802782

Stratigrahic and structural relations along the west-central margin of the Bowser Basin, Oweegee and Kinskuch areas, northwestern British Columbia

C.J. Greig[1]
Cordilleran Division, Vancouver

ABSTRACT

In the Oweegee and Kinskuch areas, southwest vergent structures predominate within the Jurassic and Lower Cretaceous Bowser Lake Group along the northeast margins of basement culminations. In basement rocks in the Oweegee Range, structures pre- and postdate the Lower and lower Middle Jurassic Spatsizi Group. The younger structures may not link kinematically with those in the Bowser Lake Group. In the Kinskuch area, basement structures have southwest-directed shortening.

New fossil localities in the Oweegee and Kinskuch areas contain faunas diagnostic of the Lower Jurassic, thus confirming the presence of Hazelton Group rocks. The Hazelton Group appears to underlie much of the Oweegee dome. Map relations with Permian limestone and the Stuhini and Spatsizi groups suggest that the Hazelton Group was deposited on a surface with significant relief.

[1] Department of Geosciences, University of Arizona, Building #77, Tucson, Arizona 85721 U.S.A.

INTRODUCTION

This report describes preliminary results of 1990 mapping in the Oweegee Range and Kinskuch Lake area, northwestern British Columbia (Fig. 1). The work represents the initiation of a three season mapping program focussing on the stratigraphic and structural relationships between the Jurassic and Lower Cretaceous Bowser Lake Group and its Paleozoic and earlier Mesozoic Stikine terrane basement rocks in west-central Bowser Basin.

Evenchick (in prep.) has proposed that the northern part of the Bowser Basin consists of a latest Jurassic(?) to latest Cretaceous northeast-directed fold belt (Skeena Fold Belt) with shortening of up to 50 % across its greater than 200 km width. This proposal has significant implications for local and regional structural studies and for tectonic reconstructions, and provides the impetus for the present project. The mandate of this study is to examine the poorly known west-central part of the Skeena Fold Belt and Bowser Basin and to investigate how shortening is accommodated in the basement rocks. Thus, the structural transition between the Bowser Lake Group and its basement has been the focus for initial mapping. The stratigraphic transition is also important because basement rocks to the Bowser Lake Group along much of their western margin include precious and base metal-rich rocks of the Lower and Middle Jurassic Hazelton Group. Recent discoveries of significant stratabound mineral occurrences within the upper part of the Hazelton Group have refocussed exploration activity on this stratigraphy and, as a consequence, a better understanding of the distribution of the Hazelton and Bowser Lake groups and of their structural style, may prove of use to mineral explorationists.

This study is funded by the Frontier Geoscience Program as part of the Bowser Basin project, which is under the direction of Dr. C.A. Evenchick. The mapping and associated research forms part of doctoral studies being undertaken at the University of Arizona under the supervision of Dr. G.E. Gehrels.

OWEEGEE RANGE

In the Oweegee Range, a structural culmination, commonly referred to as the "Oweegee dome," forms one of the few places where basement rocks are exposed in the Bowser Basin. The Oweegee dome has been described previously by Koch (1973) and by Monger (1977). Mapping during July of 1990 focussed on the northeastern side of the Oweegee dome and on Bowser Lake Group rocks to the east. Figure 2 shows the distribution of map units in the northern Oweegee Range.

Stratigraphy

Permian limestone

Pale grey weathering Permian limestone occurs on the ridge system northeast of Oweegee Peak, and in several exposures on both sides of the Skowill Creek valley. Exposures low in Skowill Creek valley were not examined. Layering in the dark grey, massive to thick bedded but predominantly medium bedded bioclastic limestone is commonly outlined by discontinuous layers of tan weathering black chert. Fossils are common and include solitary and colonial corals, fusulinids, bryozoans and crinoids.

The limestone body northeast of Oweegee Peak is in fault contact with Late Triassic Stuhini Group rocks and in most places, with Lower and Middle Jurassic rocks of the Hazelton Group as well. Faulted contacts with Hazelton Group rocks were likely originally depositional, as tuffaceous rocks near the contact contain local carbonate fragments and locally, such as at the northernmost end of the limestone, rocks correlative with the Hazelton Group overlie the Permian rocks. Previously, some of the rocks assigned to the Hazelton Group in this study were thought to be older than the limestone (Koch, 1973; Monger, 1977). The complexity of Hazelton Group-limestone contact relationships, both at this locality and west of Skowill Creek, is considered to result from deposition on a surface with considerable relief and later modification by faults.

