



## WEARY RIDGE AND BLEASDELL CREEK AREAS ELK VALLEY COALFIELD\* (82J/7)

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### INTRODUCTION

Detailed geological mapping and sampling of the north half of the Elk Valley Coalfield (Figure 5-1-1) began this year as part of the ongoing evaluation of the East Kootenay coal district by the Geological Survey Branch. The end result, a 10 000-scale geological map on an orthophoto base, will extend previous mapping coverage a distance of 40 kilometres to the north, from the general vicinity of Britt and Henretta Creeks to the Elk Lakes Provincial Park (Figure 5-1-2). Work in 1986 was restricted to the area between Britt and Henretta Creeks to the south, and Weary Creek to the north (Figure 5-1-2). This article describes geology and coal rank distribution for the Weary Ridge and Bleasdell Creek areas.

The Weary Ridge-Bleasdell Creek area lies in the Elk River valley, 35 to 40 kilometres north of Elkford and 15 to 20 kilometres north of Fording Coal Ltd.'s Fording River operations. It is accessible by two-wheel-drive vehicle from Elkford, although access to some localities requires four-wheel drive.

Relief in the area is not extreme. Weary Ridge rises to a maximum elevation of 2200 metres, 650 metres above the floor of the Elk Valley. Topography near lower Bleasdell Creek rises gradually above the Elk River, but steepens dramatically towards Mount Bleasdell, outside the study area.

The area is licenced Crown land and comprises part of two separate properties. The south end of Weary Ridge is part of the Fording River property, owned by Fording Coal; the remainder of the area is part of the Elk River property, owned 50 per cent by Fording Coal, with ownership of the other 50 per cent shared by Stelco Inc., Scurry-Rainbow Oil Ltd. and Home Oil Co. Ltd. Fording acquired its interest in the property in 1986.

Recent coal exploration on Weary Ridge began in 1968, when North American Coal Corp. conducted an extensive program of trenching, drilling and underground work. In 1969 Scurry-Rainbow completed a similar program covering both Weary and Little Weary Ridges. Subsequent programs were concentrated on Little Weary Ridge, but included work on the northern part of Weary Ridge. Operators were Emkay Canada Natural Resources Ltd. and Scurry-Rainbow Oil Ltd. between 1970 and 1972, Elco Mining Ltd. and Exploration und Bergbau GmbH in 1975 and 1976, and Elco Mining Ltd. in 1976 and 1977. A surface mine plan for Little Weary Ridge was given government approval-in-principle in 1979.

Exploration in the Bleasdell Creek area was mainly confined to 1969, when Scurry-Rainbow Oil carried out trenching, drilling and adit construction.

### FIELDWORK AND METHODS OF STUDY

Field data were plotted directly on British Columbia Government air photographs, enlarged to approximately 1:7500 scale. Data were later transferred to 1:10 000-scale orthophotos, prepared especially for this project.

A stratigraphic section of Mist Mountain Formation on Weary Ridge was measured using a 1.5-metre "pogo stick".

Grab samples of coal were taken to provide material for petrographic rank determinations. In all cases, bloom and other highly degraded coal was avoided, usually by sampling from fresh-looking cuts or by digging through softer material.

Three 1969 diamond-drill cores from Weary Ridge were logged in detail using the method of Ruby *et al.* (1981) as described by Grieve and Elkins (1986). Although most of the coal had been removed for analysis, it was possible to sample thin seams and coal bands for petrographic rank determinations. Results of core logging and sampling are not yet available.

Petrographic rank of coal was determined by the  $\bar{R}_o$  max method (mean maximum vitrinite reflectance in oil). Maximum readings on 50 grains per sample were measured and averaged. Coals are classified into ASTM rank categories as follows: high volatile bituminous,  $\bar{R}_o$  max < 1.12 per cent; medium volatile bituminous, 1.12 per cent <  $\bar{R}_o$  max < 1.51 per cent; and low volatile bituminous,  $\bar{R}_o$  max > 1.51 per cent.

