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PAPER 63-33

TRIASSIC STRATIGRAPHY OF THE ROCKY MOUNTAIN FOOTHILLS BETWEEN PEACE AND MUSKWA RIVERS, NORTHEASTERN BRITISH COLUMBIA

(Report, 2 figures, appendix)

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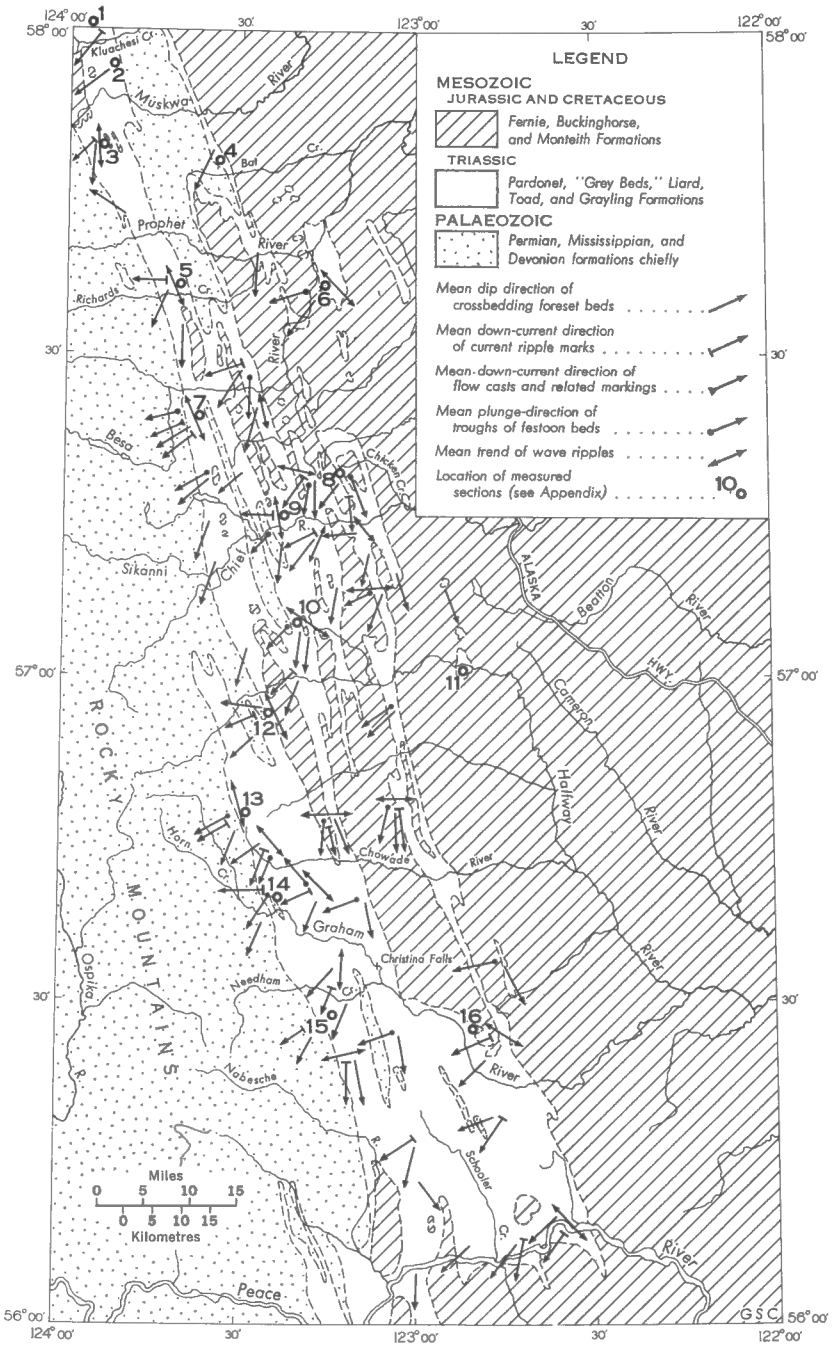

Figure 1. Outcrop of Triassic rocks, sedimentary trends and location of measured sections, Rocky Mountain foothills belt

TRIASSIC STRATIGRAPHY OF THE ROCKY MOUNTAIN FOOTHILLS BETWEEN PEACE AND MUSKWA RIVERS, NORTHEASTERN BRITISH COLUMBIA

INTRODUCTION

This report is the last of four preliminary papers (Pelletier, 1960, 1961, 1963) dealing with the stratigraphy of Triassic outcrops in the Rocky Mountain Foothills of northeastern British Columbia. The study began in the summer of 1959, continued during the field seasons of 1960 and 1961, and was completed in 1962. During the 1962 field season, sections were measured in hills and ridges adjacent to the valleys of Kluachesi Creek and Muskwa, Prophet, Besa, Sikanni Chief, Halfway, and Graham Rivers (Figure 1). The stratigraphy and lithology of the Triassic formations in adjacent areas north to Liard River, as well as the area between Graham and Peace Rivers, were described in the previous three papers.

Earlier descriptions of Triassic rocks in northeastern British Columbia were summarized by McLearn and Kindle (1950). Triassic outcrops were also described in geological reports and maps by Hage (1944), and Pelletier and Stott (1963) in Trutch map-area, by Muller (1961) in Pine Pass map-area, and by Irish (1962) in Halfway River map-area. Occurrences of Triassic rocks in the subsurface of central Alberta and northeastern British Columbia east of the Foothills have been described by Hunt and Ratcliffe (1959), Colquhoun (1960, 1962), and Armitage (1962). An interpretation of the effects of the Peace River Arch upon the deposition of Mesozoic strata in the area of the Foothills and Rocky Mountains west of Fort St. John was presented by Williams (1958).

Ammonoid faunas of the Pardonet Formation, Peace River area, were described by McLearn (1960) and reports on Triassic faunas of western Canada were given by Tozer (1961, 1962). Westermann (1962a, 1962b) gave accounts of some Triassic (Norian) pelecypods of the Pine Pass map-area and the mid-Triassic brachiopod "Spiriferina" stracheyi (Salter) of the Trutch map-area.

This report presents additional sections (see Appendix), stratigraphic correlation (see charts), and sedimentary studies (Figure 1). Several collections of invertebrate fossils were made at sections described in the Appendix, and E.T. Tozer is responsible for the identification of these faunas.

The field work was carried out by means of a Bell-G2 helicopter piloted by F. Nobels, with J. Warden as engineer. Assistance in the field was given by G.L. Goruk, technical officer, and R.E. Ireland and J.T. Postle. The following persons worked in base camps or assisted on camp moves: W. Boring, A. Lamont, D. McDougald, R.L. Ross, and I. Severson. To all of these assistants, aviation crew, and camp workers the writer extends his thanks.

GENERAL STATEMENT

Triassic outcrops in the Trutch and Halfway map-areas occur chiefly within the folded belt of the Foothills. These outcrops form high ranges separated by culminations of Palaeozoic rocks on the one hand, and by synclines of younger Mesozoics on the other, all within the Foothills' characteristic valley-and-ridge province. This structural and physiographic province lies west of the low-lying, gently folded Cretaceous beds in the eastern half of the area, and east of the more highly elevated, highly folded, and thrust-faulted Palaeozoic and possibly older beds to the west. In general the Triassic is overlain disconformably by Lower Cretaceous beds in the area northwest of Besa River and Richards Creek, whereas to the south the Triassic is overlain disconformably by the Jurassic Fernie Group. A regional unconformity bevels the Jurassic and Triassic beds in such a manner that younger beds are absent successively toward the northeast. This unconformity appears to be due to uplift in the northeast, presumably in the direction of the northeastern part of British Columbia, and adjacent parts of Alberta and Northwest Territories, where the Triassic is absent. The lower contact of the Triassic lies disconformably upon chert of Palaeozoic age which may be either Permian or Mississippian.

The Triassic system has been subdivided into several formations, the oldest being the Grayling, followed successively by the Toad, the Liard, 'Grey Beds', and the Pardonet. 'Grey Beds' is a provisional lithological term set up by McLearn (see McLearn and Kindle, 1950, p. 46) and is subdivided here into lower, middle, and upper formations to correspond respectively to the Halfway, Charlie Lake, and Baldonnel Formations of the subsurface to the east. The equivalence of these subsurface formational names in the Foothills is tentative. Within the Triassic system, formational contacts are generally gradational, although local erosional surfaces are common. The formational contacts can be traced along the trend of the Foothills; in this direction a particular facies associated with the contacts persists for scores of miles. Across the Foothills' trend the dominant characteristics of each formation disappear over a distance of a few miles and correlation across strike becomes difficult, particularly in the western Foothills. Rocks of the eastern sections, consisting chiefly of massive siltstone, sandstones, bioclastic limestones, evaporites, and various carbonates, pass rapidly into a monotonous succession of calcareous platy siltstones and sandstones characterized by a scarcity of fossils, particularly in the sections near Mount Laurier. Westerly the textures of the clastic units become finer, and bedding and unit thicknesses decrease; the carbonates pinch out rapidly, generally within a distance of several hundred yards to a few miles from their area of maximum development.

Along the eastern Foothills in the area between Muskwa and Prophet Rivers, where Fernie shales bearing their characteristic pectens are absent, Triassic rocks occur in their entirety between the disconformable boundaries of the underlying Palaeozoic chert and the overlying Cretaceous shale, and are less than 3,000 feet in thickness. To the southwest, the Triassic rocks are thicker and may exceed 5,000 feet in the areas of Mount Laurier on Halfway River, and Pardonet Hill - Mount Green on Peace River. Northeast of the Foothills the Triassic decreases in thickness, according to data from subsurface sections (Hunt and Ratcliffe, 1959). This decrease is due partly to

TABLE OF FORMATIONS

PERIOD OR EPOCH	FORMATION AND THICKNESS (feet)	LITHOLOGY	FAUNAL ZONES
Lower Cretaceous	Bullhead Group	Shale, sandstone, and conglomerate.	
Jurassic	Fernie Group (0 - 1,200)	Black shales, dark grey siltstones and sandstones.	
Upper Triassic	Pardonet (0 - 2,000+)	Dark grey platy limestone and calcareous siltstone.	Monotis
	Upper 'Grey Beds' (Baldonnel) (0 - 750)	Fine-grained, medium grey, partly bioclastic, bituminous limestones; minor interbedded sandstone.	Halobia
	Middle 'Grey Beds' (Charlie Lake) (145 - 440)	Interbedded fine-grained, light grey to yellow limestone and dolomite with interbedded intraformational breccia, sandstone and yellow shale.	
	Lower 'Grey Beds' (Halfway Formation) (300 - 1,400)	Grey, calcareous, fine- to coarse-grained, highly crossbedded sandstones, with minor interbeds and units of massive, grey, fine-grained and bioclastic limestone.	
Middle Triassic	Liard (600 - 1,300)	Massive, grey, calcareous sandstones, minor grey limestones, and dark grey siltstones.	Nathorstites
	Toad (650 - 1,200)	Massive, grey, calcareous siltstones and mudstones, minor sandstone and limestone, platy shales and siltstones.	Gymnotoceras - Beyrichites Wasachites
Lower Triassic	Grayling (0 - 350)	Chiefly dark grey, non-calcareous shales and minor siltstones and limestones; interbedded thin sandstone in lower part.	Claraia stachei
Permian - Pennsylvanian?	Fantas(?)	Thick-bedded, blocky, dark bluish grey to black chert.	

