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SOUTHEAST BRITISH COLUMBIA

TERTIARY STRATIGRAPHY IN SOUTH CENTRAL BRITISH COLUMBIA (82E)

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Much of the interior of British Columbia is covered by a deeply dissected assemblage of Early Tertiary lavas, associated pyroclastic rocks, and intercalated fluvial and lacustrine sedimentary rocks. These lie in a northwesterly trending belt about 160 kilometres wide extending roughly 800 kilometres from the Republic Mining District in Washington State to the Babine Lake area in central British Columbia. Stratigraphic thicknesses range to more than 2 500 metres and averages of a thousand metres are common. The basal zone is composed, in part, of granite pebble conglomerate, while the upper surface is often coincident with gently rolling uplands. In some areas the succession is capped by a veneer of 'plateau' basalt which is the erosional remnant of once widely distributed Miocene and Pliocene lava flows.

Current investigations of these rocks have been stimulated by recent discoveries of uranium mineralization and renewed interest in lignite deposits. Little information is available on the composition, regional stratigraphy, structure, or history of the Tertiary assemblage and it is the purpose of this present study to provide additional geological data.

The areas of detailed mapping, shown on Figure 1, coincide with a segment of the region covered by the Uranium Reconnaissance Program in 1976. Some of the more interesting results of this geochemical survey were found in the Tertiary outliers near Penticton, Kelowna, and Rock Creek. Approximately 1 200 square kilometres have been mapped at 1:50 000 scale, by way of 83 separate traverses and 1 460 geological stations in 1977.

STRATIGRAPHY

Working laterally from the White Lake basin between Keremeos and Penticton, the various Tertiary formations can be followed without much difficulty using the stratigraphic subdivisions proposed by the writer (Church, 1973). A few new sedimentary units have been recognized in the Marron section but these are only locally important. The Springbrook basal conglomerate is largely missing in the northern part of the basin, where these rocks are replaced by rhyolite ash and breccia deposits that appear to have had their source in the Shingle Creek stock. Above this unit and extending to Riddle Creek, west of Penticton, are radioactive mafic phonolites and rhomb porphyry lavas of the Yellow Lake member. The tan trachyte

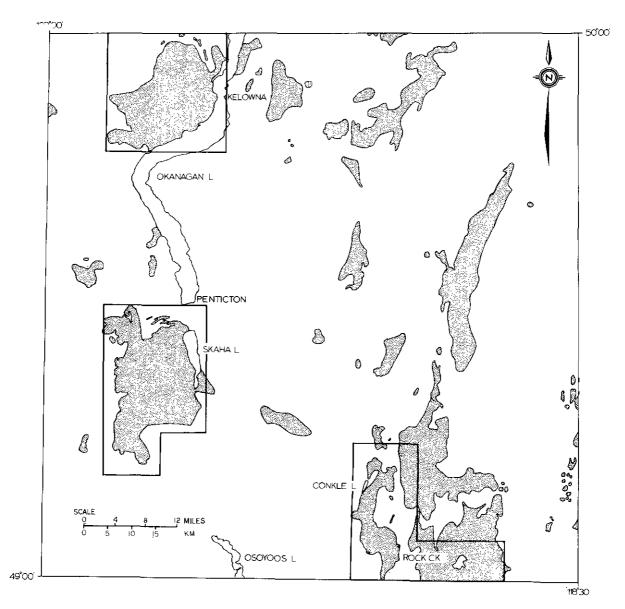


Figure 1. Outliers of Tertiary volcanic and sedimentary rocks in the Okanagan Valley and Kettle River region of south central British Columbia (areas of detailed mapping outlined).

belonging to the Nimpit Lake member in the middle part of the Marron Formation extends beyond Summerland where the lavas are replaced by ash flow deposits of the same composition. The most significant changes in the stratigraphy are noted in the northwest sector of the Penticton outlier where several new volcanic formations are recognized above the Marron unit.

The Marama dacite was traced north along the axis of the Okanagan Valley from the south end of Skaha Lake to Giants Head at Summerland and Mount Boucherie in the Kelowna area. These lava accumulations form an array of well-developed domes of apparent contemporaneous age. Perhaps the most interesting discovery in the chronology of the volcanic sequence is the occurrence of Marama dacite resting on deeply eroded Marron volcanic rocks (Yellow Lake member). It seems probable now that the Marama Formation is Late Eocene or possibly Oligocene (?) age.