### STRATIGRAPHY

The stratigraphic column in the study area is shown as the legend in Figure 5-1-3. Economic coals in southeastern British Columbia are contained within the Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group. A thin coal seam is known to occur within the underlying Morrissey Formation (basal Kootenay sandstone) but was not observed. In addition, thin humic and sapropelic coals occur throughout the Elk Formation. The Kootenay Group is overlain by Cadomin Formation, the basal conglomerate unit of the Lower Cretaceous Blairmore Group.

A stratigraphic section of 507 metres of the Mist Mountain Formation, measured along Weary Ridge, is shown in Figure 5-1-4. Coal seams are exposed in trenches excavated for bulk sampling in 1968. An estimated additional 50 metres of Mist Mountain Formation, containing two or three thin coal seams, is present on Weary Ridge. This is overlain in turn by a resistant sandstone unit, believed to be the basal unit of the Elk Formation, which forms a prominent dip slope at the south end of the ridge.

The coal seam nomenclature used in Figure 5-1-4 corresponds with that applied by North American Coal. A total of 63.8 metres of coal occurs in approximately 15 seams or zones, ranging from 1.6 metres (G-seam) to 9 metres in thickness (S-seam). The most economically attractive part of the section appears to be the uppermost 150 metres, which contains 29 metres of coal in four zones (N, P, Q and S). The uppermost of these, S-seam, correlates with the burning seam south of Aldridge Creek (Bustin and Mathews, 1982).

An intriguing aspect of the Weary Ridge section is the relative scarcity of discrete, thick sandstone units (Figure 5-1-4). A prominent sandstone overlies S-seam, and three thin sandstone units occur within the section, but for the most part, sandstone is fine or very fine grained and occurs as interbedded sandstone-siltstone sequences. This suggests that fluvial channels were remote during most of the deposition of the Mist Mountain Formation and may account for the good development of coal at this location.

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

South of Bleasdell Creek the basal part of the Mist Mountain Formation has been faulted out, while north of the creek the entire formation is preserved. The stratigraphy of the formation on the west side of the Elk Valley appears generally similar to that on Weary Ridge.

## STRUCTURE

The Weary Ridge-Bleasdell Creek area is underlain by both limbs of the north-trending Alexander Creek syncline (Figure 5-1-3), which extends throughout the Elk Valley Coalfield. The west limb ranges from steeply east-dipping to overturned and steeply west-dipping. It is over-ridden by the west-dipping Bourgeau thrust fault, which has placed Triassic and older rocks in contact with either Fernie or Kootenay strata (Figure 5-1-3). The flatter east limb dips 40 to 45 degrees to the west.

Local structural disturbances are mainly associated with the Bourgeau thrust. At Coal Creek, a tributary of Bleasdell Creek, the lower Mist Mountain Formation is cut by imbricate thrusts; local thickening of a coal seam is present in this highly disturbed zone.

## RANK DISTRIBUTION

Sample analysis for rank determination is on-going. Reflectance values obtained to date on samples from the Weary Ridge measured section are displayed in Figure 5-1-4. Values for some samples from Weary Creek, Coal Creek, and a series of trenches less than 1 kilometre north of Bleasdell Creek have also been determined.

Based on results obtained so far, there is a striking and significant contrast in coal rank between the east and west limbs of the Alexander Creek syncline, with the east limb having the higher rank values. For example, on Weary Ridge reflectance values range from 1.59 to 1.15 per cent (Figure 5-1-4) corresponding with low and medium volatile bituminous coals. Values obtained on samples in Weary Creek, representing approximately the same interval as seams B to I or J, range from 1.63 to 1.43 per cent.

In marked contrast, values obtained on samples collected north of Bleasdell Creek, representing the interval from the basal to the uppermost coal-bearing zone of the Mist Mountain Formation, range from 0.85 to 0.65 per cent. Values from Coal Creek, less than 1 kilometre south of Bleasdell Creek, range from 0.86 to 0.89 per cent, with the exception of one value of 1.00 per cent.

These results corroborate work by Hughes and Cameron (1986) in the same general area. Hughes and Cameron have also found

similar abrupt rank changes across other large overturned folds in the footwalls of major thrust faults. However, no other similar situations are so far known in southeastern British Columbia. Based on modelling of the coalification in this and similar cases, Hughes and Cameron speculate that the deformation of Kootenay strata directly affected deposition of Upper Cretaceous sediments, leading to significant and abrupt contrasts in depth of burial.

