteristics similar to those of the Kechika Group and to those of unit Cs. Yet the presence of gritty, feldspathic horizons suggest links to the Upper Proterozoic Hyland Group. The limestone of PPal does not resemble carbonate in Paleozoic units. However, lower grade sections are similar to carbonate of the Hyland Group on Chee Mountain. A similar limestone member is found at the top of the Yusezyu Formation, at its contact with the Narchilla Formation, in the type area of the Hyland Group (Gordey and Anderson, 1993). Although this correlation may be appealing, the calcareous phyllites, and phyllites of PPac bear little resemblance to the coarse clastic-rich parts of the Yusezyu Formation, unless this area represents a region which was sheltered from clastic input, a situation alluded to by Gordey and Anderson (ibid.) for certain parts of the Yusezyu Formation.

The stronger metamorphism and deformation in this package suggest it may, at one time, have been at greater depth than surrounding rocks, and was later uplifted along a deep-rooted fault. This interpretation implies that these rocks are relatively old, perhaps a lower part of the Hyland Group. In summary, the stratigraphic affinities of the Aeroplane Lake panel are enigmatic due, in large part, to the limited outcrop.

CAMBRIAN STRATA

Strata of Cambrian age show the greatest facies variations within the map area. This is best illustrated by the abrupt, northwestern termination of Middle to Late Cambrian carbonates which give way to fine-grained siliciclastics and minor carbonate assigned to unit Cs. A less spectacular facies change also occurs within the dominantly siliciclastic Cambrian section whereby thick sequences of coarser quartz sandstones and quartzites in the southeast are replaced by predominantly shales and siltstones to the northwest. Furthermore, coarse Middle Cambrian conglomerate, and possible volcanic deposits, suggest localized uplift.

Cambrian clastics and carbonates in the area were previously called the Atan Group (Gabrielse et al., 1977; Taylor and Stott, 1973), based on broad similarities with the Lower Cambrian Atan Group in the Cassiar Mountains. The two-fold subdivision of Lower Cambrian strata, as exemplified by the Atan Group in the Cassiar Terrane, is not well developed in rocks of the Kechika Basin. The thick, laterally persistent Lower Cambrian carbonate is missing, or poorly developed, in the Gataga area. Instead, siliciclastics predominate, with only thin layers or lenses of archaeocyathid-bearing limestone. This led Fritz (1980b) to suggest that the term ‘Atan Group’ be restricted to ancestral North American rocks west of the Northern Rocky Mountain Trench.

The broad similarities of the Lower Cambrian siliciclastic succession to rocks of the Gog Group, as defined in the southern Canadian Cordillera, prompted Fritz (1991) and Ferri et al. (1995a; 1996b) to suggest the use of this nomenclature for the Northern Rocky Mountains. Subsequent work by the authors has shown that the term Gog Group is probably not applicable to this part of the Cambrian sequence due to the facies variations and broader age range of the siliciclastics within this package. These siliciclastics, and succeeding carbonates, have broader similarities with Cambrian sequences of the northern ancestral miogeocline, suggesting the use of Selwyn Basin terminology is more appropriate. Poor exposure, coupled with complicated structure, do not allow recognition of a complete section and these units will remain unnamed until more detailed investigations are carried out.

LOWER TO UPPER? CAMBRIAN SILICICLASTICS (Cs)

Fine-grained siliciclastics and minor carbonates of Cambrian age are exposed in several thrust panels within the
map area. The best exposures are in the southern part of the area along ridges east and northwest of Split Top Mountain and extending up to Terminus Mountain. Cambrian siliciclastics within the thrust panel east of Split Top Mountain can be traced north until just south of Horneline Creek where they are interpreted as disappearing within the core of a northwesterly plunging anticline. Similar siliciclastics can be traced along the east side of the map area from the area around Horneline Lake northwards to the region east of Gemini Lakes where they are mixed with conglomerate of probable Middle Cambrian age. Good sections of probable Cambrian siliciclastics are also found along creeks draining the eastern and western sides of Chee Mountain. Well exposed sections of possible Cambrian clastics can also be seen along the lower parts of the Red River and along east-flowing creeks south of it and west of the Kechika River.

The thickest and most continuous section of this unit is exposed in the southeastern part of the map area, extending from the Gataga River to the area south of Netson Lake. Structural sections indicate thicknesses of approximately 1200 metres in the north and 1500 metres in the south, assuming no thrust faults or folds have repeated this rather monotonous package. The section consists predominantly of flaggy, thinly interlayered grey-green to dark grey slate, siltstone and brown to beige, fine-grained quartz sandstone (Photo 15, 16). Most sections are dominated by slate and siltstone with thin planar-bedded sandstone commonly making up less than 20 per cent of the section. Slate and siltstone sections commonly have a grey to dark grey, striped or banded pattern and contain layer-parallel worm burrows or other trace fossils (Photo 17). At the southern end of the map area, the basal part of the sequence contains 10 to 30-metre sections of thick-bedded, tan to white quartzite interlayered with lesser, thin-bedded grey to brown siltstone and green to grey phyllite (Photo 18). Some of the thicker sandstone sections exhibit cross-stratification and wave ripples on bedding surfaces. These sequences may form mappable units up to a hundred metres thick ($g_{sq}$).

In the southern exposure of this panel of Cambrian clastics, approximately 50 to 150 metres of striped or uniform, grey, grey-blue to dark grey to black slate and siltstone are exposed at the top of the section, immediately below the Kechika Group. Immediately north of Bluff Creek, the top of this section contains thin to moderately bedded, grey to orange-weathering grey limestone to sandy limestone, siltstone and black chert layers or nodules.

Cambrian clastic rocks are exposed along the northeast-facing slopes directly south of Netson Lake. Grey and rusty weathering, greenish grey and silvery, banded micaceous slate and siltstone, together with thinly bedded, very fine grained quartz sandstone crop out just northwest of

Photo 15. Thinly interlayered quartz sandstone, siltstone and slate unit $g_{sq}$ in the hangingwall of the Netson Creek thrust, approximately 5 kilometres south of Netson Lake.
Photo 16. Bedding plane picture of quartz sandstone to quartzite of unit Cs, showing ripple structures in an outcrop located 4 kilometres due east of Split Top Mountain.

Photo 17. Bedding-parallel worm burrows in siltstone of unit Cs, approximately 5 kilometres southeast of Split Top Mountain.