Stuhini Group

The Stuhini Group includes abundant medium to dark green, thick bedded turbiditic tuffaceous(?) sandstone, somewhat less common black siliceous siltstone, dark green crystal lithic dacite or andesite ash and lapilli tuff, and rare pyritic siliceous tuff, pyroxene-plagioclase phyric basalt, and thin (<30 cm) carbonate lenses. No fossils were found, although Monger (1977) reports the presence of Upper Triassic ribbed belemnites from north of Oweegee Peak. Stuhini Group rocks are in fault contact with Permian limestone to the north and Hazelton Group volcanic rocks to the south and are overlain unconformably along their northeast margin by the Lower to lower Middle Jurassic Spatsizi Group. Stuhini Group rocks reported by Monger (1977) to lie west of Skowill were examined only briefly. They appear to be indistinguishable from overlying Hazelton Group rocks and are tentatively assigned to that map unit.

Hazelton Group

Much of the Oweegee dome is underlain by a thick succession of volcanic and subordinate volcaniclastic rocks of the Lower and Middle Jurassic Hazelton Group. Lower and Middle Jurassic fossils, heretofore unknown from the Oweegee dome, were found west of Skowill Creek and northeast of the toe of Delta glacier.

In exposures of Hazelton Group west of Skowill Creek and south of Mt. Skowill, well-layered and typically gently dipping maroon and green feldspathic crystal lithic ash and lapilli tuff predominate. Farther to the south, more varied lithologies occur. They include limy lapilli and ash tuff, polymictic boulder conglomerate, abundant tuff-breccia, and distinctive buff weathering coarse arkosic wacke that is locally fossiliferous. Near the upper part of the section, rusty and pale weathering dacite to rhyolite flows are common.

Hazelton Group rocks east of Skowill Creek and north of Oweegee Peak, in part previously referred to as pre-Permian

(Monger, 1977), consist mainly of dark green and maroon feldspathic basaltic(?)-andesite lapilli tuff and tuff-breccia, but also include subordinate feldspar porphyritic amydaloidal andesite flows and flow breccia as well as pale weathering dacite to rhyolite flows(?) and flow breccia.

South of Oweegee Peak, the Hazelton Group was examined in detail only at its northern end and at the southernmost end of the Oweegee dome. However, it appears that the intervening area is underlain by gently to moderately dipping massive volcanic units of the Hazelton Group. As with Hazelton Group exposures north of Oweegee Peak, green end maroon feldspathic crystal lithic andesite ash and lapilli tuff dominate; more felsic(?) dust tuff and more mafic (basaltic-andesite?) tuff-breccia are subordinate. Northeast of Delta glacier, near the fault separating the Hazelton and Stuhini groups, lithologies of the Hazelton Group are more varied and more deformed. In addition to the ubiquitous green andesite ash tuff, lapilli tuff and tuff-breccia are local pyroxene feldspar porphyritic basaltic volcanic breccia, fossiliferous medium bedded, pale brown weathering limestone, green to black laminated to thin bedded siltstone and sandstone, and massive pale green to black silty (locally tuffaceous and/or limy) mudstone. Most of the finer-grained rocks in this area, both sedimentary and pyroclastic, display abundant evidence for syn-sedimentary deformation.

Spatsizi Group

Rocks assigned to the Lower to lower Middle Jurassic Spatsizi Group (Thomson et al., 1986) outcrop in a thin (30-250 m) but relatively continuous belt around the northern margin of the Oweegee dome. Thus, they appear to form the basal unit of the "cover" rocks to the basement rocks in the Oweegee dome. Spatsizi Group rocks are characterized by their relatively thin bedded and siliceous character compared to overlying clastic rocks of the Bowser Lake Group. Laminated and thin bedded black siliceous siltstone is the most common lithology, but discontinuous silty limestone layers up to 0.5 m thick, thin bedded chert, and pale weathering pyritic clay-altered dust tuff(?) are also commonly present.

Along the northeast margin of the Oweegee dome, near the headwaters of Deltaic Creek, moderately northeast dipping Spatsizi Group rocks unconformably overlie overturned Stuhini Group rocks which dip steeply to the west. The lowermost bed of the Spatsizi Group in this area is a pebbly siltstone which has up to 10 cm of relief at its base. Immediately overlying rocks are typical of the Spatsizi Group elsewhere in the Oweegee area. The unconformable relationship of Spatsizi with Stuhini group rocks indicates that either Hazelton Group rocks were never depositied on this part of the Stuhini Group or that considerable uplift (and deformation?) must have occurred during or following deposition of the Hazelton Group and prior to deposition of the Spatsizi Group. Contacts with the Hazelton and Bowser Lake groups were not directly observed, but from the distribution of map units end from a general iack of evidence for deformation in the Spatsizi Group, the contacts are inferred to be stratigraphic.

Bowser Lake Group

North and east of the Oweegee dome, the Jurassic and Lower Cretaceous Bowser Lake Group has been tentatively subdivided into three facies: a turbidite facies on the west, a shallow marine facies on the east, and an intervening siltstone-rich facies. The turbidite facies appears to be the oldest of the three, and in general grades upward into the siltstone facies. The siltstone facies appears to grade both upward and laterally into the shallow marine facies. The relationships are consistent with the predominant eastward dips in the units and with their map distribution, but their relative ages are somewhat uncertain because of complex structure and a lack of marker units.

