ABSTRACT

An abstract of the thesis of Christopher Charles Humphrey for the Master of Science in Geology: presented July 2, 1996.

Title: Correlation of the upper Ellensburg Formation with the Old Scab Mountain eruptive center, east-central Cascade Range, Washington.

The Ellensburg Formation, preserved in the Nile basin 50 km northwest of Yakima, Washington, consists of a series of middle to late Miocene epiclastic and pyroclastic rock assemblages rich in porphyritic hornblende-biotite dacite. Geochemical, petrographic, and stratigraphic correlations indicate that Old Scab Mountain, a dacite porphyry intrusion, located at the western margin of the basin (lat. 46°53'30", long. 121°13'00"), is the probable source for much of the upper Ellensburg volcaniclastic material in the basin. The dacite intrusion exposed at Old Scab Mountain was emplaced at depths of 1 to 3 km and underlaid a now eroded volcanic edifice. This volcanic center is interpreted to have been active during the time of deposition of the upper Ellensburg Formation. A K-Ar age of 8.75 ± 0.20 Ma for an adjacent sill of similar dacite suggests an age for Old Scab Mountain between 9 to 7 Ma (Smith, 1988a). This age corresponds with
the upper Ellensburg Formation which stratigraphically overlies Grande Ronde Basalt lava flows of the Columbia River Basalt Group, within the basin.

Stratigraphic reconstruction of the Nile basin deposits indicates a dome collapse eruptive style. Progressive dome growth was punctuated by short-lived eruptions resulting in dome collapse and deposition of debris-avalanche and lahar deposits. These deposits were remobilized by fluvial processes which generated thick conglomerates and interstratified volcanic sandstones.

Upper Ellensburg deposits and dacite of Old Scab Mountain are calc-alkaline and medium-K in composition. Silica content ranges from 53 to 67 weight percent SiO₂ for upper Ellensburg deposits and 66 to 67 weight percent SiO₂ for dacite of Old Scab Mountain.

Older deposits composing the lower Ellensburg Formation are interbedded with and underlie the Grande Ronde Basalt. The lower Ellensburg deposits are typically more tholeiitic, range from 56 to 74 weight percent SiO₂, and show slightly higher trace element concentrations than the upper Ellensburg deposits. These deposits were possibly derived from other dacite centers located near the headwaters of the adjacent Naches basin.