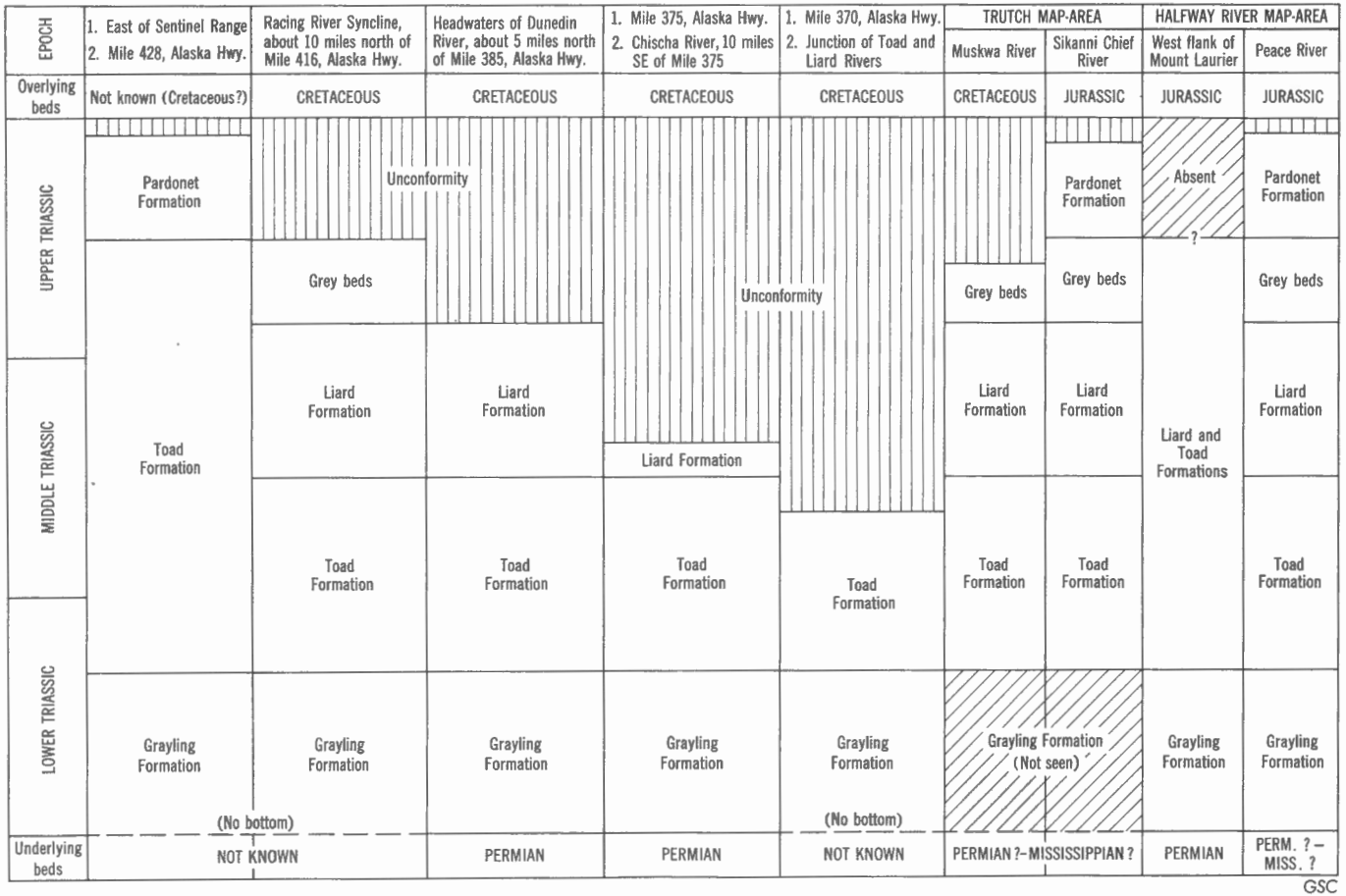

Figure 2. Correlation of Triassic formations, Rocky Mountain foothills

pre-Cretaceous erosion, and partly to eastward convergence of the formations. There is insufficient evidence to show whether the Triassic decreases west of the Foothills in the Halfway and Trutch map-areas, although this is indicated in the Toad - Liard River area to the north (Pelletier, 1963).

GRAYLING FORMATION

The Grayling Formation consists of dark grey non-calcareous, flaky shales with minor thin, interbedded sandstones in the lower part. The shales weather dark grey to black and are soft, generally occurring as deeply recessive units on ridgetops and hillsides, or as concealed units in anticlinal valleys. Large kettle concretions are present in the shales at some localities, and may contain fossils. Certain thin sandstones weather a bright rusty-orange, and may exhibit small-scale crossbedding, ripple-marks, flow casts, and associated structures. The presence of ammonites and the pelecypod Claraia stachei indicate a marine environment of deposition for the Grayling Formation during the early part of the Scythian epoch (McLearn, 1945). Apart from its occurrences in river sections between Liard and Chischa Rivers, the Grayling Formation occurs in the present area at Mount Green (Pelletier, 1963, Section 8). Other occurrences in this area are restricted to the extreme western Foothills, particularly on the west flank of Mount Laurier (Section 13).

The Grayling Formation is generally thin in the western Foothills and absent in the east. In the vicinity of Mount Laurier the formation is less than 100 feet thick, and is overlain conformably by the Toad Formation which contains a fauna of early and late upper Scythian age. To the east in Needham Creek, 2 miles west of the junction with Graham River, a 15-foot concealed interval above the Permian chert was previously thought to be occupied by the Grayling (Pelletier, 1963, Section 6). However, at an outcrop 1/2 mile below the Needham Creek junction on Graham River, black platy siltstones typical of the Toad Formation rest disconformably upon the Permian chert, and the typical non-calcareous Grayling shales are absent. Therefore this Needham Creek - Graham River vicinity is a known limit east of which the Grayling Formation does not extend. Possibly the eastern limit is farther west in the vicinity of the lower tributaries at the headwaters of Graham River. The western limit of deposition of the Grayling Formation beyond Mount Laurier and Mount Green was not determined.

TOAD FORMATION

The Toad Formation consists of calcareous, dark grey, platy siltstones and shales, which alternate with sequences of calcareous, dark grey massive siltstones in units up to several hundred feet thick. Small black phosphatic pebbles and fragments, weathering dark blue, occur in the lower Toad about 800 to 1,000 feet below the Liard Formation. These pebbles occupy less than 5 per cent of the bed and occur in several layers, chiefly in sections in the eastern Foothills. Some very fine grained calcareous sandstones are present in the upper part of the Toad and contain crossbedding and ripple-marks. These upper beds pass gradationally into the Liard Formation. A Wasachites fauna of early upper Scythian age, and a

Gymnotoceras fauna of Anisian age are generally characteristic of the Toad Formation. The older Toad fauna occurs in Sections 13 to 15. The fossil collections include specimens of Posidonia mimer Oeberg, Xenocetites cf. subevolutus Spath, Posidonia aranea Tozer, Meekoceras sp. and Pseudomonotis cf. occidentalis Whiteaves. Stratigraphic positions of the fauna are shown in the Appendix. The younger Toad fauna is found in Sections 1, 2, 5, 7, 9, and 10. The fossil collections include specimens of Hungarites sp., Acrochordiceras sp., Gymnotoceras sp., Parapopanoceras tetsa McLearn, Gymnotoceras helle McLearn, Daonella sp., Hollamdites humi McLearn, Ptychites sp., Protachyceras sp. and Arcestes sp. Both upper and lower fauna were identified by Tozer.

The thickness of the Toad Formation, where it occurs between recognizable boundaries of the Grayling beneath and the Liard above, decreases from 1,200 feet in the eastern exposures along the Foothills to about 650 feet in the western ranges. This decrease in thickness is due presumably to normal convergence. Farther west, a facies change in the overlying Liard Formation and 'Grey Beds' results in a thick sequence of platy siltstones similar to those of the Toad Formation in the east but much younger in age. This abrupt expansion of a Toad facies in the west occupies almost the entire known Triassic interval of more than 4,500 feet. East of the Foothills as well as farther north, the Toad Formation is thinner and disappears altogether in the subsurface. As discussed previously (Pelletier, 1963), this eastward thinning is due partly to convergence, and partly to pre-Lower Cretaceous erosion.

LIARD FORMATION

The Liard Formation in the eastern Foothills consists of fine- to coarse-grained, grey massive sandstones with minor interbeds of thick grey limestone, and minor sequences of dark grey massive siltstone. However, the intervals of massive arenaceous beds grade westerly across strike over a distance of a few miles into less well defined ledges of finer sandstones, and finally into a monotonous succession of platy siltstones similar to those in the Toad Formation. A shallow-water facies is characteristic of the Liard in eastern exposures as shown by the occurrences of festoon bedding, cross-bedding, ripple-marks, scour features, and coquinoid layers. The presence of the Nathorstites fauna at one or more stratigraphic levels indicates a Ladinian age for the Liard. This fauna has been found in Sections 1, 7, 9, 10, 12, 13 and 15. The fossil collections, identified by Tozer, include specimens of Daonella elegans McLearn, Nathorstites mcconelli (Whiteaves), Paratrachyceras sutherlandi McLearn, Daxatina sp., Asklepioceras sp., Protrachyceras sp., Spiriferina sp., Daonella nitanae (McLearn), "Monotis" montini McLearn, Pecten sp., Lingula sp., Terebratula cf. liardensis Whiteaves, Protrachyceras sikaniam McLearn, and Ostrea sp. The fauna of the Liard Formation has been discussed by McLearn (1947) and Tozer (1961).

The greatest thickness of the Liard Formation is about 1,300 feet and occurs along an axis extending in a southeasterly direction between Mount Withrow on Sikanni Chief River and sections about 4 miles west of Graham River in the vicinity of Needham Creek. To the west beneath the summit on the eastern flank of Mount Laurier, the Liard Formation has thinned to approximately 600 feet, and farther

west the same interval is occupied by platy siltstones and the Liard Formation was not recognized. To the east the beds thin, and beneath the surface in the Plains region are absent entirely. As discussed previously (Pelletier, 1963), this eastward thinning is due partly to pre-Cretaceous erosion, and partly to normal convergence.

'GREY BEDS'

The 'Grey Beds' are a provisional lithologic unit without formal status (McLearn, 1940, p. 63), and consist chiefly of thick, massive beds of light to medium grey, fine to coarse sandstones and various types of carbonates. This unit is subdivided here into lower, middle, and upper parts which are tentatively correlated with the Halfway, Charlie Lake, and Baldonnel Formations respectively. As these three formations occur in the subsurface east of the Foothills, the designation of the formations outcropping within the Foothills is based partly on lithological similarity (Hunt and Ratcliffe, 1959; Colquhoun, 1960, 1962; and Armitage, 1962) and partly on faunal evidence, together with stratigraphic position in the Triassic section. Certain units of the 'Grey Beds' are present in all sections in Trutch map-area, and in all eastern sections of the Foothills in Halfway River map-area. Due to a facies change these typical 'Grey Beds' units disappear abruptly in the vicinity of Mount Laurier and upper Horn Creek, where their position in the section is occupied by platy siltstone. The maximum thickness of the 'Grey Beds' is more than 2,000 feet. This thickness occurs along an axis trending northwesterly and roughly parallel with the axis of maximum thickness of the Liard Formation, and perhaps a few miles farther west. Eastward and northward thinning is due to pre-Cretaceous erosion and normal convergence of the Triassic strata. Erosion is demonstrated in sections along Muskwa River where Lower Cretaceous beds rest disconformably upon the middle part of the 'Grey Beds'.

Halfway Formation (Lower 'Grey Beds')

The Halfway Formation consists of grey, calcareous, fine- to coarse-grained sandstones generally outcropping as thick ledges. Massive, grey, fine-grained and bioclastic limestones are interbedded but may occur as separate ledges. The occurrences of large-scale crossbedding, numerous festoon beds, ripple-marks, scour features, and bioclastic units indicate a shallow-water origin, perhaps of the platform type. Fossils are present and may include those of the Nathorstites zone although not necessarily Nathorstites itself. Coquinoids of broken spirifers, terabratulids, and gryphaeids are common. Casts of these genera and rarely small gastropods are found in the more arenaceous carbonates.

The maximum development of the Halfway Formation is about 1,400 feet in thickness in the vicinity of Schooler Creek, and extends from there along a northwesterly trending axis. Farther west, the sandstones pass gradationally into platy siltstones, and the thick carbonates disappear abruptly. East and north, along the easternmost range of Foothills, the Halfway Formation decreases in thickness. At Aylard Creek north of Peace River the formation is about 450 feet thick; at Sikanni Chief River it is 350 feet thick; at Muskwa River it is 300 feet thick; and 35 miles north of Trutch map-area on Chischa River it

is absent. Because the Charlie Lake Formation is generally gradational with the Halfway Formation, thinning of the Halfway to the east and northeast is due mostly to convergence. However as the Charlie Lake also disappears north of Trutch map-area, thinning of the Halfway Formation in that area is also due to pre-Cretaceous erosion. The eastern limit of the Halfway Formation occurs in the subsurface east of the Foothills, and the western limit in the vicinity of Mount Laurier and Pardonet Hill.