Rocks of the turbidite facies are characterized by thin, medium and thick bedded, fine to medium grained dark grey to black silty sandstone beds with few internal sedimentary structures (AE turbidites). These are interbedded with abundant dark grey to black laminated to massive siltstone. The siltsone facies consists of thick sequences of black siltstone with regularly interbedded (5-10 m) buff weathering, iron carbonate cemented, fine grained sandstones (Fig. 3). Rocks of this facies also display abundant evidence for bioturbation. The shallow marine facies, like the turbidite facies, contains a relatively greater proportion of sandstone than does the siltstone facies. Sandstone of the shallow marine facies, however, is relatively well sorted compared to those of the turbidite facies. Crossbeds are also common and bedding surfaces commonly contain ripple marks. The unit is further distinguished from rocks of the other facies by common bivalve and oyster coquinas.

Structure

Structures in the Oweegee Range may be subdivided on the basis of whether or not they involve the Spatsizi Group. Structures which do not are of course restricted to rocks within the dome, but may nevertheless be difficult to distinguish from younger structures because all are brittle and later may have reactivated earlier. At this preliminary stage of the study, prior to a thorough analysis of structural data, it appears difficult to kinematically link structures within the dome to those in the Bowser Lake Group.

Within the Oweegee dome, the most notable pre-Spatsizi structures are northwest dipping fault(s) which place Permian limestone on Stuhini Group rocks, and a steeply south dipping fault which juxtaposes the Stuhini Group on the north with Hazelton Group rocks on the south (Fig. 4). The faults are unrelated. The fault separating the Stuhini and Hazelton groups locally truncates structures which conform to the Permian limestone-Stuhini Group fault contact. Near the northeast margin of the dome are several steeply southwest to south dipping faults (Fig. 5), some of which have components of southwest side up and dextral motion.

Folds and faults in the Bowser Lake Group are best outlined by relatively resistant rocks of the shallow marine facies. Chevron folds, in most cases more tightly-spaced than those shown in Figure 6, typically verge southwest. A number of thrust faults of small displacement (10-100 m) were noted, but could not be traced for any significant distance; most verge southwest. Nearer to the dome, in the siltstone and turbidite facies, structures are more difficult to identify because of the recessive character of the rocks, but in general, folds appear to be tighter, more upright, and hinges are more commonly disrupted.

KINSKUCH LAKE

The Kinskuch Lake area lies approximately 100 km due south of the Oweegee Range (Fig. 1). Although not truly forming an inlier in the Bowser Basin, basement rocks in the Kinskuch area are nearly surrounded by rocks considered age-equivalent with the Jurassic and Lower Cretaceous Bowser Lake Group. In an attempt to trace structures from the Bowser Lake Group into the older rocks, a well-exposed area extending across the structural grain outlined by previous workers (Alldrick et al., 1986; Grove, 1986; Hanson, 1935) was mapped in August and early September of 1990. Results of the mapping are shown in Figure 7.

Stratigraphy

In spite of the relative abundance of sedimentary rocks in the Kinskuch area, fossils are rare, and therefore absolute ages of map units are poorly constrained. However, regional correlations and limited paleontologic data suggest that rocks of units 1, 2 and 3 are equivalents of the Late Triassic Stuhini Group and rocks of units 4 and 5 are equivalents of the Lower and Middle Jurassic Hazelton Group (D.J. Alldrick, pers. comm., 1990; Anderson, 1989). Based on similar reasoning, units 6 and 7 are probable equivalents of the Lower and Middle Jurassic Salmon River Formation and the Jurassic and Lower Cretaceous Bowser Lake Group. Using the stratigraphic nomenclature of Anderson and Thorkelson (1990), unit 5 would correlate, in part, with the Lower and Middle Jurassic Salmon River Formation.

On both the east and west margins of the study area, the relative ages of units are known, but this is not so in the central part. Most of the doubt arises from the uncertain affinity of rocks and uncertain nature of faults near the north end of Kinskuch Lake. This area received little attention and further mapping is necessary.

Stuhini Group

Unit 1: Deformed black clastic rocks

The western margin of the study area is underlain by thin bedded silty argillite and fine grained sandstone, and by rare rusty weathering siliceous siltstone and lenses and discontinuous beds of tan to medium grey silty limestone up to 40 cm thick. The unit is characterized by steeply dipping, commonly contorted and highly veined and fractured beds. Alteration related to iron carbonate veining locally gives the rocks a striped black and tan or orange appearance. The contact with mafic rocks to the east (unit 2), where observed, is commonly marked by orange limonitic zones, probably related to dike intrusion and iron carbonate alteration. In several localities, the contact is marked by a steeply northeast dipping reverse fault putting mafic rocks on black siltstone. Nowhere along the contact with unit 2 was evidence for a stratigraphic contact observed.