The Tertiary stratigraphy west of Kelowna (Westbank) is relatively straightforward although modified somewhat from the Penticton section. The sequence is as follows:

Uppermost:	Lambly Creek basalt ('valley basalt') Carrot Mountain basalt ('plateau basalt') Marama dacite Marron Formation — Nimpit Lake member (tan trachytes)	
	 Kitley Lake member (trachyandesites) 	
Lowermost:	Trepanier rhyolite	

Yellow Lake mafic phonolites and romb porphyry lavas, widespread further south, are unknown in the Kelowna area.

Prospecting in the Kelowna outlier appears to have been directed to geochemical responses near isolated exposures of Carrot Mountain basalt. Reconnaissance scintillometer surveys conducted during the mapping program show most of the rocks as having relatively weak radioactive emission response compared to similar formations near Penticton, although the Trepanier rhyolite yields about twice normal radioactive background.

Tertiary geology between Rock Creek and Midway is almost an exact repetition of the type Marron section in the White Lake basin, 70 kilometres to the northwest, with the exception of the Kearns Creek basaltic andesite which is missing, and a hornblende andesite unit was found to occur below the Park Rill member. To the north near Conkle Lake, the Yellow Lake member attains a thickness of about 450 metres, and is comprised of more than 25 lava flows and pyroclastic beds including a sequence of phonolites and a peculiar, weakly radioactive assemblage of analcite-bearing, augite-bearing, and anorthoclase rhomb porphyry lava species. At the base of the succession rhyolite breccias and tuffs are locally present in place of conglomerates and sandstones of the Kettle River Formation. Above the Marron Formation, equivalents of the Marama and White Lake beds were not found, however, east of Midway in the area of the headwaters of Norwegian Creek, a slide breccia melange has a striking resemblance of the Skaha Formation, the youngest Quaternary beds in the Penticton area.

STRUCTURE

Northerly trending graben structures extend across the interior of the Province from the Fraser River lineament on the west to the Flathead Valley on the east, with the central zone displaying the thickest

volcanic accumulations. Here, the association of alkaline lavas with rifting is well documented. Structural control of the Tertiary volcanic outliers relates to a herringbone pattern of pronounced conjugate shears of northeast and northwest orientation, important elements in a north-south stress scheme which also produced the many graben and half graben structures.

MINERALIZATION

Uranium exploration on the west side of the Okanagan Valley has disclosed several interesting radioactive zones. One of the more interesting of these is the Brinex-Comaplex discovery on the ASH-AGUR claims 25 kilometres northwest of Penticton. The principal radioactive response here appears to be related to a northwest-trending shear zone which transects basal units of the Marron Formation. The highest scintillometer counts, greater than 1000 cps, are measured over crushed acid volcanic rocks exposed below Marron lavas on Riddle Creek. The full extent of the anomaly, about 3 kilometres, includes most of the rocks of the Tertiary outlier. Rectangular porphyry and rhomb porphyry alkaline lavas belonging to the Yellow Lake member of the Marron Formation are prevalent in this area, displaying average background counts in the range of 200 to 300 cps. Source of these lavas appears to be a Coryell-type stock, also somewhat radioactive, exposed at the southwest margin of the outlier.

The actual presence of uranium was first detected in stream waters and sediments by the Uranium Reconnaissance Program survey. This showed that Aneas Creek, which follows a strong northwest-trending lineament through the Summerland area, was somewhat enriched in uranium as were some adjacent streams and a number of alkali ponds. At the same time, working south of Penticton near Oliver, Brinex exploration, directed by Culbert and Leighton (in press), discovered surprisingly high uranium levels in a cluster of stagnant alkali ponds. Water sample s from four of these ponds were submitted by the Ministry for analysis. The results confirmed relatively high concentrations of uranium and showed corresponding high pH values:

Sample	U	рH
	ppm	
1	9.1	8.4
2	17.5	8.6
3	0.6	7.2
4	2.3	8.2

It is speculated that the uranium was derived from the underlying Oliver granite or perhaps leached from scattered glacial deposits containing eroded fragments of Tertiary volcanic rocks exposed to the north. In any case, the ponds are interesting even if not of commercial importance, because they may reflect conditions of current uranium concentration which is evident elsewhere in the Quaternary stratigraphic record of the region.

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