Charlie Lake Formation (Middle 'Grey Beds')

The Charlie Lake Formation consists of thick units of interbedded, fine-grained, light grey to yellow limestone and dolomite. Thick beds of intraformational carbonate breccia of the collapse or solution type are also present. Many of the carbonate beds contain a box-work pattern of vugs which may represent salt casts or leached fragments of breccia. Stylolites and pods of coarse white calcite are common. Minor thick, coarse-grained, porous, and bituminous sandstones commonly outcrop as ledges. Thin yellow shale beds, generally in the form of partings, are present throughout. The Charlie Lake Formation occurs in the Foothills as a deeply recessive interval characterized by considerable greyish and yellowish weathered talus, some of which is encrusted with manganese dendrites. Both upper and lower contacts of this formation are gradational; the lower contact passes into arenaceous beds and the upper into a sequence of bituminous and partly bioclastic limestones. The Charlie Lake Formation is thought to have an evaporitic origin because of the occurrences of the collapse-type breccia and a box-work system of vugs, the abundance of stylolites and carbonate veins, occurrences of dolomite and limestone interbedded with festoon-bedded sandstones thought to be offshore bars, and a general lack of fossils except for a few casts in the more arenaceous units.

The thickest development of this formation, about 440 feet, is along an axis extending southeasterly through Mount Withrow, on Sikanni Chief River and a range of hills about 3 miles east of Mount Stearns, on Halfway River. Southwest of Mount Laurier this formation is absent and the stratigraphic interval is occupied by platy siltstones. In the most easterly range of the Foothills, thicknesses of the Charlie Lake Formation are as follows: at Bat Creek, 304 feet; at Klingzut Mountain, 394 feet; and on Sikanni Chief River, 145 feet. To the north the formation again decreases in thickness due partly to erosion. This is seen in sections near Kluachesi Creek where Lower Cretaceous beds rest disconformably upon the upper beds of carbonate breccia. There the Baldonnel Formation, which should overlie the Charlie Lake and in turn be overlain by the Cretaceous, is absent. North of Trutch map-area, the Charlie Lake Formation is also absent.

Baldonnel Formation (Upper 'Grey Beds')

The Baldonnel Formation consists mainly of a sequence of fine-grained, medium grey, partly bioclastic, bituminous limestones. Some minor sandstone is interbedded and may form ledges 10 to 20 feet thick. Both upper and lower contacts are gradational, and in many cases are difficult to distinguish. However the lower contact was taken arbitrarily at the top of the broad recessive interval characteristic of

the Charlie Lake Formation. The upper contact was taken as the top of the rather resistant limestone that generally weathers light grey. Above this unit lies the darker, somewhat recessive Pardonet Formation. The gradual disappearance of sand in the Baldonnel Formation in the western sections together with the increasing amounts of soft, dark grey, fossiliferous limestone with considerable silt, particularly in the eastern sections, indicates marine deposition during a gradual transgression of the sea to the east and north. The Halobia fauna is the most characteristic faunal zone of these upper 'Grey Beds'. Several fossil collections were made, and their stratigraphic positions are noted in Sections 3, 4, 5, 7, and 8 to 12. Specimens include: Halobia sp., Palaeocardita sp., Lima (Plagiostoma) sp., "Myophoria" sp., Gryphaea sp., Pecten sp., Pleuromya nidovana McLearn, Entolium sp. and Spiriferina sp. Tozer identified and dated these as Upper Triassic.

The greatest thickness of the Baldonnel Formation appears to be along a northwest-trending axis passing through Mount Stearns. There the formation is about 750 feet thick, but thins to the southwest, presumably where the upper beds pass gradationally into the predominantly silty lower Pardonet beds and a change of facies takes place. North and east of Mount Stearns the Baldonnel Formation also thins rapidly due to convergence. At Mount Withrow the thickness is 650 feet; in the easterly Foothills on Sikanni Chief River, 465 feet; and in the westerly Foothills on Besa River, 480 feet. In all other sections farther north the Baldonnel Formation is overlain disconformably by Lower Cretaceous beds so that thinning is more rapid due to the additional effect of erosion. The Baldonnel is about 350 feet thick along Prophet River, 260 feet thick along Muskwa River, and is absent entirely at Kluachesi Creek. The eastern limit of the Baldonnel occurs in the subsurface east of the Foothills.

PARDONET FORMATION

The Pardonet Formation consists mainly of dark grey to black, platy calcareous siltstones, and thin interbedded bituminous limestones, some of which are partly bioclastic. All beds weather a dark brownish grey and are distinctive where they occur over the light-grey-weathering limestones of the Baldonnel Formation. Sandstones are rare except in the lower part, and the general occurrence of well-laminated platy beds containing marine ammonoid and pelecypod faunas suggests continued deposition from 'Grey Bed' times in an area undergoing marine transgression. The virtual absence of sand in the western sections suggests that the Upper Triassic (Norian, at least) sea advanced to the east and possibly the north. The Monotis subcircularis, and Himavatites zones are most characteristic of the Pardonet Formation. It is noteworthy that the younger fauna is absent in the northeastern sections. However specimens, which were identified by Tozer, were collected from one or both zones at Sections 8, 10, 11, 15 and 16, and include the following: Monotis subcircularis Gabb, Monotis scutiformis pinensis Westermann, Monotis alaskana Smith, Proclydonautilus natosisi McLearn, Halobia sp., Malayites sp., Drepanites hyatti rutherfordi McLearn, Himavatites columbianus McLearn, Pseudosirenites sp., Distichites sp., Parathisbites oineus McLearn, Hypisculites sp., Meleagrinella sp., Placites sp., Oxytoma cf. mucronata Gabb, and Juvavites sp.

The greatest thickness of Pardonet beds reported is about 2,000 feet (McLearn and Kindle, 1950, p. 53) at Pardonet Hill on Peace River. North and northeast the thickness of the Pardonet decreases to zero in the Foothills, but extends for some distance in the subsurface east of the Foothills. South of the headwaters of Needham Creek the thickness of the formation is about 1,150 feet; along upper Halfway River near Mount Stearns it is 500 to 600 feet; 6 miles farther northeast it is 265 feet; and still farther north near Mount Withrow on Sikanni Chief River it is 180 to 200 feet. In the easterly Triassic sections of the Foothills, a parallel trend occurs. The Pardonet Formation is 275 feet thick at White Creek near Christina Falls on Graham River, and thins to 175 feet on Sikanni Chief River. North of Prophet River the Pardonet is absent in all Foothills exposures, and Lower Cretaceous beds rest disconformably upon progressively older beds in a northeasterly direction.

HISTORY OF SEDIMENTATION

About 1,500 observations were made on primary current structures in order to determine the direction of sedimentary transport at different localities, the regional sedimentary trends such as depositional strike and dip of beds, and the probable location of the area contributing the clastic sediments. This study involved the following measurements: attitude of crossbedding foreset beds, trend of wave ripples, downcurrent direction of current-ripple marks, plunge direction of troughs of festoon beds, and downslope direction determined from flow casts and related markings. Because these structures occurred in folded rocks, corrections for folding were made by means of the stereographic net. The mean current direction indicated by symbols representative of the types of structure occurring at each field station is shown in Figure 1. Although geographic variations of the mean current direction exist for the different structures, and although unanimity of direction for all types of structures at a given station may not occur, it can be seen that the regional direction of sedimentary transport is to the southwest in the northern part of the area, and appears to be more southerly in the southern part. This suggests that: (1) the shoreline trended northwesterly in the northern part of the area and that it swung more to the east in the south; (2) a source area for the sediments lay to the northeast; and (3) the sediments moved out of this source area in the northeast, toward the depositional site in the southwest and south.

During the Scythian and Anisian epochs, deposition of marine shales and siltstones took place in a sea that transgressed to the east. This is shown by the occurrence of finely laminated platy siltstones and shales, which grade into more massive siltstones and arenaceous units to the east but which are almost entirely shaly and silty to the west. From late Anisian to at least Karnian time a marine regression occurred which brought about deposition of progressively coarser sandstones. With the exception of minor transgressions, as noted by the presence of thin units of shale and siltstone, regression prevailed. This regression brought about the following: (1) the occurrences of younger beds in the westerly outcrops of any particular facies; (2) the deposition of coarser clastic sediments progressively farther west at progressively younger times throughout the late Anisian - Ladinian - Karnian interval; (3) the generally westward progression of axes of maximum thickness for successively

younger formations deposited during the Middle and Upper Triassic regressive phase. Furthermore, the texture of the arenaceous units deposited during this time grades from coarse in the east to fine in the west. This progressive westerly occurrence of sand deposition coincides with the direction of movement of sedimentary material as shown by the palaeocurrents, and the direction in which the major changes of textural facies occur.

Many of the Ladinian and Karnian sandstones are heavily crossbedded or festoon-bedded, and are thought to represent former offshore sandbars. The associated thick beds of bioclastic limestones presumably were derived locally. Between the sandbars and the shore, as indicated by the palaeocurrents, a facies change to evaporites occurred. The evaporitic facies is thick and occurs as several units interbedded with highly bituminous coarse sandstones and bioclastic limestone. One theory on the origin of these evaporites is like that proposed by Armitage (1962). The bioclastic carbonates and the sandbars appear to have acted as barriers between an open sea and a shallow-water lagoon with restricted circulation.

The Karnian epoch closed with marine transgression to the east which continued through Norian times. This is shown by the reappearance of thin platy marine siltstones, shales, and limestones overlying the sandstones, bioclastic limestones, and evaporitic sequences of the older epochs. The latest Triassic series is not present in this Foothills area. Probably some uplift was involved, as an erosional contact marks the base of the overlying Jurassic Fernie Group in some sections, particularly south of Prophet River. However uplift to the northeast did take place one or more times in post-Norian to pre-Lower Cretaceous times. This is shown by the overlap of Lower Cretaceous beds on the Fernie in the south and on progressively older and bevelled Triassic beds in the north.

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APPENDIX

Section 1. Hill south of Gathto Creek (NTS 94J) and 2 miles north of Kluachesi Creek at east end of Kluachesi Lake.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Upper part of section is inaccessible and consists of Middle and Upper Triassic beds. These equivalent beds are described in Section 2. Base of section occurs in gully on west flank of hill.		
	Liard Formation		
5	Sandstone and siltstone, dark grey and weathering medium brownish grey; calcareous; very fine grained; massive, forms ledge generally but upper 90 feet somewhat recessive. At 40 feet from base, the fossils Daonella elegans McLearn, and Nathorstites mcconnelli (Whiteaves) of the Nathorstites zone indicate Middle Triassic, Ladinian age. Similarly at 70 and 110 feet the fossil Nathorstites indicates Ladinian age.	286	1097
	Toad Formation		
4	Covered interval, dark grey calcareous siltstone and shale in talus; recessive.	40	811
3	Siltstone, dark grey to black and weathering dark brownish grey and dark grey; calcareous, massive; forms entire face of lower part of hill as a somewhat resistant unit.	620	771
2	Covered interval, recessive.	46	151

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
1	Siltstone, dark grey to black and weathering dark brownish grey and dark grey; calcareous; irregularly shaped phosphatic pebbles occur at several levels, and are black with deep blue weathering and occupy less than 5% of the associated bed; bedding is finely laminated in places and massive in others so that hard and soft aggregates a few feet thick alternate throughout; unit is generally recessive. Fossils indicate a Middle Triassic, Anisian age at 15 feet from base; "Hungarites" sp., Acrochordiceras sp. and Gymnotoceras sp. occur at 45 feet from base; Parapopanoceras tetsa McLearn and Gymnotoceras helle McLearn present. Base of section in anticlinal core at creek level.	105	105

