

# GEOLOGY OF THE HEADWATERS OF WILSON CREEK, LARDEAU MAP AREA, SOUTHEASTERN BRITISH COLUMBIA

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## Abstract

Structures and stratigraphy, particularly for the three assemblages of the Upper Mississippian and Lower Pennsylvanian Milford Group, have been traced from the Goat Range northwestward through upper Wilson Creek into Poplar Creek map area. Davis sedimentary assemblage lies east of Schroeder-Spyglass Fault. Keen Creek volcanic assemblage, west of this fault, unconformably overlies lower Paleozoic Lardeau Group within a window beneath Stubbs Fault. Much of the window and both faults are intruded by McKian Creek Stock. McHardy siliceous argillite assemblage, above Stubbs Fault, is cut by another thrust fault folded by Cascade Mountain Anticline in Poplar Creek area. Coarse conglomerate within the anticline was apparently derived in Late Mississippian time from a nearby source in the Lardeau Group. Near Kuskanax Batholith McHardy assemblage is separated by a zone of ultramafics (probably marking the location of Whitewater Fault) from the overlying amphibolite and minor pelitic schist which are correlated with the Lower Permian and (?)Carboniferous Kaslo and Upper Triassic Slocan groups, respectively.

## Résumé

On a découvert les structures et la stratigraphie, notamment des trois assemblages du groupe de Milford du Mississipien supérieur et du Pennsylvanien inférieur, à partir du chaînon Goat vers le nord-ouest, en passant par la partie amont du ruisseau Wilson, jusque dans la région cartographiée du ruisseau Poplar. L'assemblage sédimentaire de Davis se trouve à l'est de la faille Schroeder-Spyglass. L'assemblage volcanique de Keen Creek est situé à l'ouest de cette faille et repose en discordance sur le groupe de Lardeau du Paléozoïque inférieur à l'intérieur d'une fenêtre tectonique sous la faille de Stubbs. Le massif de McKian Creek a pénétré les deux failles et une grande partie de cette fenêtre tectonique. L'assemblage d'argillite siliceuse de McHardy, qui est sus-jacente à la faille de Stubbs, est coupé par une autre faille de chevauchement qui a été plissée par l'anticlinal de la chaîne des Cascades dans la région de Poplar Creek. Un conglomérat à grain grossier à l'intérieur de l'anticlinal date du Mississipien récent et est vraisemblablement dérivé d'une source voisine dans le groupe de Lardeau. Près du batholite de Kuskanax, une zone de roches ultramafiques (qui marque vraisemblablement l'emplacement de la faille de Whitewater) sépare l'assemblage de McHardy des amphibolites et des schistes pélitiques secondaires sus-jacents qui ont été mis en corrélation avec les groupes de Kaslo du Permien inférieur et du (?)Carbonifère et le groupe de Slocan du Trias supérieur respectivement.

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## Introduction

Two weeks of field work in 1984 in the headwaters of Wilson Creek were devoted to tracing rock units and structures mapped in the Goat Range study area (Klepacki and Wheeler, 1985) into Poplar Creek map area (Read, 1973; Fig. 35.1). Stratigraphy worked out in the less-deformed Goat Range study area, particularly in the western assemblages of the Milford Group, enabled a better resolution of the complicated map pattern worked out by Read (1973) in southwestern Poplar Creek map area and the recognition there of faults mapped earlier in the Goat Range.

## Stratigraphy

The oldest rocks in the Wilson Creek (Fig. 35.2) area are grit, pelitic schist and minor calc-schist of the Broadview Formation. The exposures north of McKian Creek stock, unit 9a of Read (1973), were found to extend into the west wall of Wilson Creek.