Unit 2: Mafic volcanic and volcaniclastic rocks

On the west, most of this unit consists of very distinctive, resistant, dark green volcanic and subordinate volcaniclastic rocks that are characterized by their mafic composition and the presence of pyroxene. Lithologies include very massive monomictic mafic lahar or flow-breccia, locally with fragments up to 1 m across. Pyroxene feldspar crystal lithic lapilli and ash tuff, mafic wacke, local black siltstone and rare mafic volcanic conglomerate, green siltstone and augite porphyritic flows are also present. Along the western margin of the unit, near its base, is an approximately 50 m thick section where finer grained rocks predominate. There, mafic wacke and/or ash tuff are interbedded with pale green laminated tuffaceous chert or felsic dust tuff and thin to medium bedded green-grey felsic ash and dust tuff.

In the central part of the study area, rocks immediately to the east of Flat Top Mountain have been (speculatively) correlated with rocks of unit 2. To the west, they are in fault contact with tuff-breccia of unit 4, and to the east they are overlain conformably(?) by similar unit 4 tuff-breccia. In general, they comprise a very resistant package of volcaniclastic rocks which bear similarities with the finer grained mafic and felsic rocks at the base of unit 2 to the west. They comprise abundant thick bedded, medium to coarse grained, tuffaceous(?) mafic to arkosic wacke, as well as laminated to thin bedded, medium to dark grey-green tuffaceous(?) siltstone and thin bedded siliceous ash and dust tuff.

Unit 3: limy clastic rocks

This unit, locally up to 150 m thick, conformably overlies unit 2 in the western part of the study area. It comprises rusty weathering, coarse grained, commonly limy arkosic wacke, dark grey, moderately siliceous siltstone, and limy sedimentary breccia. Coarser grained lithologies are more common toward the base of the unit. The breccia is commonly bioclastic and locally contains fragments of colonial corals. Most breccia fragments are siltstone. On Porphyry Mountain, the wacke unit is conformably overlain by andesite tuff-breccia, which at its base contains abundant sedimentary lithic fragments, commonly in a limy matrix.

Hazelton Group

Unit 4: Maroon and green andesite pyroclastic rocks

This unit is a very thick sequence in which pale green and mauve weathering green and maroon massive andesite lapilli tuff-breccia predominates. Tuff-breccia is typically monomictic and locally contains fragments up to 1.5 m across. It is interbedded with subordinate andesite lapilli and ash tuff, rare dust tuff and local lahar of similar composition and maroon to green colouration. Between Porphyry and Flat Top mountains, the breccia unit contains undeformed (except in narrow zones adjacent to northeast trending faults) and continuous sequences up to 50-100 m thick of thin-bedded dark grey siltstone and fine to locally coarse grained, thin bedded turbiditic sandstone. Overlying tuff-breccia has downcut up to several metres into the sedimentary rocks.

Although the relationship between rocks in the continuous Porphyry-Flat Top section to rocks farther east is uncertain, much of the area southeast of Flat Top Mountain and north of Lavender Peak is underlain by lithologically similar tuff-breccia. In several places, particularly near the contact with Unit 6, but also north of Lavender Peak, Unit 4 grades upward into more heterogeneous and typically more felsic volcanic rocks of Unit 5.

Unit 5: Intermediate to felsic volcanic and associated clastic rocks

Volcanic rocks of dacitic-andesite or rhyodacitic composition are consistently present within this unit, but it is perhaps best distinguished by its varied lithologies. In the study area, the unit is volumetrically insignificant compared to Unit 4. Intermediate to felsic volcanic rocks include rusty, buff, cream and very pale green weathering medium green, grey or tan lapilli tuff, tuff-breccia, flow-breccia, dust tuff and welded tuff. Rare buff weathering, pale grey, metre-scale felsic flows containing well-developed flow-layering also occur, as do local massive green (hornblende) feldspar (rarely megacrystic) andesite porphyry flows.

Volcanic rocks of unit 5 are interlayered with a wide variety of sedimentary rocks that range from laminated to thick bedded and lens-shaped black or green limy mudstone, to medium bedded, brown weathering limestone with discontinuous millimetre- to centimetre-scale black chert layers, to coarse monomictic sedimentary breccia containing either siltstone or felsic volcanic clasts in a silty mudstone matrix. At one locality, adjacent to the contact with Salmon River Formation rocks, coarse grained tuffaceous wacke contains fossils of Toarcian age (late Early Jurassic, H.W. Tipper, pers. comm., 1990).