Section 2. Hill about $2\frac{1}{2}$ miles south southeast from east end of Kluachesi Lake, and about 4 miles north of Muskwa River. Base of section begins in upper part of Toad Formation on east flank of hill.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Summit of hill consists of Cretaceous sandstones. Underlying unconformity has cut out the Fernie Group (Jurassic), the Pardonet Formation (Upper Triassic), and the upper part of the 'Grey Beds' (Baldonnel Formation). Contact of Cretaceous and Triassic concealed.		
	'Grey Beds' (Charlie Lake Formation)		
21	Covered interval mostly but contains broken outcrops of limestone and dolomite breccia, fine-grained limestone, and sandstone; rocks are medium grey and bright yellow, and weather yellow ochre; sandstone is friable; some limestones are stylolitic. Unit is recessive. This may be an evaporite interval. Part may be missing due to erosion.	150	1608
	(Halfway Formation)		
20	Limestone, medium grey and weathering medium to dark grey; fine-grained, thick-bedded; forms ledge.	20	1458
19	Covered interval mostly; some light grey limestone and sandstone in broken ledges.	72	1438

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
18	Sandstone, light grey and weathering light brownish grey and light grey; calcareous, fine-grained; thick-bedded; ledge.	95	1366
17	Sandstone, light grey and weathering light to medium grey and yellowish grey; calcareous; coarse-grained; crossbedded; massive; forms ledge.	15	1271
16	Sandstone and siltstone, light to medium grey and weathering medium brownish grey; calcareous; very fine grained; thin-bedded; recessive.	25	1256
15	Sandstone, medium to dark grey and weathering dark brownish grey, calcareous, fine-grained and thin-bedded in lower 15 feet but light to medium grey, medium- to coarse-grained and thick-bedded in remaining upper part; highly cross-bedded throughout; forms ledge.	85	1231
	Liard Formation		
14	Covered interval, recessive.	30	1146
13	Sandstone and limestone interbedded; sandstone is dark grey and weathers dark brownish grey; calcareous; highly bituminous; fine-grained; massively bedded. Limestone is medium grey and weathers light to medium grey and is practically a coquina of pelecypods and brachiopods; massively bedded; unit forms ledge.	52	1116

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
12	Sandstone and minor interbedded siltstone and shale, dark grey and weathering brownish grey and dark grey; calcareous; fine-grained; thin-bedded; siltstones and shales are platy; minor scour features and fine-scale crossbedding and ripple-marks; unit is recessive.	58	1054
11	Covered interval, recessive.	35	996
10	Sandstone and interbedded limestone, medium grey and weathering yellowish grey and medium grey; sandstone is calcareous and fine-grained; limestone is fine-grained and partly bioclastic with coquinoid beds of brachiopods, beds are massive and unit forms ledge. Fossils found indicate a questionable age of Middle Triassic. Fossils are: Ostrea sp., Spiriferina sp.	56	961
9	Sandstone, medium grey and weathering orange to yellowish grey; calcareous; fine-grained; generally medium-bedded; highly crossbedded; forms ledge.	45	905
8	Sandstone, medium to dark grey and weathering orange to yellowish grey; calcareous; fine-grained; minor limestone interbedded; thick-bedded to massive; forms ledge.	40	860
7	Covered interval, deeply recessive, generally siltstone, dark grey and weathering dark grey and brownish grey.	45	820
6	Sandstone, medium grey and weathering orange to yellowish grey; calcareous; fine-grained; massive; forms ledge.	15	775

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
5	Sandstone, medium to dark grey and weathering orange to yellowish grey: calcareous; fine-grained; thin- to medium-bedded with minor platy siltstones and shale partings; numerous fine-scale cross-bedding and ripple-marks; unit forms ledge.	70	760
4	Sandstone, siltstone and shale partings, dark grey to black and weathering dark grey and brownish yellowish grey; beds are thin and flaggy; ledge in upper part, but lower 35 feet is recessive.	55	690
3	Sandstone, dark grey and weathering dark orange brown to brownish grey; calcareous; fine-grained; minor interbeds of dark grey limestone and siltstone; beds massive and form ledge, but lower 50 feet is recessive. Prolific Nathorstites fauna at 55 feet from base indicates a Middle Triassic, Ladinian age. Fossils include: Nathorstites mcconnelli (Whiteaves) Protrachyceras sikanium McLearn. This collection and unit is similar to Unit 5, Section 1.	225	635
	Toad Formation		
2	Siltstone and sandstone, medium grey to brownish grey and weathering medium orange-brown; calcareous; very fine grained; beds massive but breaking into plates; forms ledge.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Crushed ammonites present also Daonella sp. which indicates a Middle Triassic age. Fossils found 15 feet from base above recessive interval.	345	410
1	Siltstone, dark grey to black and weathering dark grey; calcareous; soft, massive; recessive. The fossils Daonella sp. and crushed Gymnotoceras? sp. indicate a questionable Middle Triassic, Anisian? age. Section continues to base of hill but only upper part examined.	65+	65

Section 3. Gully on east flank of hill in first high range east of Rocky Mountains about 5 miles south of Muskwa River, and about 11 miles north of Prophet River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Section begins at head of gully and continues to west beneath summit. Cretaceous beds are in disconformable contact with Triassic beds, and consist of black non-calcareous, fissile and thin-bedded shales weathering black and orange.		
	'Grey Beds' (Baldonnel Formation)		
15	Limestone, dark grey and weathering medium grey, fine-grained, partly bioclastic, highly bituminous, generally thin- to medium-bedded; bones of marine reptiles common; forms ledge. The fossils Gryphaea sp. and Halobia sp. indicate an Upper Triassic age.	22	1550
14	Limestone, light brownish grey and weathering light grey, fine-grained and bioclastic in part; stylolitic, medium-bedded, recessive in lower part, but ledge in upper 26 feet.	48	1528
13	Limestone and minor siltstone, black and weathering dark brownish grey; dense; platy to medium-bedded and breaking into blocks; recessive.	110	1480

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
12	Limestone and sandstone, dark grey to black and weathering medium brownish grey; limestone is fine-grained, arenaceous, and medium-bedded; sandstone is calcareous and fine-grained, and thin- to medium-bedded; unit forms ledge. The fossil Spiriferina sp. occurs in middle part.	80	1370
11	Limestone, dark grey and weathering light grey, fine-grained, thick-bedded with minor interbedded sandstone; forms ledge.	55	1290
	(Charlie Lake Formation)		
10	Covered interval mostly (over 70%) consisting of carbonate breccia, limestone and sandstone; limestone is dark grey and weathers light grey, and is fine-grained, thick-bedded, and forms minor 20-foot ledges; sandstone is dark grey, calcareous, fine-grained and streaked with yellow ochre; some beds consist entirely of friable sand cemented by yellow iron ochre, and are generally recessive; the breccia is coarse angular, massive and recessive. This unit may be an evaporite interval.	240	1235
	(Halfway Formation)		
9	Sandstone, light grey and weathering light grey and orange-yellow; calcareous; fine- to medium-grained; massive; numerous cross-beds and ripple-marks; forms ledge.	225	995

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
8	Sandstone, dark grey and weathering dark brownish grey; calcareous; fine-grained; thin- to medium-bedded; partly covered and recessive.	38	770
7	Sandstone and limestone, dark grey and weathering brownish grey and dark grey; fine-grained; coquinoid of pelecypods in some beds; massive; forms ledge.	12	732
	Liard Formation		
6	Covered interval, recessive; broken outcrops of sandstone, dark grey and weathering dark brownish grey; calcareous; fine-grained; thin- to thick-bedded.	63	720
5	Limestone and sandstone; dark grey and weathering orange-brown; fine-grained; massive; forms ledge. The fossil Protrachyceras sp. indicates age as Middle or Upper Triassic.	20	657
4	Sandstone, dark grey and weathering dark brownish grey; calcareous; very fine grained with minor interbedded siltstone; resistant unit.	95	637
3	Sandstone, medium to dark grey and weathering orange-yellow; calcareous; fine-grained; thick to massive bedding; recessive.	72	542
2	Covered interval.	30	447

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
1	Sandstone, dark grey and weathering orange-brown to dark brownish grey; calcareous; fine-grained; massive; this unit forms a series of 10- to 30-foot ledges and alternate recessive intervals throughout. This unit is thought to be entirely in the Liard Formation. At 370 feet from base fossils from the Nathorstites zone occur: Nathorstites mcconnelli Whiteaves, Terebratula cf. liardensis Whiteaves which indicates the age as Middle Triassic, Ladinian. Between 240 and 275 feet from base "Terebratids indet." occur. Base of section occurs at creek level in anticlinal core.	440	440

Section 4. Creek 2 miles north of Bat Creek and $4\frac{1}{2}$ miles south of Muskwa River in front range of Foothills.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cretaceous shales, black, weathering black and rusty orange, in disconformable contact with underlying Triassic beds in creek.		
	'Grey Beds' (Baldonnel Formation)		
15	Limestone, medium grey and weathering brown; fine-grained; bioclastic in part; thick-bedded; forms ledge. The fossils found, Entolium sp. and Halobia sp. indicate an Upper Triassic age.	9	2264
14	Covered interval, recessive.	30	2255
13	Limestone and siltstone, dark grey to black and weathering brownish grey; fine-grained, slightly bituminous; thin-bedded and platy; prolific pelecypod fauna present, unit is recessive. The fossil Halobia sp. indicates an Upper Triassic age.	15	2225
12	Covered interval, recessive.	35	2210
11	Limestone, medium brownish grey and weathering light grey; fine-grained; stylolitic; thick-bedded; forms ledge.	30	2175
10	Limestone and calcareous siltstone, dark grey to black and weathering dark grey; fine-grained; siltstone dominant in upper 25 feet, but occurs as partings otherwise; black chert nodules at base; beds platy to blocky; unit is recessive. Indeterminate pelecypod fragments occur 70 feet from base.	100	2145

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
9	Limestone, dark grey and weathering medium to dark grey; fine-grained and coarsely bioclastic, somewhat bituminous; minor dark grey, fine-grained sandstone interbedded; unit is thick-bedded and forms ledge.	130	2045
	(Charlie Lake Formation)		
8	Covered interval, recessive, talus of Unit 7, consisting of yellow carbonate breccia and sandstone.	84	1915
7	Limestone and dolomite breccia and interbedded sandstone; light grey and bright yellow ochre, and weathering the same; fine- to medium-grained with numerous yellow clay partings as well as minor intraformational breccias that appear to be solutional or collapse type; some bituminous sandstone in upper part; generally recessive. This unit is probably an evaporite interval.	220	1831
	(Halfway Formation)		
6	Sandstone, light to medium grey, weathering medium grey and brownish grey; calcareous; fine- to medium-grained; highly cross-bedded; minor interbeds of light grey limestone; unit is thick-bedded and forms ledge.	300	1611
	Liard Formation		
5	Covered interval, recessive.	85	1311

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
4	Sandstone, medium dark grey and weathering dark brownish grey; calcareous; fine-grained; massive; numerous thin to medium beds of limestone containing coquinas of pelecypods and brachiopods all highly recrystallized; unit forms ledge.	78	1226
3	Covered interval, recessive, thin sandstone siltstone and shale in talus.	55	1148
2	Sandstone, medium to dark grey and weathering dark brownish grey; calcareous, very fine-grained; massive; forms ledge. At 68 feet from base, a coquinoid layer contains Terebratula cf. liardensis Whiteaves, indicating a Middle Triassic age.	128	1093
	Toad Formation		
1	Siltstone and shale, dark grey to black and weathering dark grey; calcareous; medium-bedded limestones and sandstones are interbedded and occupy less than 1 per cent of unit; siltstones are well laminated and break into thin platy units; interval generally recessive except for a few ledges in upper third. Base of section in anticlinal core beneath summit of hill at creek headwaters.	965	965