The western assemblages of the Milford Group consist of the Keen Creek and McHardy assemblages. The Keen Creek assemblage, in the Goat Range south of McKian Creek stock, lies unconformably on the Broadview Formation (Klepacki and Wheeler, 1985). The assemblage consists essentially of two tholeiitic volcanic units (and related sediments) separated by a limestone unit yielding Late Mississippian and Early Pennsylvanian conodonts (Orchard, 1985). Sparse conglomerate occurs at the base of the assemblage. During the present study units of the Keen Creek assemblage were traced into the west wall of Wilson Creek valley west of McKian Creek stock. Volcanic and volcanoclastic units north of Keen Creek grade westward into rusty weathering quartz-plagioclase-biotite-muscovite-chlorite schists where they include some quartzite beds west of Wilson Creek. Amphibolite persists near the base of the assemblage. Limestone grades west of Wilson Creek into quartz-plagioclase-carbonate-biotite-actinolite granulite. The Keen Creek assemblage has also been identified north of McKian Creek stock in Poplar Creek map area. There, basal clastics composed of fine grained Broadview detritus also lie unconformably on the Broadview Formation. The succession above the basal beds, which is similar to the Keen Creek assemblage to the south, comprises two volcanic units and related sediments – units 13a, 13b and 19 of Read (1973) – separated by limestone (unit 14).

The McHardy assemblage in the Goat Range area is predominantly bedded, cherty or siliceous argillite underlain by a sequence, in descending order, of: dark grey limestone and white marble, boulder conglomerate and metagreywacke, and pink tuffaceous metasediments. The limestone has yielded Upper Mississippian conodonts (Orchard, 1985). The conglomerate, 1500 m northwest of Mount Cooper, consists of diorite, mafic volcanic and rare granite boulders dated by U-Pb methods on zircons as Ordovician (Okulitch et al., in prep.). The McHardy assemblage commonly contains bodies of amphibolite and equigranular and porphyritic hornblende diorite of late Paleozoic age (Klepacki and Wheeler, 1985).

Siliceous argillite, diorite and amphibolite of the McHardy assemblage has been traced from the Goat Range area around the western and northern sides of McKian Creek stock into the Poplar Creek map area. There, west of the Spyglass Fault, the McHardy assemblage comprises unit 15 of Read (1973) as well as abundant limestone (unit 14). The stratigraphic section beneath the limestone in the anticline south of Cascade Mountain is similar to that in the McHardy assemblage northwest of Mount Cooper. In particular it includes conglomerate similar to the conglomerate near Mount Cooper and contains boulders of

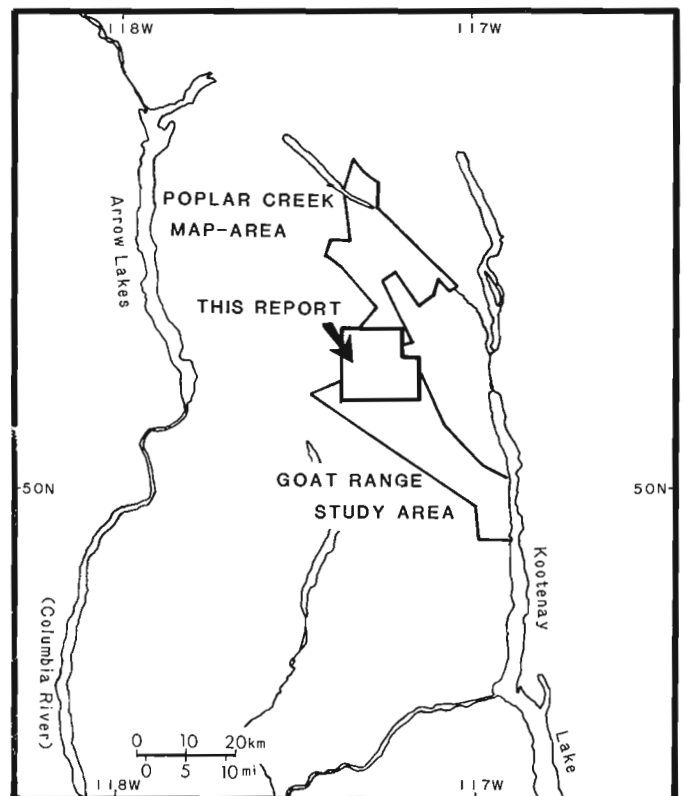
quartz-pebble conglomerate, gneiss (with the foliation at an angle to the foliation in the matrix), greywacke, blue-quartz-granule grit identical to that in the Broadview Formation, and minor volcanics and diorite. The composition of the conglomerate suggests that a source in the Broadview and other units of the Lardeau Group was nearby.