## MINEABILITY

Preliminary evaluation suggests that Weary Ridge offers significant potential as a surface minesite. At the south end of the ridge the N to S-seam interval is near the surface and offers the combination of the lowest coal ranks on Weary Ridge with the most attractive apparent waste-to-coal ratio (Figure 5-1-4). The presence of basal Elk Formation covering the south end of the ridge is a negative feature, but the volume of material is probably not great (Figure 5-1-3).

## ACKNOWLEDGMENTS

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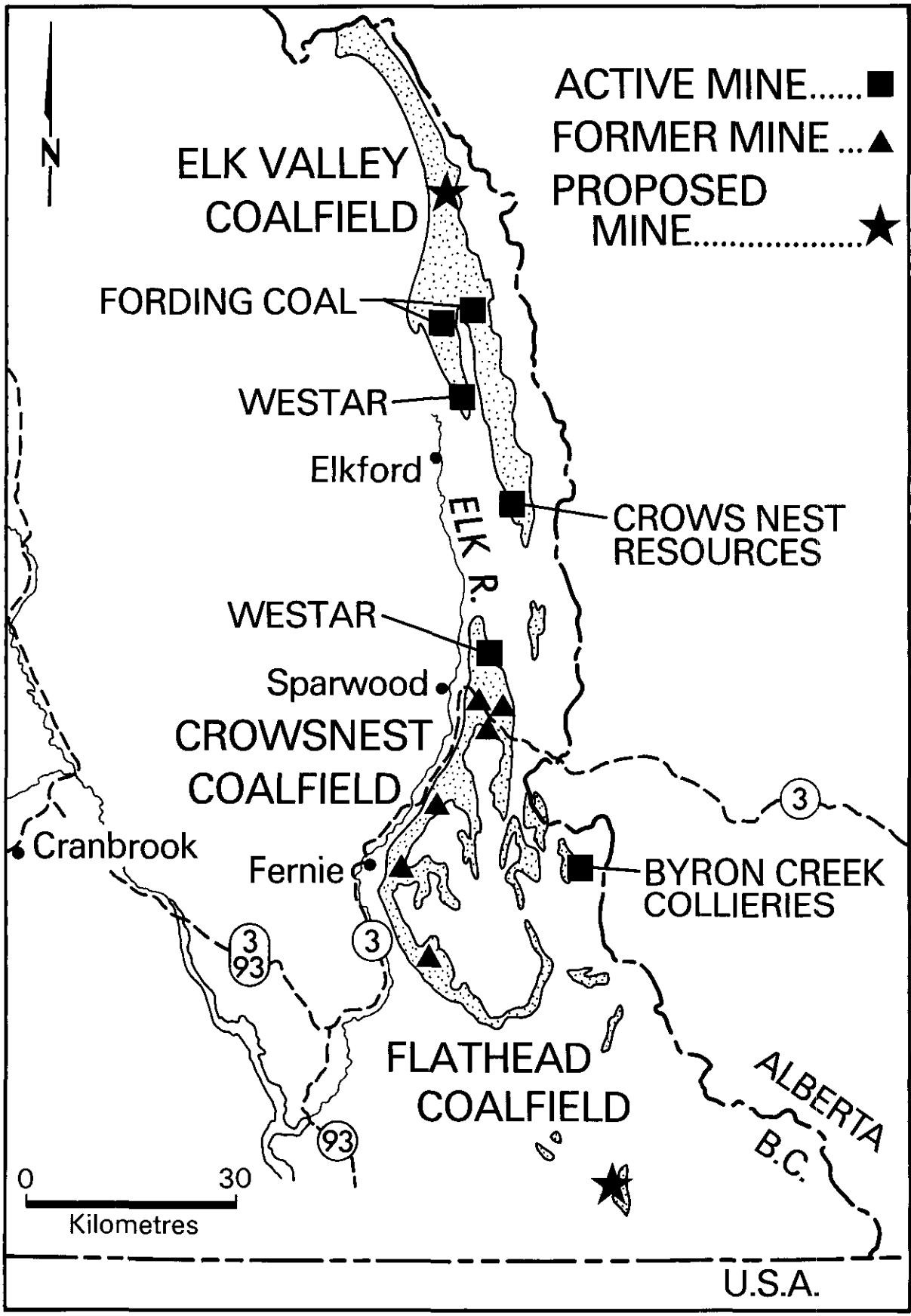


Figure 5-1-1. East Kootenay coalfields with mine properties located.