Section 5. Third gully on east flank of mountain on north bank of Richards Creek about 5 miles south of Prophet River, and about 8½ miles west, southwest of junction of Richards Creek and Prophet River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cretaceous shales occur in disconformable contact with Upper Triassic beds on hill to south, across Richards Creek. At Section 5, Cretaceous is absent.		
	'Grey Beds' (Baldonnel Formation)		
36	Limestone, dark grey to black and weathering silvery grey; bioclastic; bituminous; massive; forms ledge.	25	3512
35	Limestone, black and weathering dark brownish grey and dark grey; fine-grained; medium- to thick-bedded; recessive.	30	3487
34	Limestone, dark grey and weathering light to medium grey; fine-grained and coarsely bioclastic in places; thick-bedded; recessive. Occurrence of Spiriferina sp. indicates a Middle or Upper Triassic age.	40	3457
33	Limestone, dark grey and weathering dark brownish grey, fine-grained; thick-bedded; forms ledge. The fossil Gryphaea sp. indicates a Middle or Upper Triassic age.	20	3417
32	Limestone, medium grey and weathering light grey, fine-grained, partly bioclastic; thick-bedded; interval is partly covered and recessive.	95	3397

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
31	Sandstone, medium grey and weathering light grey; calcareous; fine-grained; massive; forms ledge.	15	3302
30	Limestone, medium grey and weathering light grey; fine-grained and dense; slightly arenaceous; thick to massive bedding; forms ledge.	120	3287
	(Charlie Lake Formation)		
29	Limestone and dolomite breccia, and interbedded sandstone; rocks are light grey and weather bright yellow ochre, carbonates are fine-grained, porous in places, pitted stylolitic and friable, and commonly consist of intra-formational breccia of the collapse or solution type; sandstone is medium- to coarse-grained; moderately crossbedded; well-laminated; porous and highly bituminous in places. Except for a few sandstone ledges this interval is deeply recessive. These beds are thought to be evaporitic.	155	3167
	(Halfway Formation)		
28	Limestone light to medium grey and weathering light grey; fine-grained; somewhat arenaceous in places with interbedded sandstone; thick-bedded; partly recessive but generally forms ledge.	52	3012
27	Sandstone, light grey and weathering light yellowish grey; calcareous; fine-grained; medium to massive bedding but generally massive; highly crossbedded; forms dominant ledge.	165	2960

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
26	Covered interval, recessive.	30	2795
25	Sandstone, light to medium grey and weathering light yellowish grey; calcareous; fine-grained; minor interbedded limestone; thick-bedded; forms ledge.	55	2765
24	Covered interval, recessive.	10	2710
23	Sandstone, medium to dark grey and weathering light yellowish grey; calcareous; fine-grained; minor interbedded limestone; massive; forms ledge.	50	2700
	Liard Formation		
22	Siltstone and sandstone, dark grey to black and weathering dark brownish grey; minor limestone and shale partings present; beds are thin but occur in massive aggregates several feet thick; forms resistant unit.	51	2650
21	Siltstone, dark grey to black and weathering dark brownish grey; calcareous; minor platy shale and thin sandstone present; recessive.	60	2599
20	Sandstone, dark grey and weathering dark brownish grey; calcareous; fine-grained; thick-bedded; forms ledge.	78	2539
19	Sandstone and siltstone, medium to dark grey and weathering dark brownish grey; calcareous; fine-grained; minor ripple-marks; thin-bedded; partly covered and generally recessive.	125	2451

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
18	Covered interval, recessive.	30	2326
17	Sandstone and limestone interbedded, medium to dark grey, weathering orange-brown and medium to dark grey; sandstone is calcareous and fine-grained; limestone is fossiliferous and bioclastic; beds are massive; unit forms ledge. Fossils of the Nathorstites zone indicate a Middle Triassic, Ladinian age. Fossils are: Terebratulids indet. and Nathorstites mcconnelli (Whiteaves).	18	2296
16	Sandstone, medium to dark grey and weathering yellow to orange-brown; calcareous; fine-grained; flaggy to medium-bedded with minor interbeds of shale and siltstone; current-ripple marks present; unit is recessive.	61	2278
15	Sandstone, medium grey and weathering yellow to orange-brown; calcareous; fine-grained; large worm burrows present as well as ripple-marks and crossbedding; bedding is medium to massive; unit forms ledge.	25	2217
14	Sandstone, medium grey and weathering yellow to orange-brown; calcareous; fine-grained; flaggy; recessive.	130	2192
13	Sandstone, medium grey and weathering orange-brown; calcareous; fine-grained; thick-bedded; ledge.	72	2062
12	Sandstone, dark grey and weathering orange to yellow-grey; calcareous; fine-grained; flaggy; recessive.	60	1990

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
11	Siltstone and fine sandstone, dark grey to black, dark grey and yellowish grey weathering; calcareous; thin- to thick-bedded with minor shale interbeds; forms ledge. The fossil Nathorstites mcconnelli (Whiteaves) indicates a Middle Triassic, Ladinian age.	85	1930
	Toad Formation		
10	Siltstone and shale, dark grey to black, weathering yellowish grey and black; calcareous; platy beds occur in aggregates up to 6 feet thick; unit is recessive.	188	1845
9	Siltstone, dark grey and weathering yellowish grey; calcareous; beds medium to massive with thin interbeds of shale; due to fine laminations beds weather into plates but mostly in the form of massive units; generally resistant.	465	1657
8	Siltstone and minor shale, dark grey and weathering dark grey and yellowish grey; calcareous; platy; shaly at base and recessive, but becoming slightly sandy at top and forming ledges.	93	1192
7	Siltstone and mudstone, dark grey and weathering yellowish grey and dark grey; calcareous; slightly coarser than underlying siltstone; massive and without laminations; forms ledge.	65	1099

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
6	Siltstone and shale, dark grey to black and weathering dark grey to black with some yellowish grey on certain beds; calcareous; contains fragments and pebbles of phosphatic material which are black, weather dark blue, and are present over several levels in lower 150 feet; beds are platy, well laminated and occur in massive aggregates. Unit is somewhat recessive. Occurrences of Hollandites humi McLearn and Ptychites(?) sp., indicate a Middle Triassic, Anisian age.	460	1034
5	Covered interval, recessive.	70	574
4	Siltstone, dark grey to black and weathering dark grey, calcareous, massive but finely laminated so that rock breaks into 1/4-inch plates. Unit forms ledge.	52	504
3	Covered interval, recessive.	82	452
2	Siltstone, dark grey to black and weathering dark grey and brownish grey; calcareous; phosphatic nodules present; soft platy beds in thick-bedded aggregates alternate with harder, massive beds; unit forms ledge.	40	370
1	Covered interval, recessive, section ends at base of this unit. It is underlain by chert of Permian or Mississippian age.	330	330

Section 6. West flank of Klingzut Mountain, in creek 1 mile east of Besa River and 4 miles south of junction of Besa and Prophet Rivers.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cretaceous shales and sandstone are in disconformable contact with Triassic beds.		
	'Grey Beds' (Baldonnel Formation)		
18	Limestone, dark grey and weathering light silvery grey; fine-grained; coarsely bioclastic; highly bituminous; contains chert pods and lenses up to 2 inches thick; beds massive; unit forms ledge.	96	1445
17	Limestone, dark grey to black and weathering dark grey and dark brownish grey; fine-grained; thin- to medium-bedded and blocky; recessive.	45	1349
16	Limestone, dark grey to black and weathering brown; fine-grained; partly bioclastic; highly bituminous; stylolitic; medium- to thick-bedded; forms ledge.	73	1304
15	Limestone, dark grey and weathering light to medium grey; fine-grained; partly bioclastic; thick-bedded; ledge at base.	70	1231
14	Sandstone and limestone interbedded; dark grey and weathering medium to dark grey; fine-grained; thick-bedded; forms ledge.	45	1161

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	(Charlie Lake Formation)		
13	Limestone, dolomite sandstone and clay partings; carbonates are light grey, weathering yellow ochre, fine-grained, and in places consist of an intra-formational breccia of the collapse or solutional type; sandstones are generally fine- to medium-grained but occasional grits and pebble beds may be interbedded; yellow shale partings are common and in places have a clay consistency; manganese dendrites coat some of the beds, particularly the sandstones; beds vary from medium thick to massive and the various lithological types alternate throughout; interval is generally recessive but minor sandstone ledges are present. This unit is thought to be an evaporite interval.	394	1116
	(Halfway Formation)		
12	Sandstone, yellowish brown and light grey, weathering the same; calcareous; fine-grained; thin- to thick-bedded; forms ledge.	9	722
11	Sandstone, medium grey and weathering yellowish brown; calcareous; fine-grained; thin- to medium-bedded with inter-bedded thick light grey, fine-grained limestone; slightly recessive.	45	713

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
10	Sandstone, light to medium grey, weathering orange-yellow and yellowish grey; calcareous; fine- to coarse-grained; grits present as well as coarse, porous, friable bituminous sands, particularly between 50 and 65 feet from base and in upper part of unit; large scale crossbedding common; beds are generally thick; unit forms ledge.	158	668
	Liard Formation		
9	Sandstone and interbedded siltstone and shale, dark grey and weathering dark grey and pale yellowish grey; calcareous; fine-grained; thin-bedded and platy; some minor dark grey, thin limestone and medium-bedded siltstone; recessive.	47	510
8	Sandstone, light to medium grey, weathering light orange-yellow and grey; calcareous; fine-grained; moderately crossbedded; thick to massive bedding; forms ledge. The following fossils occur at the top of unit and are partly representative of the Nathorstites zone: Nathorstites sp. (crushed) "Monotis" montini McLearn Pecten sp., Lingula sp. A Middle Triassic age is indicated.	50	463
7	Sandstone, medium to dark grey and weathering dark grey; calcareous; very fine grained; laminated; finely festooned with several other small-scale scour features; minor interbedded black platy siltstones and shales; recessive.	17	413

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
6	Sandstone, medium to dark grey and weathering dark brownish grey; calcareous; fine-grained; thick-bedded with interbeds of medium grey limestone, containing highly recrystallized terebratulids and other fossils; unit forms ledge.	20	396
5	Siltstone and sandstone, dark grey to black and weathering dark grey; calcareous; fine-grained; thin-bedded and flaggy; finely laminated; recessive.	29	376
4	Sandstone, medium to dark grey, weathering orange-brown and yellowish grey; calcareous; very fine-grained; minor interbedded limestone containing terebratulids in upper part; massive; unit forms ledge.	65	347
3	Sandstone, dark grey, weathering dark brownish grey to orange-yellowish grey; calcareous; fine-grained but coarser at top; pods of recrystallized terebratulid coquinas present; beds massive; forms ledge.	132	282
	Toad Formation		
2	Siltstone, dark grey to black, weathering dark grey and dark brownish grey; calcareous; considerable white calcite veining; beds laminated; recessive.	40	150
1	Siltstone, dark grey to black, weathering black and dark yellowish grey; calcareous; massive; with alternations of hard and soft beds; somewhat resistant. Section ends in core of anticline.	110	110

Section 7. Hill between Besa River and Nevis Creek about 9 miles due north of west end of Trimble Lake.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Contact between Triassic formations and overlying Jurassic beds (Fernie Group) is concealed. Cretaceous sandstone occurs above wide covered interval in topographic saddle.		
	Pardonet Formation		
29	Covered interval; deeply recessive with some brown-weathering talus on hillside. Thickness is only approximate and some of this interval may be occupied by the Fernie Group.	450	4509
	'Grey Beds' (Baldonnel Formation)		
28	Limestone, dark grey to black and weathering light silvery grey; coarsely bioclastic; bituminous; thick-bedded, forms ledge. The fossils Gryphaea sp., and Halobia sp., indicate an Upper Triassic age.	125	4059
27	Covered interval, recessive; small outcrops of bituminous limestone containing pockets of coarse bitumen; black chert nodules and a few undetermined pelecypod fragments present.	55	3934
26	Limestone, dark grey to black and weathering dark grey; fine-grained; and finely arenaceous; bituminous; thin- to medium-bedded; somewhat blocky; forms series of ledges on east-facing dip slope.	95	3879