A belt of amphibolite along the southeastern margin of the Kuskana Batholith contains deformed pillows and is bounded on the southeast by one or two narrow zones of serpentinite, talc schist and equigranular diorite bodies (unit 13d of Read, 1973). These rocks are considered to be correlative with the upper plate units of the Lower Permian and (?) Carboniferous Kaslo Group in the Goat Range area. There they are floored by serpentinite along the Whitewater Fault which is intruded by the Early Permian Whitewater diorite (Klepacki and Wheeler, 1985).

Grey pelitic schist (unit 17 of Read, 1973) bordering the Kuskana Batholith and overlying the amphibolite probably belongs to the Slocan Group on the basis of relationships in the Goat Range area where the Upper Triassic Slocan Group lies above and is deformed with the Kaslo Group. The intervening Lower Permian Marten conglomerate (Klepacki and Wheeler, 1985) was not observed in the Wilson Creek area.

## Structure

Several of the major structures of the Goat Range area can be either traced into or identified within the Poplar Creek map area. These include the Stubbs and Whitewater thrust faults and the Schroeder west-dipping normal fault and its apparent continuation as the Spyglass Fault.



**Figure 35.1.** Location of the area of detailed mapping around Wilson Creek headwaters, the Poplar Creek area mapped by Read (1973) and the Goat Range area mapped by Klepacki (Klepacki and Wheeler, 1985).

