area continue to the north and south where they are intruded by Upper Jurassic granodiorite of the Okanagan Intrusive Complex (Preto, 1973). Upper Triassic sediments of the Nicola Group (Bostock, 1940a; Rice, 1947) occur west of the study area and also to the east (Read and Okulitch, 1977) where they unconformably overlie presumed upper Paleozoic rocks of the Apex Mountain Group. The youngest rocks are nearly flat-lying Eocene conglomeratic and volcanic units of the Springbrook and Marron Formations respectively. Locally these rocks are found unconformably overlying all other rocks.

1. Middle Triassic and Older Rocks

Rocks designated as Middle Triassic and older were previously mapped by Bostock (1941) and divided into several formations. The Shoemaker Formation consists mainly of ribbon chert with minor tuff, greenstone, and limestone. Chert, with lesser amounts of greenstone, breccia, and argillite, and minor limestone form the Independence Formation. The Old Tom Formation was described as being metabasalt and andesite with compositionally related intrusives and minor chert, and the Bradshaw Formation was described as containing argillite, tuff, quartzite, breccia and andesite. The similar nature of these formations warrants their collective designation in this study as the Apex Mountain Group.

Bostock assigned a Triassic or older age to the above formations based on stratigraphic relationships. Recently, most authors (Read and Okulitch, 1977; Monger, 1977) have considered the Apex Mountain

Group to be Carboniferous in age based on Danner's suggestion of a probable Pennsylvanian age for crinoidal limestone in Olalla Creek (Neugebauer, 1965). In addition, Read and Okulitch (1977) found middle and late Paleozoic fossils in the limestones of Shoemaker Creek. Data from the present study shows the structurally higher Olalla Creek limestone to be a Carboniferous olistolith and the Shoemaker Creek limestone to be a reworked deposit that contains Middle Triassic as well as late Paleozoic fauna (Chapter II).

A large block of upper Paleozoic limestone at Blind Creek near Keremeos contains faunas of Mid-Carboniferous and Early Permian(?) age and was emplaced by Tertiary landsliding (Smith, 1935; Barnes and Ross, 1975; Wilson, 1980). The source terrain of the limestone remains uncertain; however, Danner (verbal communication, 1982) reports that Mississippian fauna in the matrix of the Blind Creek limestone are very similar to those in limestone of the Harper Ranch Group.

Rocks of the Kobau Group near Mt. Kobau were mapped by Okulitch (1969). The group consists of quartzite, phyllite, greenstone, and minor limestone considered to be pre-Pennsylvanian(?) in age based on structural evidence. Okulitch (1973) has suggested that these rocks may represent the metamorphosed equivalent of the Apex Mountain Group. Okulitch also equated rocks of the Kobau Group with parts of the Anarchist Group in the southern Okanagan area. Lithology and style of deformation are similar; however, the

Anarchist Group is considered to be Permian in age based on poor fossil evidence (Waters and Krauskopf, 1941; Rinehart and Fox, 1972). The Chapperon Group, a variably metamorphosed assemblage of argillaceous sediments and volcanic rocks west of Vernon may also be correlative with the Kobau and Anarchist Groups. Correlation of these groups with the Apex Mountain Group is discussed in Chapters II and IV.

2. Upper Triassic and Younger Rocks

Most of the rocks of this age in south-central British Columbia belong to the Nicola Group. Figures 2 and 3 show the distribution of Nicola Group rocks in this region.

Rocks of the Upper Triassic Nicola Group are divided into two distinct coeval facies that are laterally gradational. The type locality of the westernmost facies occurs near Nicola Lake, about 65 km southwest of Kamloops. It consists of basaltic and andesitic flows, breccias, tuffs, related sediments, and reef limestones (Schau, 1970) and is believed to be representative of an oceanic volcanic arc complex. Upper Triassic rocks east of Kamloops consist of deeper water mudstone, lithic sandstone, volcaniclastic rocks, conglomerate and limestone; some of the latter may be olistostromes. Within this clastic facies there is a progressive eastward decrease in the amount of volcaniclastic material in the sediments with a corresponding increase in the amount of terrigenous material (Smith, 1979). This facies is thought to

represent a back-arc basin that developed east of the main volcanic arc. Farther east, Upper Triassic volcanic flows lie unconformably above Permian limestones (Sada and Danner, 1974). Monger (1982) reports that volcanic rocks of the Nicola Group of southern British Columbia also show an eastward gradation from felsic to ultramafic composition.