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
25	Limestone, dark grey to black and weathering dark brownish grey; fine-grained; bituminous; medium- to thick-bedded; slightly resistant.	40	3784
24	Sandstone and siltstone, dark grey to black and weathering dark brownish grey; fine-grained; calcareous; bituminous; thin- and medium-bedded; recessive.	87	3744
23	Limestone, light to medium grey and weathering light grey; fine-grained but partly bioclastic; somewhat of a calcarenite; thick-bedded; forms ledge in lower 25 feet.	77	3657
	(Charlie Lake Formation)		
22	Covered interval, recessive; some broken outcrops of yellow-weathering limestone and sandstone mostly concealed. This is thought to be evaporite interval.	234	3580
	(Halfway Formation)		
21	Sandstone, medium brown and weathering light grey; fine-grained; calcareous; thick-bedded, forms ledge.	95	3346
20	Sandstone and arenaceous limestone; dark grey and weathering light grey and light brownish grey; sandstone is fine-grained and calcareous; all beds are thick and form low ledge on hilltop.	65	3251

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
19	Sandstone, light brownish grey and weathering light to medium brown and grey; calcareous; fine-grained; thin and platy to thick-bedded; partly covered and recessive but forms thick ledge at base.	60	3186
18	Sandstone, medium brownish grey and weathering light grey and light brownish grey; fine- to medium-grained with minor interbedded grit; calcareous; some grey limestone interbedded; highly crossbedded; thick-bedded; unit forms ledge.	75	3126
17	Sandstone, dark grey and weathering medium brownish grey; fine-grained; calcareous; thin-bedded; forms ledge.	30	3051
16	Limestone, dark grey and weathering medium to dark greyish brown; fine-grained and arenaceous; thick-bedded; forms ledge in lower 10 feet.	20	3021
15	Sandstone, medium grey and weathering bright orange and yellowish grey; fine- to medium-grained; calcareous; crossbedded; forms ledge.	80	3001
	Liard Formation		
14	Sandstone and siltstone, dark grey, weathering dark brownish yellow and dark yellowish grey; fine-grained; calcareous; thin- and medium-bedded; recessive but resistant enough to make slight ledge.	65	2921

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
13	Covered interval, dark calcareous siltstone and shale somewhat thin-bedded and platy in talus; recessive.	65	2856
12	Sandstone, dark grey and weathering medium yellowish grey; fine-grained; minor interbeds of dark bituminous limestone and siltstone and some shale; thick-bedded; recessive. Nautiloids; marine reptile bones and terebratulids occur. Nathorstites mcconnelli (Whiteaves) is present and indicates age as Middle Triassic, Ladinian.	185	2791
11	Sandstone, medium grey and weathering orange to yellowish grey; fine-grained; calcareous; large concretions, 4 to 24 inches in diameter and weathering low so as to be slightly recessive, contain indeterminate terebratulids and spirifers; beds are massive; forms ledge.	45	2606
10	Sandstone, dark grey and weathering orange to yellowish grey; fine-grained; calcareous; finely laminated, ripple-marked and crossbedded; large 1-inch worm burrows present; unit forms ledge.	65	2561
9	Sandstone, light brownish grey and weathering light brownish grey; fine-grained; calcareous; flaggy but some beds thick and massive, small-scale ripple-marks, crossbeds, festoon beds present, some 6-foot slump structures (pene-contemporaneous deformation); unit is mostly covered and is recessive.	145	2496

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
8	Sandstone, dark grey, weathering medium grey and yellowish grey; very fine grained; calcareous beds mostly platy and flaggy but occur in massive aggregates interbedded with black siltstone and shale so that thin recessive intervals are present; flow casts present; unit generally resistant and forms ledge. Nathorstites mcconnelli (Whiteaves) is present and indicates a Middle Triassic, Ladinian age.	175	2351
7	Sandstone, dark grey and weathering yellowish grey; very fine grained; calcareous; massive; somewhat resistant. The presence of Nathorstites mcconnelli (Whiteaves) and Daonella nitanae (McLearn) indicate a Middle Triassic, Ladinian age.	186	2176
6	Siltstone and sandstone, dark grey and weathering yellowish grey; very fine grained; calcareous; minor sandstone at top of unit; finely laminated in medium to thick beds; intervals of hard and soft beds; unit is generally recessive. At 110 feet from base, the occurrence of Daonella sp. and Nathorstites(?) sp. indicates a Middle Triassic, probably Ladinian age. At base the occurrence of Daonella sp. and Protrachyceras(?) sp. indicates age as Middle Triassic.	140	1990

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Toad Formation		
5	Siltstone, dark grey to black; weathering dark grey and yellowish grey; calcareous; massive; generally recessive with ledges of harder silt up to 10 feet thick about 10 to 40 feet apart.	595	1850
4	Siltstone, dark grey to black and weathering dark grey and brownish grey; finely laminated; massive; forms ledge.	50	1255
3	Covered interval, recessive.	265	1205
2	Siltstone and shale, dark grey to black and weathering dark grey and brownish grey; calcareous; massive aggregates of finely laminated beds somewhat resistant alternating with soft recessive platy siltstones and shales; unit generally forms a ledge. Poorly preserved ammonite and pelecypod impressions occur throughout. These are: Daonella sp. and Gymnotoceras(?) sp. (crushed) and indicate a Middle Triassic, probably Anisian age.	140	940
1	Covered interval, deeply recessive. Section ends at contact with Palaeozoic rocks. All bedrock is concealed in this interval. A thickness of 800 feet is only an estimate.	800	800

Section 8. West flank of hill at headwaters of Chicken Creek about 5 miles north of Sikanni Chief River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cretaceous sandstones and Jurassic shales (Fernie Group) occur at top of section on west flank of hill where beds dip very steeply to west. The Fernie Group, about 18 feet thick there, is in disconformable contact with the Upper Triassic beds.		
	Pardonet Formation		
30	Siltstone and minor limestone, dark grey and weathering medium brownish grey; fine-grained; calcareous; bituminous; platy, recessive. Fossils occur in the following beds: in the upper 20 feet Monotis subcircularis Gabb indicates an Upper Triassic, Norian age (this is the Monotis subcircularis zone). In the lower 10 feet Monotis scutiformis pinensis Westermann, and Proclydonautilus natosisi McLearn indicate an Upper Triassic, Norian age, probably the Himavatites zone.	80	1170
29	Limestone, dark grey to black and weathering dark brownish grey, partly bioclastic and arenaceous, wavy laminations; platy but in massive ledge. The fossils Halobia sp. and Gryphaea sp. indicate an Upper Triassic age.	20	1090

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
28	Covered interval, recessive, consists of talus and broken outcrops of dark bituminous limestone and platy siltstones. The fossils Halobia sp., Gryphaea sp. and Monotis scutiformis pinensis Westermann indicate an Upper Triassic, Norian age, probably the Himavatites zone.	50	1070
27	Limestone, dark grey to black and weathering dark brownish grey; fine-grained; finely arenaceous; bituminous; platy with wavy laminations; forms ledge. The fossils Gryphaea sp. and Halobia sp. indicate an Upper Triassic age.	15	1020
26	Covered interval, recessive.	10	1005
	'Grey Beds' (Baldonnel Formation)		
25	Limestone, light grey and light brownish grey in places, weathering light silvery grey; fine-grained; partly bioclastic; massive; forms ledge. The fossil Lima (Plagiostomata) indicates a probable Upper Triassic age.	45	995
24	Limestone, dark grey to medium brownish grey and weathering light to medium grey; fine-grained; partly bioclastic; pods of white calcite up to 1 inch and black chert up to 2 feet present; beds massive; unit forms ledge. Possible Gryphaea(?) sp. present.	55	950

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
23	Limestone, dark grey to black and weathering dark grey; fine-grained; finely arenaceous; medium-bedded but breaking into plates and narrow angular blocks; somewhat recessive.	40	895
22	Limestone, dark grey and weathering light grey; calcar - enite in part; partly bioclastic; contains bones of marine reptiles; beds massive; forms ledge.	15	855
21	Limestone and sandstone, dark grey and weathering dark brownish grey; sandstone is fine grained, calcareous and occurs as massive interbeds with the dark grey to black, fetid, fine-grained limestone which contains thin bioclastic layers in places; forms ledge. This unit thins rapidly to west where it disappears within a few hundred feet.	90	840
20	Limestone, light grey and weathering light grey and medium brownish grey; massive; forms ledge.	75	750
	(Charlie Lake Formation)		
19	Covered interval mostly, recessive; consists of some small outcrops of calcareous sandstone, limestone, and dolomite; some intraformational carbonate breccia of the collapse or solutional type present; carbonates are stylolitic, coarsely vuggy, and contain veins of coarse white calcite; rocks are generally yellow, brown and some reddish and white and weather to similar colours. Interval is thought to be an evaporite.	145	675

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	(Halfway Formation)		
18	Sandstone, bright yellowish grey to brown and weathering yellow; fine-grained; calcareous; soft; manganese dendrites on weathered surface; thin- to medium-bedded; unit forms ledge. This and the underlying unit have some features characteristic of the Charlie Lake Formation. The boundary here is arbitrary due to gradational nature of the adjacent units, but is placed below a well-defined recessive interval, overlain in turn by a well-defined carbonate sequence.	16	530
17	Limestone, light to medium grey and weathering light grey; fine-grained; stylolitic; thick-bedded; soft calcareous yellowish brown sandstone occurs in upper part; unit is partly covered and somewhat resistant.	61	514
16	Sandstone, dark grey and weathering dark brownish grey; fine-grained, medium-bedded; ledge.	13	453
15	Covered interval, recessive.	21	440
14	Sandstone, dark grey and weathering light grey and brownish grey; fine- to medium-grained; calcareous; large-scale crossbedding; thick-bedded; forms ledge.	30	419

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
13	Sandstone and limestone, light grey and weathering yellowish brown and light grey; sandstone is fine grained and calcareous; limestone is fine grained and dense; all beds are medium thickness; unit forms ledge except for lower few feet.	35	389
12	Sandstone, medium to dark grey and weathering brownish grey; fine-grained; calcareous; thick-bedded with minor thin interbeds of dark grey limestone containing stylolites; unit forms ledge.	16	354
11	Covered interval, recessive.	11	338
10	Sandstone, light to medium grey with considerable rust staining, weathering yellowish brown; fine- to medium-grained; calcareous; interbedded with light yellowish brown carbonate; medium- to thick-bedded; forms ledge.	7	327
9	Covered interval, recessive.	8	320
8	Limestone, light grey and weathering light grey; fine-grained; medium-bedded; small ledge.	4	312
7	Covered interval, recessive.	23	308
6	Sandstone, light to medium grey and weathering yellowish brown to greyish brown; fine- to medium-grained; calcareous; minor thin light grey limestone interbedded; medium- and thick-bedded; unit forms ledge.	8	285
5	Covered interval, recessive.	30	277

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
4	Sandstone, light to medium grey and weathering yellowish brown; fine- to medium-grained; calcareous; large-scale cross-bedding present; massive; forms ledge.	24	247
3	Sandstone, medium grey to dark grey, and weathering dark brownish grey; fine-grained; calcareous; thick-bedded to massive; forms ledge.	28	223
	Liard Formation		
2	Sandstone and siltstone, medium grey to dark grey and weathering orange-brown and brownish grey; very fine grained; calcareous; an arenaceous limestone in part; somewhat flaggy but beds occur in massive aggregates; forms ledge but recessive in lower parts.	35	195
1	Sandstone, medium grey and weathering orange-brown and dark brownish grey; fine- to medium-grained; calcareous; minor thin lenses of dark grey limestone; medium-scale crossbedding; unit forms dominant ledge. Section ends at base of cliff in creek where beds are flat lying.	160	160

Section 9. South flank of Mount Withrow, 1 mile north of Sikanni Chief River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Upper Triassic beds (Pardonet Formation) are missing at the summit of Mount Withrow but do occur on Mount Wooliever 6 miles to the southeast where they are overlain disconformably by Jurassic beds (Fernie Group). On Mount Wooliever, 180 to 200 feet of dark grey to black, bituminous, thin siltstones and limestones are present, and overlie light grey limestones which occur at the summit of Mount Withrow.		
	'Grey Beds' (Baldonnel Formation)		
31	Limestone, dark grey to black and weathering light silvery grey; fine-grained; small black chert nodules present; beds massive; forms ledge.	35	2433
30	Limestone, dark grey to black and weathering medium grey; dense; blocky; generally medium-bedded; recessive.	55	2398
29	Limestone, dark grey to black and weathering medium to dark greyish brown and grey; dense; bituminous; massive; forms ledge. Pelecypods present but species indeterminate; age undetermined.	120	2343