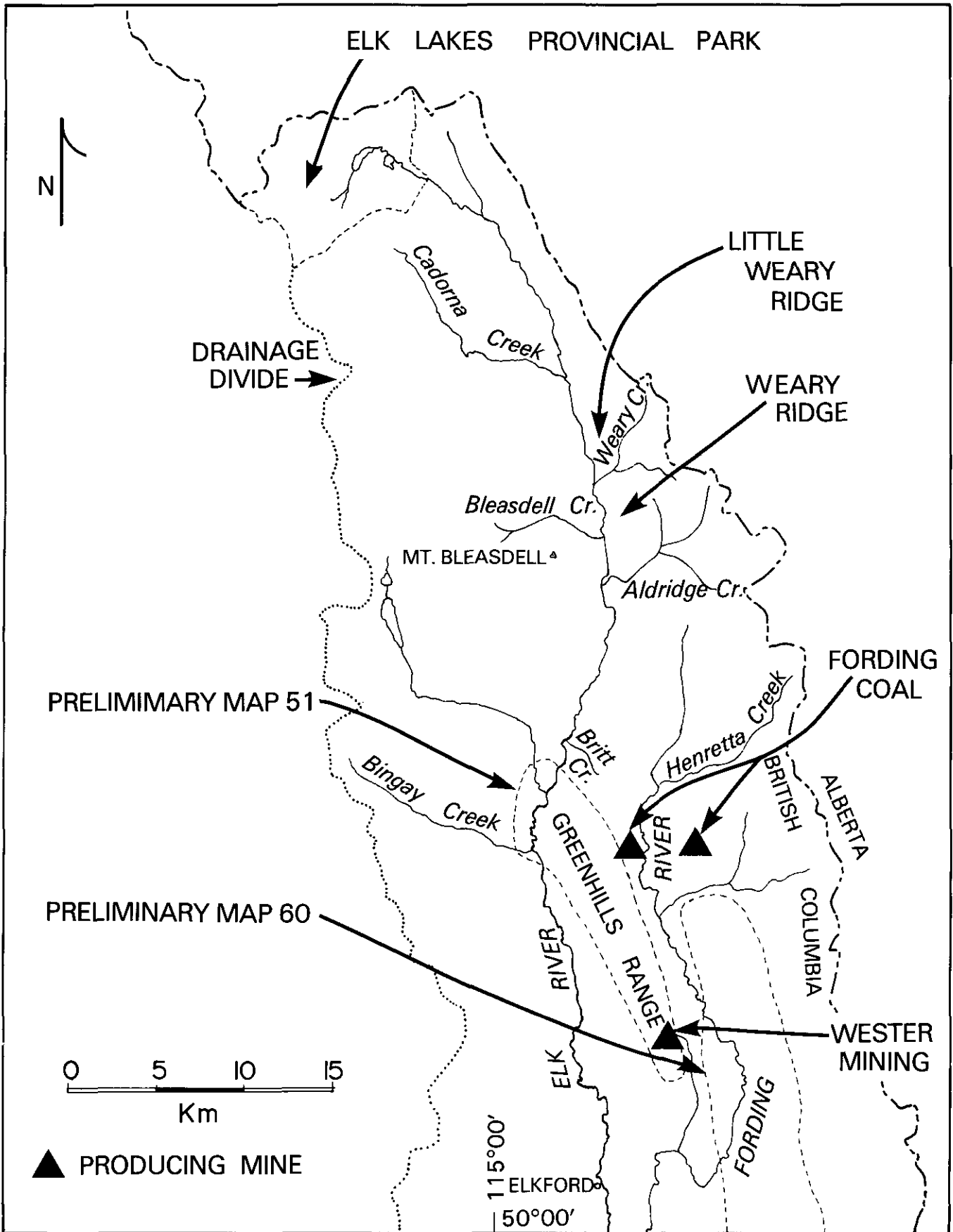


Figure 5-1-2. Location map of the Elk River valley north of Elkford.