Just northeast of Olalla, Upper Triassic rocks occur above the aforementioned Permo-Triassic unconformity. Locally, this unconformity has been shown to have up to 500 m of relief (Ross and Barnes, 1972). The succession consists of a basal chert breccia followed by calcareous chert wacke, shale, and limestone. These rocks have been correlated with the Nicola Group based on their similar lithology and age (Read and Okulitch, 1977).

Nicola Group rocks also occur to the west in the Princeton map area and were mapped and described by Bostock (1940a) and Rice (1947). The Nicola Group in this area consists predominantly of andesitic and basaltic flows, breccias, pyroclastic rocks, and compositionally related intrusives. Most of the sedimentary rocks lie below the volcanic rocks and are much more restricted in their distribution. They consist of tuffaceous argillite, calcareous tuff, greywacke, volcaniclastic breccia, quartzite, and limestone. Late Triassic fossils have been found at many localities (Rice, 1947). The largest belt of these Upper Triassic sedimentary rocks occurs near Hedley where they are conspicuously lacking in volcanic material.

Bostock (1940a) divided these rocks into several formations: Redtop, Sunnyside, Hedley, and Henry Formation (oldest to youngest). As described by Bostock, these formations consist mainly of quartzite, cherty quartzite and massive limestone with lesser amounts of siliceous argillite, tuff, breccia, conglomerate, and impure limestone. These rocks will herein be referred to as the sedimentary facies of the Nicola Group.

Sedimentary rocks of the Nicola Group occur in the study area on the west side of Winters Creek, and are described in Chapter II of this report. They are separated from the Apex Mountain Group rocks to the east by a steeply dipping fault along Winters Creek.

Plutonic and intrusive rocks in the region range in age from late Paleozoic to Late Jurassic. Minor hornblende-augite sills intrude the Apex Mountain Group near Olalla and are presumed to be late Paleozoic in age based on Read and Okulitch's (1977) report that they cut the Old Tom and Shoemaker Formations but not the Nicola Group. Read and Okulitch also report K-Ar ages of two porphyritic sills within the Nicola Group rocks near Olalla as 149 $\pm$5 Ma and 168 $\pm$6 Ma (Early Jurassic).

Most of the plutonic rocks in this region belong to the Okanagan Intrusive Complex, a name given by Preto (1973) to the composite batholith lying between Princeton and Okanagan Lake. These rocks range in composition from syenite to pyroxenite and peridotite. The more acidic bodies have a K-Ar and Rb-Sr isotopic age of 156 $\pm$6 Ma (Late Jurassic) and the basic bodies are distinctly older at 165 to 186 Ma (Middle Jurassic) (Peto and Armstrong, 1976).

Eocene rocks of the Springbrook and Marron Formations unconformably overlie the Nicola Group and Apex Mountain Group near Olalla. Directly above the unconformity is the Springbrook Formation, a fluvial conglomerate that contains angular to subrounded pebbles and cobbles of chert, greenstone, limestone, and trachytic syenite set in a slightly calcareous matrix of lithic sandstone. Volcanic rocks of the Marron Formation overlie the Springbrook Formation and consist of porphyritic basalt and andesite with zeolite-filled amygdules. This formation attains thicknesses up to 1400 m (Church, 1973) and mantles older rocks throughout much of the area of upland terrain west of the Okanagan Valley.

E. Other Eugeoclinal Assemblages in Southern British Columbia

Upper Paleozoic and Mesozoic sequences of eugeoclinal rocks in the Canadian Cordillera have been described by Monger (1977). Figure 3 shows the locations of southern British Columbia assemblages and is modified from figures in Monger (1977), Smith (1979), and Tipper and others (1981). Brief descriptions of these assemblages are given below and are largely taken from Monger (1977) and Smith (1979).

1. Eastern Assemblage

The Eastern Assemblage forms a discontinuous belt that extends for approximately 3200 km from just north of the British Columbia-Idaho border to Alaska. The assemblage contains the easternmost upper Paleozoic eugeoclinal rocks in the Canadian Cordillera.