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	(Charlie Lake Formation)		
28	Covered interval, recessive, a few outcrops of grey limestone and fine- to medium-grained sandstone; also some limestone and dolomite intra-formational breccia of the collapse type as well as fragments of limestone, sandstone and clay, all weathering bright yellow. Gastropod impressions occur in the dolomite. This unit is thought to be an evaporite interval.	440	2223
	(Halfway Formation)		
27	Sandstone, light grey and weathering light grey; fine- to medium-grained; calcareous; thick-bedded; forms ledge.	35	1783
26	Limestone, light to medium grey and weathering light brownish grey; fine-grained; arenaceous in upper part; massive; recessive.	20	1748
25	Sandstone, light grey and weathering orange and light yellow-grey; medium-grained; calcareous; minor interbedded medium grey limestone, weathering light grey; medium-scale crossbedding throughout; thick-bedded; unit forms ledge.	100	1728
24	Sandstone, dark grey and weathering dark brownish grey; fine-grained; calcareous; some fine-grained partly bioclastic medium grey limestone, weathering grey, is interbedded; all beds are thick; recessive.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Some Spiriferina sp. present but age is undetermined.	35	1628
23	Sandstone, medium grey and weathering orange and yellowish grey; fine-grained; calcareous; medium-scale crossbedding throughout; bedding is medium to massive; unit forms ledge. Some Spiriferina sp. are present but age is undetermined.	70	1593
22	Sandstone, medium grey and weathering light grey; fine-grained; calcareous; crossbedded; thick-bedded; unit forms ledge.	24	1523
	Liard Formation		
21	Siltstone and interbedded bioclastic limestone, dark grey to black and weathering dark brownish grey; calcareous; massive; recessive. Some spirifers, terebratulids, and gryphaeids present but age is undetermined.	15	1499
20	Covered interval, recessive.	25	1484
19	Sandstone, dark grey and weathering light grey; fine-grained; calcareous; massive; forms ledge.	49	1459
18	Sandstone and shale, dark grey and weathering dark yellowish brown; very fine grained; calcareous; thin-bedded and flaggy; recessive.	34	1410

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
17	Sandstone and minor interbedded limestone; dark grey and weathering dark brownish grey; fine-grained and somewhat silty; calcareous; massive; forms ledge. Some Spiriferina sp. and terebratulids present. Age undetermined.	32	1376
16	Sandstone and shale, dark grey and weathering medium yellowish grey; very fine grained; calcareous; thin-bedded and flaggy; recessive.	10	1344
15	Covered interval, recessive.	15	1334
14	Sandstone, light to medium grey, weathering orange and light yellowish grey; fine- to medium-grained but beds coarser at top than at base; calcareous; massive; forms ledge.	36	1319
13	Siltstone, dark grey and weathering dark brownish grey; somewhat sandy; calcareous; massive; soft and recessive. Prolific gryphaeids and terebratulids present.	45	1283
12	Sandstone, light grey, weathering orange and light yellowish grey; medium-grained; calcareous; large-scale crossbedding; thick-bedded; forms ledge.	27	1238
11	Sandstone, medium grey, weathering orange and yellowish grey; fine-grained; calcareous; ripple-marked; thin and medium-bedded with some flaggy beds; recessive.	67	1211

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
10	Sandstone and limestone interbedded; medium grey and weathering orange to light yellowish grey and medium grey; fine-grained; massive; forms ledge.	135	1144
9	Sandstone and interbedded siltstone and shale; dark grey, weathering orange to light yellowish grey; very fine grained; calcareous; shale and siltstone occupy half the unit; beds platy; recessive.	50	1009
8	Sandstone, dark grey, weathering orange to light yellowish grey; very fine grained although coarser toward top; calcareous; minor platy black calcareous siltstones and shales are interbedded; small-scale ripple-marks and worm burrows present; beds thin to medium in thickness and commonly flaggy; forms ledge.	100	959
7	Siltstone and sandstone, dark grey, weathering orange to yellowish grey; very fine grained but coarser toward top; calcareous; minor limestone present; bedding is massive with hard and soft beds alternating, except upper 60 feet which forms a dominant ledge. The following fossil collections were made: At 95 feet from base, Daonella sp. and Nathorstites(?) indicate a Middle Triassic age. At 145 feet from base, Daonella nitanae McLearn, Nathorstites mcconnelli (Whiteaves), Protrachyceras sp. Prenkites-like ammonoid, all from the Nathorstites zone, indicate a Middle Triassic, Ladinian age.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	At 170 feet from base, Nathorstites mcconnelli (Whiteaves) and Styrionautilus sp. from Nathorstites zone indicate a Middle Triassic, Ladinian age. At 240 feet from base, Nathorstites mcconnelli (Whiteaves) and Protrachyceras sp. from Nathorstites zone indicate a Middle Triassic, Ladinian age.	280	859
	Toad Formation		
6	Siltstone, dark grey to black, weathering dark grey; calcareous; shaly in places; laminated and platy but occurring in massive aggregates; recessive.	70	579
5	Siltstone, dark grey to black and weathering yellowish grey; calcareous; thick to massive bedding with alternating hard and soft beds; partly recessive but forms ledge near top. The fossils Daonella sp. and Protrachyceras sp. indicate a Middle Triassic age.	125	509
4	Siltstone, dark grey and weathering yellowish grey; calcareous; somewhat sandy; massive; forms ledge.	149	384
3	Covered interval, recessive.	45	235
2	Siltstone, dark grey to black and weathering light yellowish grey; calcareous; slightly sandy; massive with a few alternations of hard and soft beds; forms ledge in upper 20 feet.	105	190

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
1	Siltstone, dark grey to black and weathering medium yellowish grey; calcareous; massive but finely laminated; forms ledge. Base of section at creek bottom; remainder is concealed by overburden.	85	85

Section 10. High saddle and western flank of hill 4 miles northeast of Mount Stearns at headwaters of Headstone Creek, and 6 miles due north of Halfway River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Section begins in recessive interval of Upper Triassic beds which are overlain by Jurassic (Fernie Group) beds. Contact concealed in covered interval.		
	Pardonet Formation		
27	Siltstone and limestone, dark grey to black and weathering dark brownish grey; fine-grained; calcareous; bituminous; thin-bedded and platy; forms ledge between 65 and 95 feet and again in upper 40 feet; unit is generally recessive. The following collections were made: At 25 feet from base, Halobia sp. and Gryphaea sp. indicating a Middle or Upper Triassic age; at 60 feet from base, Oxytoma cf. mucronata Gabb, Halobia sp. and Juvanites sp. indicating an Upper Triassic age. From the same horizon in a section 1 mile to south the following were found: Proclydonautilus natosisi McLearn, Halobia sp. and Oxytoma cf. mucronata Gabb, indicating age as Upper Triassic, Norian, probably Himavatites zone. At 130 feet from base, Monotis scutiformis pinensis Westermann indicates age as Upper Triassic, Norian, probably Himavatites zone. In upper 40 feet, Monotis subcircularis Gabb indicates age as Upper Triassic, Norian, Monotis subcircularis zone.	265	3938

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	'Grey Beds' (Baldonnel Formation)		
26	Limestone, light greyish brown and weathering light grey; coarsely bioclastic and crystalline; somewhat arenaceous; thick-bedded; forms series of small ledges and recessive intervals; generally resistant.	210	3673
25	Limestone, dark grey to black and weathering medium grey; cryptograined; dense; contains black chert nodules up to 10 inches in diameter; bedding massive; forms ledge.	50	3463
24	Limestone and siltstone, dark grey to black and weathering medium grey; cryptograined; thin- to medium-bedded; recessive.	105	3413
23	Limestone and sandstone inter-bedded; limestone is dark grey and weathers medium brownish grey, and is bioclastic and bituminous; sandstone is medium grey, weathers light grey, and is fine grained, calcareous, and thick-bedded; unit is resistant. The following collections were made: between 40 and 50 feet from base, Entolium sp., indicating age as Middle or Upper Triassic; and at top of unit, "Myophoria" sp., indicating age as Middle or Upper Triassic.	120	3308
22	Sandstone, dark grey and weathering dark brownish grey; fine-grained; calcareous; thick to massive bedding; forms ledge.	50	3188

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
21	Limestone, light grey and weathering light grey; fine-grained; thick-bedded but broken into blocks and slabs; recessive.	50	3138
20	Sandstone, medium brownish grey and weathering light brownish grey; very fine grained; calcareous; thick-bedded; forms ledge.	70	3088
19	Limestone, light grey and weathering light grey; fine- to coarse-grained; some bioclastic beds included; about 15 feet of dolomite in middle; thick-bedded; somewhat resistant.	90	3018
	(Charlie Lake Formation)		
18	Covered interval, deeply recessive; a few scattered outcrops consist of medium brownish grey sandstone, fine-grained, calcareous, thick-bedded with some carbonate interbeds; light grey limestone and sandstone weathering bright yellow is also present. This unit is thought to be an evaporite interval.	650	2928
	(Halfway Formation)		
17	Sandstone, light grey and weathering light grey; medium-grained; calcareous; festoon-bedded; some brownish grey limestone, somewhat arenaceous, is interbedded; beds thick; form ledge.	135	2278
16	Covered interval, recessive.	25	2143

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
15	Sandstone, light to medium greyish brown and weathering greyish brown; fine-grained; calcareous; thick-bedded; forms ledge. The occurrence of Spiriferina sp. indicates a Middle or Upper Triassic age.	115	2118
14	Sandstone, light grey and weathering light grey; fine- to medium-grained; calcareous; lower 10 feet is fine grained and is a darker brownish grey; ripple-marks, festoon bedding and medium-scale crossbedding are prominent; beds thick and form ledge.	50	2003
	Liard Formation		
13	Covered interval, recessive.	75	1953
12	Sandstone, medium grey and weathering light grey; fine- to medium-grained; calcareous; minor thin siltstone and massive limestone interbedded; minor ripple-marks, festoons, and crossbeds; beds massive; form ledge. The fossils Ostrea sp. Spiriferina borealis Whiteaves indicate a Middle Triassic age.	190	1878
11	Sandstone, and siltstone, medium to dark grey and weathering orange-brown; fine-grained; calcareous; small-scale ripple-marks, festoons, and crossbedding present; numerous 1-inch worm burrows; platy and thin-bedded, with thicker, sandier beds in upper 35 feet; unit is recessive.	135	1688

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
10	Siltstone and sandstone, medium to dark grey and weathering orange-brown; fine-grained; calcareous; minor interbedded limestone; thick-bedded; unit forms ledge. The fossils Ostrea sp. Spiriferina sp. and indeterminate species of terebratulids indicate a Middle Triassic age.	65	1553
9	Sandstone, siltstone, and shale, dark grey and weathering orange-brown; fine-grained; calcareous; shale interbedded mostly in middle and lower part; upper 85 feet almost all sandstone; soft sediment slump present; beds generally platy; somewhat resistant but not forming a dominant ledge. At 115 feet from base, in 5 feet of limestone, the occurrence of Nathorstites mcconnelli (Whiteaves) indicates age as Middle Triassic, Ladinian, Nathorstites zone.	213	1488
8	Siltstone, dark grey to black, weathering dark grey and light orange-brown; calcareous; massive; recessive. The fossils Daonella sp., Protrachyceras sp. and Nathorstites(?) sp. indicate a Middle Triassic age.	160	1275
7	Siltstone, dark grey to black and weathering dark grey and yellowish grey; calcareous; beds are well laminated and platy; slightly harder beds are interbedded with softer ones, unit somewhat resistant.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	The fossils Daonella sp., Nathorstites(?) sp. indicate age as Middle Triassic. Trachyceratids, possibly new, also occur.	176	1115
	Toad Formation		
6	Siltstone, dark grey and weathering grey to yellowish grey; calcareous; minor limestone interbedded; beds massive; lower part generally resistant, but upper 80 feet is recessive. The middle part contains the fossils Daonella sp. and Protrachyceras sp. and the upper part Arcestes sp., indicating a Middle Triassic age.	512	939
5	Covered interval, recessive.	55	427
4	Sandstone, dark grey and weathering light brownish grey; very fine grained; calcareous; well-laminated and weathering into 1-inch plates; forms ledge.	20	372
3	Siltstones, dark grey to black and weathering dark grey to black with white coating; calcareous; platy to thin-bedded, occurring in alternate thick-bedded aggregates of hard and soft beds; resistant unit. Five feet above base some indeterminate ammonite impressions occur, possibly Ptychites sp., indicating a possible Middle Triassic.	125	352
2	Covered interval, recessive.	180	227