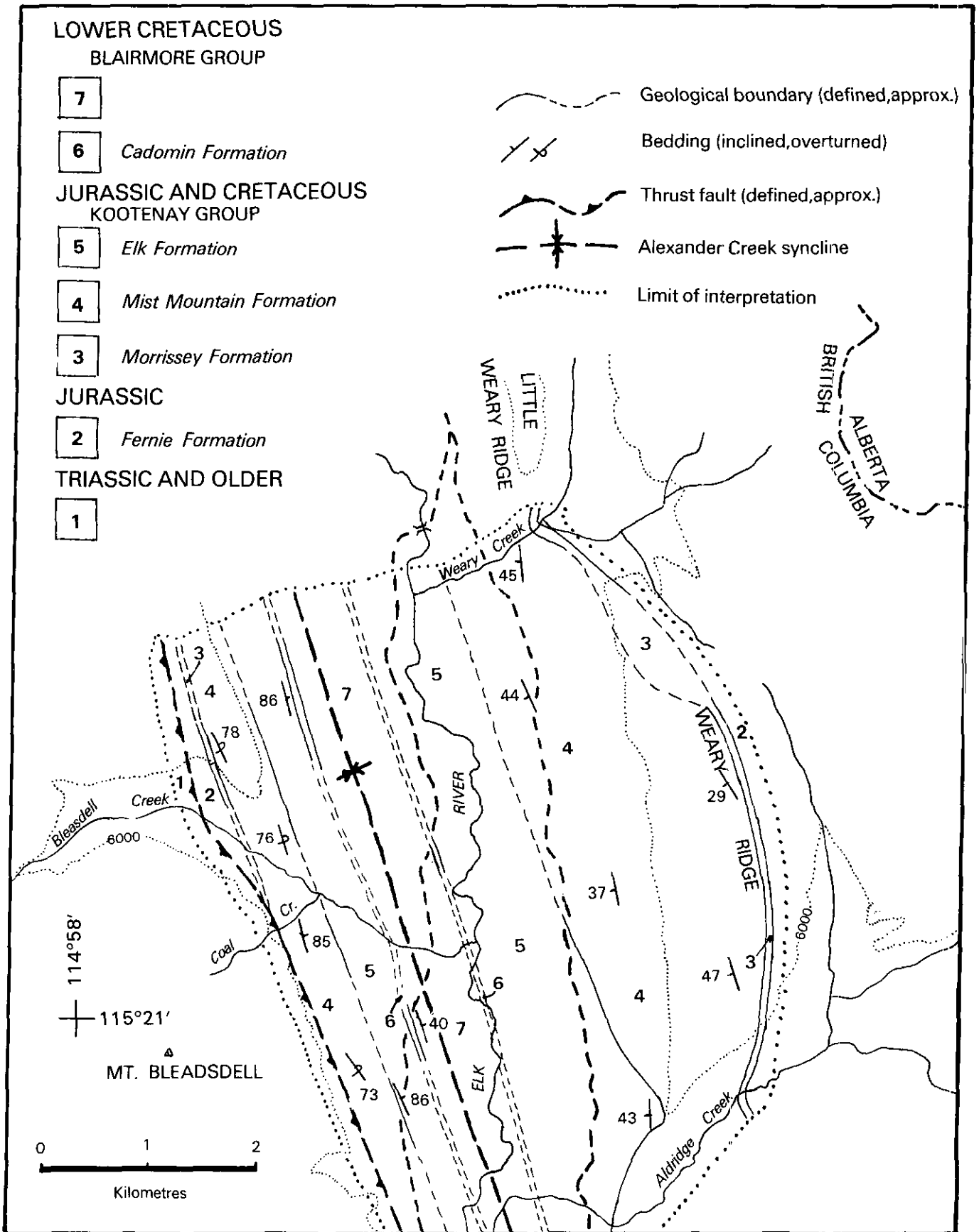


Figure 5-1-3. General geology of the Weary Ridge-Bleasdell Creek area.