Locally, the intermediate to felsic volcanic rocks of this unit are interlayered with and(or) overlain by thin bedded to massive mauve to maroon and green andesite lapilli tuff, ash tuff, and tuff-breccia indistinguishable from lithologies of unit 4. However, where this is the case, coarser grained pyroclastic rocks are less abundant and in total, maroon and green pyroclastic rocks of unit 4 do not comprise the great thicknesses observed in unit 4.

Salmon River Formation

Unit 6: siliceous clastic and volcaniclastic rocks

Siliceous clastic and volcaniclastic rocks of unit 6, the Salmon River Formation, disconformably overlie Toarcian and older rocks of units 5 on the east side of the study area. The Salmon River Formation is subdivided into a typically thin bedded and finer grained lower package which is gradational with a thick bedded and coarser grained upper package. The coarse grained rocks in turn grade upward (and laterally?) into sedimentologically more mature clastic rocks of the Bowser Lake Group. In general, rocks in both the lower and upper parts of unit 6 are relatively siliceous compared to overlying Bowser Lake Group rocks. They can also be distinguished from the pale grey weathering Bowser Lake Group rocks by their common rusty or dark grey-green weathering surfaces.

Rocks of the lower part of the Salmon River Formation are similar in many respects to rocks of the Spatsizi Group seen in the Oweegee Range. They are dominated by laminated to thin bedded black pyritic siliceous siltstone and subordinate fine grained sandstone and argillite. Discontinuous lenses of tan to grey weathering silty limestone occur locally. Where exposed, the contact with underlying rocks of unit 5 exhibits very little relief. Basal beds contain scattered angular centimetre- to sub-centimetre size clasts in a matrix of siltstone or fine grained sandstone. Along the contact, pale grey weathering hornblende feldspar andesite porphyry sills are common.

The overlying thick bedded part of the Salmon River Formation, is typified by the presence of very massive, thick bedded, medium grained turbiditic arkose. Also typifying this subunit are tuffaceous(?) siltstone and fine grained wacke containing distinctive recessive weathering lithic fragments (altered felsic volcanic lithic fragments?), locally up to 2 cm across (Fig. 8), and abundant broken feldspar and quartz grains.

Thick bedded Salmon River rocks grade upward and laterally into rocks of the Bowser Lake Group. Compositions and textures of clastic rocks support this interpretation and suggest a mixing of sedimentary provenance between a more proximal volcanic source and a more distal chert-rich source. In several places within the Bowser Lake Group, tuffaceous(?) dark grey siltstone and fine grained wacke with angular altered lithic fragments, common within the upper part of the Salmon River Formation, are found interrbedded with the typically more mature rocks characteristic of the Bowser Lake Group. In addition, pale grey weathering, well sorted, chert-rich turbiditic sandstone typical of the Bowser Lake Group is locally interbedded with rocks of the upper part of the Salmon River Formation. Indications of provenance mixing are also evident in rare granule to pebble conglomerate beds near the Salmon River-Bowser Lake Group contact. Two conglomerate beds of contrasting textural and compositional makeup occur (Figs. 9 and 10). One is poorly sorted, calcareous and contains highly angular siltstone clasts and scattered belemnite fragments of probable local derivation, and the other is well sorted and siliceous, and contains well-rounded, resistant and relatively far-traveled clasts.

Bowser Lake Group

Unit 7: pale grey weathering clastic rocks

Bowser Lake Group rocks in the Kinskuch area are characterized by pale grey weathering medium to thick bedded, medium and rarely coarse grained dark grey turbiditic sandstone. Also present are abundant pale grey weathering, laminated and thin bedded, moderately siliceous black siltstone and fine grained sandstone, and rare chert granula conglomerate.

Structure

Bowser Lake Group rocks in the study area have been folded into tight chevron shapes with a strong west vergence. The folds have short, steeply east dipping overturned southwestern limbs, and relatively long, moderately east dipping northeastern limbs. Local moderate to steep, west dipping reverse faults cut the southwest vergent folds. Drag into the faults may account for local anomalous northeast vergent folds.

Shortening evident in the Bowser Lake Group is not expressed in the Salmon River Formation, which forms a northeast dipping homoclinal sequence beneath the Bowser Lake Group. Shortening must therefore have taken place within structurally lower rocks of the Hazelton and Stuhini groups, or along a detachment between the Bowser Lake Group and the Salmon River Formation. The former alternative is preferred, but given the massive nature of Stuhini and Hazelton group volcanic rocks, it is probable that shortening was accomodated primarily by faults rather than by folds.

Faults within the Hazelton Group east of Kinskuch Lake and within the Stuhini and Hazelton groups between Porphyry and Flat Top mountains do not exhibit vergence compatible with significant southwest directed shortening. Farther to the southwest, however, fine grained black clastic rocks of unit 1 are characteristically highly disrupted. In general, they strike northwest and have steep dips. Where observed, folds are typically disharmonic, with thickened or faulted hinges, and thinned or sheared out limbs. Together with evidence for a faulted contact with the overlying mafic volcanic rocks of unit 2, this suggests that the contact might mark the trace of a significant southwest vergent contractional fault. It may also imply that rocks of unit 1 are younger than rocks of unit 2.