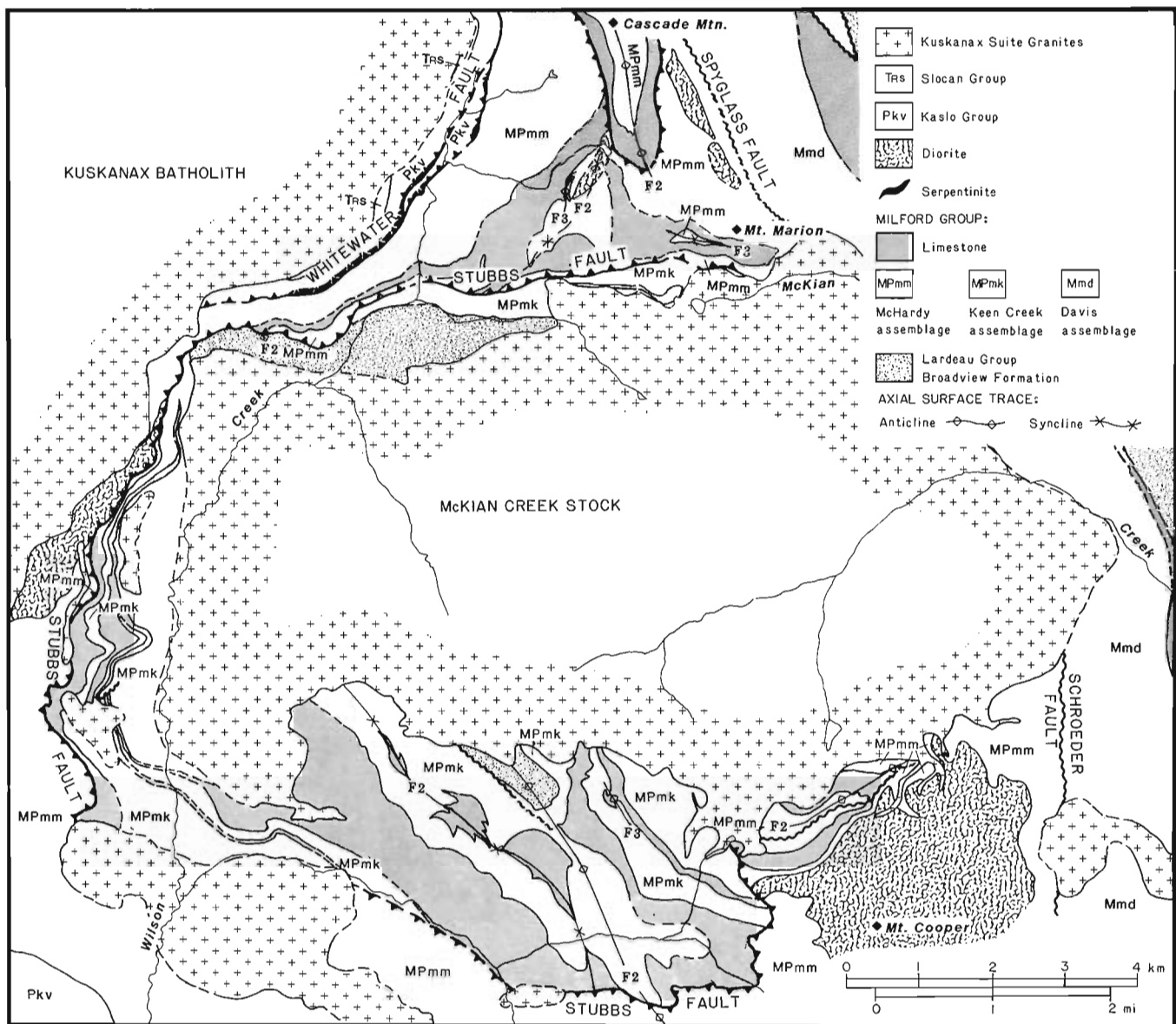


Figure 35.2. Geological map of the headwaters of Wilson Creek.

In the Goat Range area the McHardy assemblage and the overlying Kaslo and Slovan groups have been thrust over the Keen Creek assemblage along the Stubbs Fault. It was subsequently intruded by Middle Jurassic granitic plutons. The Stubbs Fault was traced from the Goat Range around the McKian Creek stock. The fault is recognized by the way it separates the Keen Creek and McHardy assemblages and truncates units within them both above and below the fault. It appears that the McKian Creek stock arched the thrust surface upon intrusion into all the assemblages of the Milford Group resulting in the exposure of the Keen Creek assemblage and the underlying Broadview Formation in a window flanking the McKian Creek stock.

The association of serpentinite, talc schist and diorite along the southeastern border of the "Kaslo" amphibolite southeast of Kuskanax Batholith suggests the location there of the Whitewater Fault and related splays. In the Goat Range the Whitewater Fault thrusts the upper plate of the Kaslo Group, floored by ultramafics, over the lower plate of the Kaslo Group underlain by the McHardy assemblage.

It appears, therefore, that in Poplar Creek map area the lower plate of the Kaslo Group is missing and that its upper plate is thrust directly onto the McHardy assemblage.

The fold south of Cascade Mountain is interpreted as an anticline rather than a synform (Read, 1973) for the following reasons. The stratigraphic succession within the core of the fold, when compared with the similar succession northwest of Mount Cooper where the facing direction is known, suggests that the fold is an anticline. In addition, southeast-plunging minor folds on the limbs suggest that the fold is a southeast-plunging anticline not a synform. The fold also exposes a folded thrust in the saddle between Cascade Mountain and Mount Marion which repeats the section and truncates the McHardy limestone above the fault.

The limestone units of the Milford Group trace out a series of folds in the Wilson Creek area. Fabrics and fold interference patterns support the chronology of deformation worked out by Read (1973).  $F_1$  folds are restricted to the Lardeau Group.  $F_2$  folds are the earliest folds recognized in

Upper Mississippian and younger rocks. The foliation in these rocks is axial planar to these folds.  $F_2$  folds generally have an "N"-shaped profile when viewed towards the north.  $F_3$  folds are generally tight mesoscopic and macroscopic folds with a reversed "N" profile looking north. A fourth folding episode, locally well developed in the Goat Range area (Klepacki and Wheeler, 1985) but weakly developed in the Poplar Creek map area (Read, 1973, p. 59), has a similar profile to  $F_3$  and may occur at Cascade Mountain. There the axial surface of the Cascade Mountain anticline changes from nearly vertical south of Cascade Mountain to easterly dipping near the summit.

#### Summary

The stratigraphy of the Goat Range study area, especially the revised upper Paleozoic Milford and Kaslo groups and their associated faults, were traced northward through Wilson Creek area into the Poplar Creek map area. This now provides a basis for re-interpreting the upper Paleozoic stratigraphy and for identifying the related faults farther northwest in the Poplar Creek area.

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