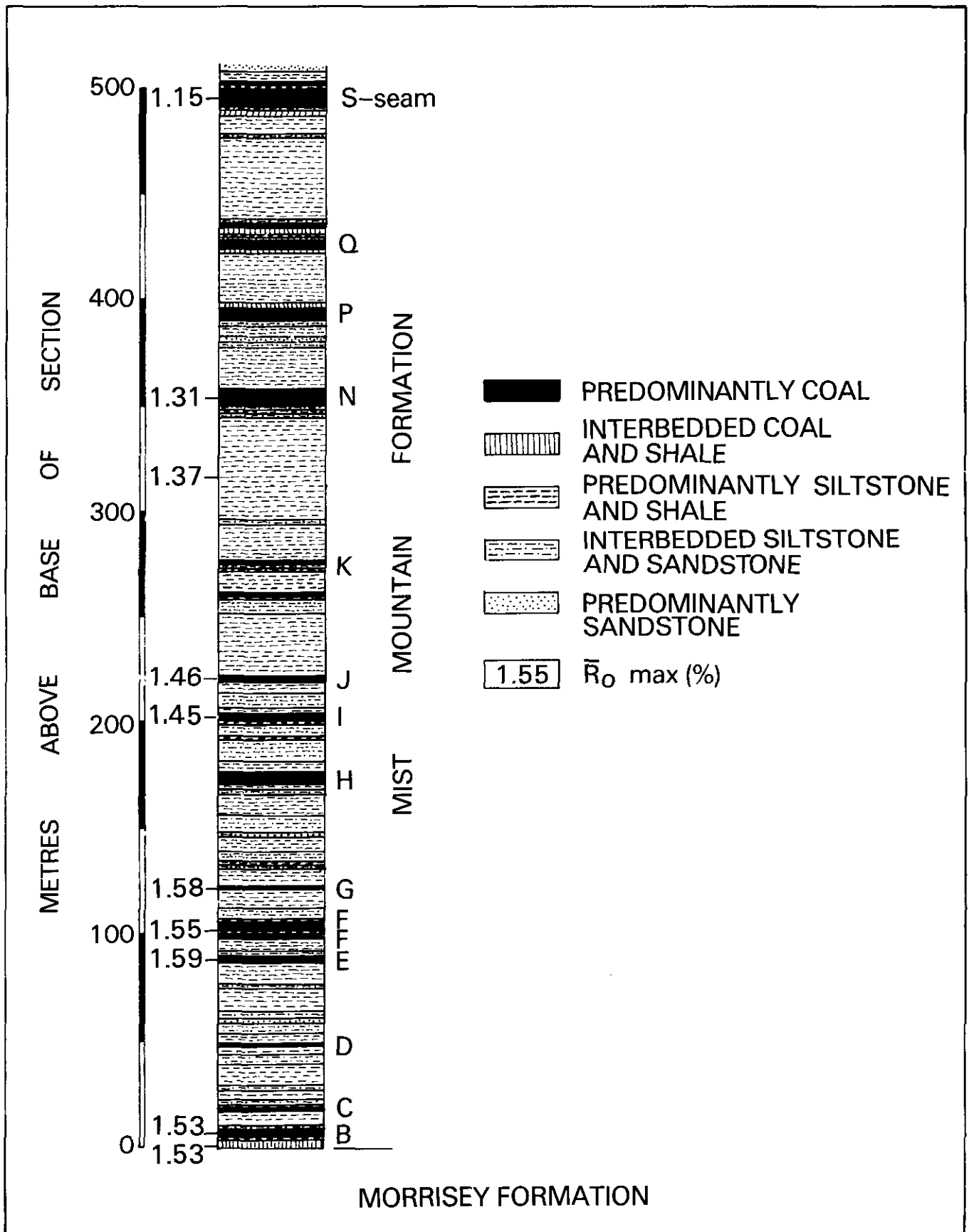


Figure 5-1-4. Generalized measured section of the Mist Mountain Formation on Weary Ridge.