A similar case may be argued for contacts and structures near the north end of Kinskuch Lake. If rocks mapped as unit 2 in that area correlate with rocks of unit 2 to the west, then the faults shown near the north end of the lake may also account for some of the shortening observed in Bowser Lake Group rocks. This possibility will be evaluated by further mapping and by attempting, via microfossil and geochronologic work, to place absolute age constraints on the map units.

ACKNOWLEDGMENTS

Carol Evenchick, Brian Ricketts, Bob Anderson, Howard Tipper and Rodney Kirkham of the Geological Survey of Canada and Dani Alldrick, Dave Lefebure and Mary Lou Mallott of the British Columbia Geological Survey Branch are thanked for their encouragment and valuable geological input. Capable field assistance was provided by Randy Castellarin and Michael C. Toolan. Keewatin Engineering is gratefully acknowledged for logistical support in the Kinskuch area; special thanks go to Dave Tupper and the crew at Keewatin's Kitsault Lake camp for stimulating geologic discussions and generous hospitality. Bert Struik and Bev Vanlier of the Geological Survey of Canada carefully edited and proofread the manuscript.

REFERENCES

Alldrick, D.J., Dawson, G.L., Bosher, J.A., and Webster, I.C.L.
1986: Geology of the Kitsault River area, NTS 103P; British Columbia Ministry of Energy, Mines and Petroleum Resources, Open File Map 1986/2.

Anderson, R.G.
1989: A stratigraphic, plutonic, and structural framework for the Iskut River map area, northwestern British Columbia; in Current Research, Part E, Geological Survey of Canada, Paper 89-1E, p. 145-154.

Anderson, R.G. and Thorkelson, D.J.
1990: Mesozoic stratigraphy and setting for some mineral deposits in Iskut River map area, northwestern British Columbia; in Current Research, Part E, Geological Survey of Canada, Paper 90-1F, p. 131-139.

Evenchick, C.A.
in prep: Geometry, evolution, and tectonic framework of the Skeena Fold Belt, north-central British Columbia; submitted to Tectonics.

Grove, E.W.
1986: Geology and mineral deposits of the Stewart area, British Columbia; British Columbia Ministry fo Energy, Mines and Petroleum Resources, Bulletin 63, 434 p.

Hanson, G.
1935: Portland Canal area, British Columbia; Geological Survey of Canada, Memoir 175, 175 p.

Koch, N.G.
1973: The central Cordilleran Region; in Future Petroleum provinces of Canada; Canadian Society of Petroleum Geologists, Memoir 1, p. 37-71.

Monger, J.W.H.
1977: Upper Paleozoic rocks of northwestern British Columbia; in Report of Activities, Part A, Geological Survey of Canada, Paper 77-1A, p. 255-262.

Thomson, R.C., Smith, P.L., and Tipper, H.W.
1986: Lower to Middle Jurassic (Pliensbachian to Bajocian) stratigraphy of the northern Spatsizi area, north-central British Columbia; Canadian Journal of Earth Sciences, v. 23, p. 1963-1973

FIGURE CAPTIONS

Figure 1: Location map of Oweegee and Kinskuch areas, north-central British Columbia. Stippled pattern represents Bowser Lake Group strata; hachured pattern represents Middle Jurassic and older basement rocks of the Stikine terrane (after Evenchick, in prep.).

Figure 2: Generalized geology, northern Oweegee range.

Figure 3: Gradational contact between rocks of the siltstone facies (lower half) and shallow marine facies of the the Bowser Lake Group, Oweegee Range. View is to northeast; beds dip moderately to steeply northeast; difference in elevation between top and bottom of section is 450 m.

Figure 4: Fault contact between near-vertical volcaniclastic rocks of the Stuhini Group and massive gently dipping volcanic rocks of the Hazelton Group on the north side of Delta Peak (high point in photo), Oweegee Range. View is to west-southwest. The moderately to steeply south dipping fault is near the center of the photo and is marked by a thin linear snowpatch which trends from the saddle toward the lower left corner of the photo. Difference in elevation between cirque and peak is 500 m.

Figure 5: Southwest dipping reverse fault juxtaposing pale grey Permian limestone (forming cliffs, approx. 150 m high) with dark weathering Stuhini Group volcaniclastic rocks, northeast margin of Oweegee dome.

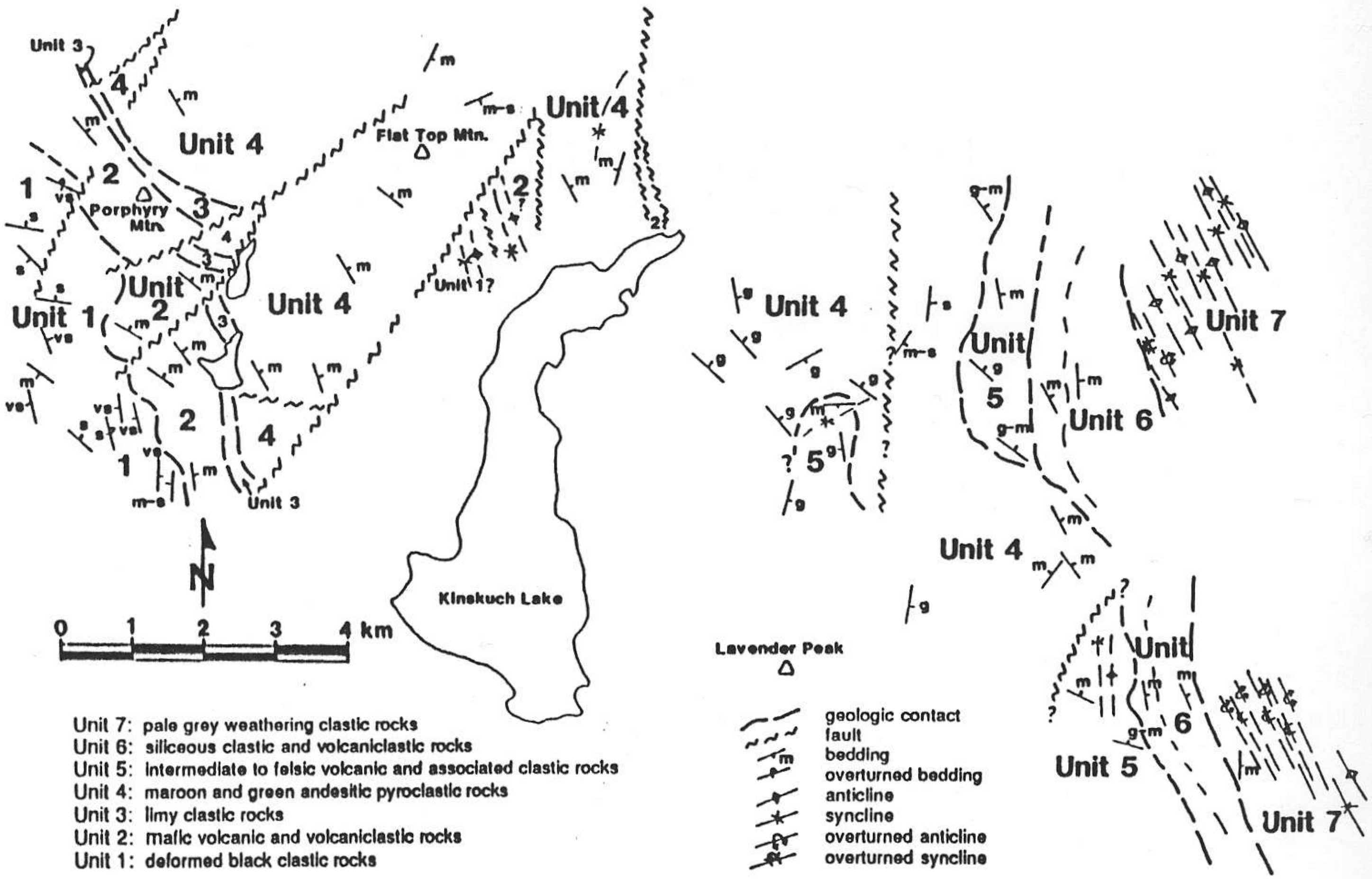
Figure 6: Southwest vergent chevron folds in the shallow marine facies of the Bowser Lake Group, Oweegee Range. Recessive rocks of the siltstone facies underlie the ridge in foreground. Cliff with fold is 150 m high.

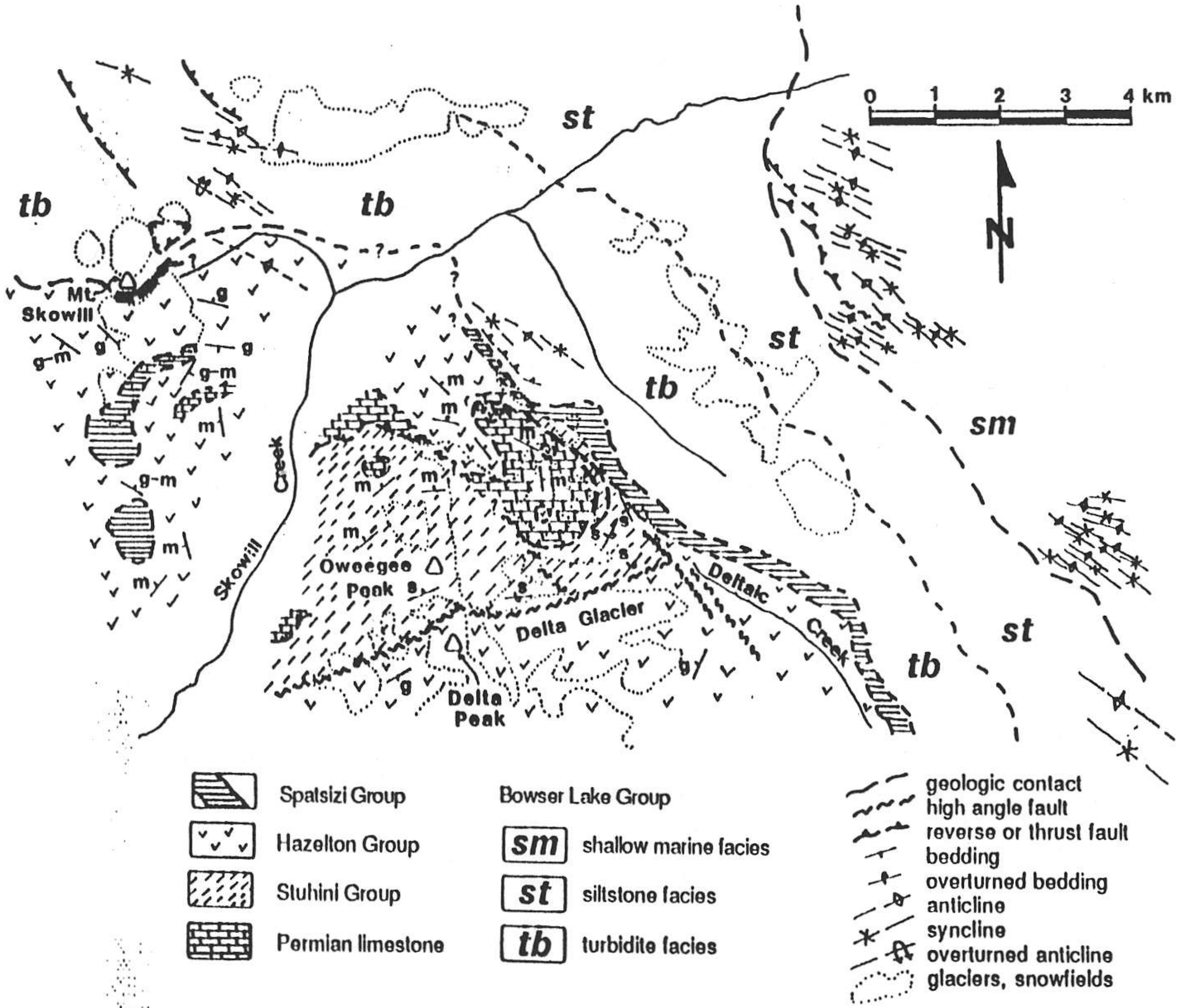
Figure 7: Generalized geology, Kinskuch River area.

Figure 8: Flaggy, black, fine grained tuffaceous wacke of the upper part of the Salmon River Formation; note scattered pale weathering, angular volcanic lithic fragments, Kinskuch River area.

Figure 9: Poorly sorted cobble conglomerate containing abundant angular siltstone clasts, Kinskuch River area.

Figure 10: Granule conglomerate/conglomeratic sandstone containing abundant well-rounded chert clasts, Salmon River Formation-Bowser Lake Group contact, Kinskuch River area.


Unit 3
Unit 4
Flat Top Mtn.
Unit 4
Porphyry Mtn.
Unit 1
Unit 2
Unit 4
Unit 1?
Unit 3
Kinskuch Lake
0 1 2 3 4 km
N
Unit 4
Unit 5
Unit 6
Unit 7
Unit 4
Unit 6
Unit 5
Unit 7
Lavender Peak
Unit 7: pale grey weathering clastic rocks
Unit 6: siliceous clastic and volcaniclastic rocks
Unit 5: intermediate to felsic volcanic and associated clastic rocks
Unit 4: maroon and green andesitic pyroclastic rocks
Unit 3: limy clastic rocks
Unit 2: mafic volcanic and volcaniclastic rocks
Unit 1: deformed black clastic rocks
geologic contact
fault
bedding
overturned bedding
anticline
syncline
overturned anticline
overturned syncline



0 1 2 3 4 km
N
tb
st
sm
Mt Skowill
Skowill Creek
Oweegee Peak
Delta Peak
Delta Glacier
Deltaic Creek
Spatsizi Group
Hazelton Group
Stuhini Group
Permian limestone
Bowser Lake Group
sm shallow marine facies
st siltstone facies
tb turbidite facies
geologic contact
high angle fault
reverse or thrust fault
bedding
overturned bedding
anticline
syncline
overturned anticline
glaciers, snowfields