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
1	Siltstone, dark grey and black, weathering dark grey and black with minor white coating; calcareous; minor thin limestone; beds platy and slightly resistant. Section ends in covered interval. This interval extends for 1/4 mile approximately to Palaeozoic chert beds, and as beds dip at 45 degrees, about 1,000 feet of lower beds in the Triassic could be concealed.	47	47

Section 11. South bank of Halfway River, 5 miles south of Pink Mountain.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cretaceous sandstones and conglomerates overlie Jurassic shales and siltstones (Fernie Group) which, in turn, rests disconformably upon Upper Triassic beds. Contact occurs halfway up hill but is concealed.		
	Pardonet Formation		
7	Siltstone and limestone, medium grey and weathering medium brownish grey; calcareous; highly bituminous; thick-bedded but well laminated and breaking into plates; forms ledge. The fossil Monotis scutiformis pinensis Westermann indicates age as Upper Triassic, Norian, probably Himavatites zone.	35	321
	'Grey Beds' (Baldonnel Formation)		
6	Limestone, medium to dark grey, weathering dark grey and medium brownish grey; coarsely bioclastic; medium-bedded; slightly resistant. Occurrence of Halobia sp. indicates an Upper Triassic age.	15	286
5	Covered interval with a few beds of dark grey limestones and calcareous siltstones weathering light to medium brownish grey; thick-bedded and mostly recessive.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	The occurrences of Gryphaea sp., Pecten sp. and Halobia sp. indicate an Upper Triassic age. Some indeterminate terebratulids present also.	70	271
4	Limestone, medium to dark grey and weathering medium grey; fine-grained; partly bioclastic; minor interbedded thick sandstone which is dark grey and weathers brownish grey; all beds thick; unit forms ledge. The fossils Gryphaea sp., Halobia sp. Pleuromya nidovana McLearn and Pecten nihaniunus McLearn indicate an Upper Triassic age.	35	201
3	Sandstone and siltstone, dark grey and weathering medium brownish grey; very fine grained; calcareous; platy; forms ledge.	10	166
2	Limestone and minor sandstone, dark grey, weathering dark grey and brownish grey; black chert nodules up to 1 foot in length present; minor shale also present; beds massive and resistant; unit forms ledge.	95	156
1	Sandstone, medium grey and weathering medium brownish grey; very fine grained; calcareous; massive; forms ledge. Base of section in gully; remainder concealed.	61	61

Section 12. Due south of Mount Stearns and 2 miles south of Halfway River. Section carried from deep gully on west flank to top of hill and then south along ridge-top to survey cairn, and then east down flank of hill to high saddle occupied by Jurassic beds.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Contact of Triassic beds (Pardonet Formation) and the Jurassic (Fernie Group) is obscured by overburden. It occurs in a high saddle between the peak to the west (Triassic beds) and the peak to the east (Cretaceous beds).		
	Pardonet Formation		
23	Covered interval, recessive dark grey thin siltstones and limestone in talus; thickness approximate as contact not definitely located. To north 4 miles, at least 480 feet of Pardonet is present.	500	3738
	'Grey Beds' (Baldonnel Formation)		
22	Covered interval with a few outcrops of dark grey, bituminous limestones weathering light grey; thick-bedded, generally recessive, but outcrops from small resistant ledges on east flank of hill, which constitutes a dip slope. The fossils at top of unit are Palaeocardita sp., Lima (Plagiostoma) sp. and "Myophoria" sp., and indicate an Upper Triassic age.	75	3238

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
21	Sandstone and interbedded limestone, dark brownish grey and weathering dark brownish grey; sandstone is fine-grained and calcareous; unit is medium-bedded and resistant.	35	3163
20	Limestone, light grey and weathering grey; fine-grained; coarse pockets of white calcite up to 2 inches long and large black chert nodules and thin lenses present; minor dark platy siltstone is interbedded; beds thick; unit is recessive.	65	3128
	(Charlie Lake Formation)		
19	Limestone and minor sandstone, light grey, weathering light grey with considerable bright yellow, particularly in the talus; limestone is fine grained and vuggy; sandstone is fine grained and calcareous; all beds are medium to thick, soft, and recessive. This is thought to be an evaporite interval.	135	3063
	(Halfway Formation)		
18	Sandstone and limestone, light grey and weathering light brownish grey; sandstone is fine grained, calcareous and crossbedded; limestone is interbedded with about 20 feet of light grey fine-grained dolomite, weathering light creamy grey, occurring 100 feet from base. All bedding is thick; unit forms ledge that leads to summit.	265	2928

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
17	Limestone, light grey and weathering creamy light grey; fine-grained; thick-bedded; recessive.	15	2663
16	Sandstone, light grey and weathering light to medium grey and yellowish grey; fine-grained but coarser in upper part; calcareous; thick-bedded; forms ledge.	210	2648
15	Limestone, light grey and weathering light yellowish grey; coarse-grained; bioclastic; somewhat similar to a coarse calcarenite; minor maroon platy siltstones and shales; beds massive; forms ledge.	20	2438
14	Sandstone, light to medium grey and weathering yellowish orange; fine- to medium-grained; calcareous; medium-scale crossbedding; soft platy siltstone and minor light grey, fine-grained limestone interbedded in upper 15 feet; beds generally thick and form ledge.	85	2418
13	Sandstone; medium grey and weathering brown; fine-grained; calcareous; medium- to thick-bedded with platy beds in upper part; unit forms ledge in lower 70 feet.	100	2333
	Liard Formation		
12	Siltstone and minor interbedded sandstone and limestone; dark grey to black and weathering dark grey and brownish yellow; arenaceous beds are also calcareous; all beds are thin to		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	medium in thickness and break into irregular plates; unit is soft and recessive. The fossils - Daonella elegans McLearn, Nathorstites mcconnelli (Whiteaves), Daxatina sp., Paratrachyceras cf. sutherlandi McLearn, and Asklepioceras sp. - indicate age as Middle Triassic, Ladinian, Nathorstites zone.	375	2233
11	Sandstone with minor dark grey siltstone and limestone; sandstone is medium grey and weathers orange-yellow; fine-grained; calcareous; ripple-marked, crossbedded, contains 1-inch worm burrows; concretions up to several inches in diameter tend to weather out; bedding is medium to thick; unit forms ledge. Terebratulids and gryphaeids occur but age is undetermined.	195	1858
10	Siltstone, shale, and minor thin sandstone; dark grey and weathering orange-brown; calcareous; flaggy; recessive.	230	1663
9	Sandstone, medium grey and weathering bright orange-yellow; fine-grained; calcareous; small-scale crossbedding and ripple-marks; small worm burrows and casts; medium-bedded; unit forms ledge.	15	1433
8	Sandstone, medium to dark grey and weathering brownish yellow; fine-grained; calcareous; thin-bedded with minor thick beds; recessive. Daonellids present but age is undetermined.	100	1418

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
7	Sandstone, medium to dark grey and weathering brownish yellow; fine-grained; calcareous; medium- and thick-bedded and breaking into 4-inch flags; unit forms ledge. Daonellids present but age is undetermined.	35	1318
6	Sandstone and siltstone, medium to dark grey and weathering medium brownish yellow; fine-grained; calcareous; beds massive but break easily into irregular flags; recessive.	75	1283
	Toad Formation		
5	Siltstone, dark grey and weathering dark grey with some orange-yellow; calcareous; massive; forms ledge.	100	1208
4	Siltstone with minor interbedded limestone; dark grey to black, weathering dark grey with some brownish to orange-yellow; calcareous; thick-bedded aggregates of soft platy layers alternating with harder more massive beds; generally recessive. The occurrence of Daonella sp. indicates a Middle Triassic age. Some indeterminate crushed ammonites also present.	200	1108
3	Siltstone, dark grey to black and weathering dark brownish grey; calcareous; thick-bedded; forms ledge.	35	908

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
2	Siltstone and shale, dark grey to black and weathering dark brownish grey to yellowish grey; minor thin- to medium-bedded limestone; shale occurs mostly as partings; beds platy; recessive.	97	873
1	Siltstone, dark grey to black and weathering dark grey with some dark brownish grey and yellowish grey; calcareous; considerable argillaceous material, and some intervals consisting of interbedded massive mudstone; shale occurs generally as partings and limestone as thin interbeds; beds are generally platy, soft and recessive with a few 10-foot resistant ledges; unit is generally recessive. Base of section occurs at bottom of gully. Remainder of section to Palaeozoic anticline about 1/3 mile to west is concealed. Several hundred feet of lower Triassic beds are covered.	776	776

Section 13. Mount Laurier on north flank.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Upper Triassic beds occur in syncline on ridge or shoulder due west of topographic cairn. Neither Jurassic or Cretaceous beds are present.		
	Upper and Middle Triassic Beds		
9	Sandstone and limestone, dark grey and weathering grey and brownish grey; sandstone is fine-grained, calcareous, crossbedded, ripple-marked, and festooned but all structures are mostly small-scale; limestone is medium grey, weathers light grey, and is coarsely bioclastic; occurring as interbeds with the sandstone; unit forms ledge. Talus at base of cliff and presumably from this unit contains Halobia sp. indicating an Upper Triassic age. This unit is equivalent to the upper part of the 'Grey Beds', perhaps the Baldonnel Formation, but the dominant carbonate lithology is absent.	210	4535
8	Siltstone and sandstone; medium grey and weathering medium brownish grey; very fine grained; calcareous; beds are 1/4 to 1 inch thick and are profusely ripple-marked; small-scale crossbeds also present; unit forms 350- to 400-foot ledge beneath topographic cairn in lower part, upper part forms a recessive interval across dip slope to west.	1070	4325

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
7	Siltstone and shale, dark grey and weathering medium brownish grey; calcareous; minor 1-inch beds of sandstone interbedded; bedding generally thin and platy; unit is recessive and partly covered along east shoulder of hill beneath cairn; thickness is approximate and may be excessive. The stratigraphic equivalent of this unit in exposures a few miles to the east is not known. Presumably it is in the lower part of the Upper Triassic, perhaps equivalent to the Charlie Lake and Halfway Formations.	1500	3255
6	Sandstone, medium grey and weathering medium brownish grey; fine-grained; calcareous; dark calcareous streaks 1/4 inch wide and several inches long occur along bedding planes, thick-bedded but may break into thin plates; forms a series of ledges. Unit may be the stratigraphic equivalent of the lower part of the Halfway Formation.	370	1755
	Liard Formation		
5	Siltstone, dark grey to black, weathering dark grey and orange to yellowish grey; calcareous; minor soft black bituminous limestone throughout; medium-bedded; recessive. This unit is like the Upper Liard beds elsewhere. The occurrence of Daonella sp. indicates a Middle Triassic age.	140	1385

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
4	Sandstone and siltstone, dark grey and weathering medium yellowish grey; very fine grained; calcareous; beds break into flags and may be interbedded with more resistant but well-laminated beds up to 4 feet thick; unit is generally resistant due to series of small ledges. The occurrences of trachyceratids at 200 feet from base, and Daonella sp. at 410 feet from base indicate age as Middle Triassic.	455	1245
	Lower Middle and Lower Triassic including Toad and Grayling Formations		
3	Siltstone, dark grey to black and weathering dark grey; calcareous; platy but occurring in thick-bedded aggregates; recessive. This unit is thought to be equivalent to upper Toad Formation.	285	790
2	Covered interval, recessive with thin platy black calcareous siltstone in talus. This unit is thought to be within the Toad Formation.	230	505
1	Siltstone and shale, dark grey and weathering rust-brown particularly in lower part; generally calcareous; platy and containing large calcareous concretions up to 3 feet in diameter; recessive and partly covered.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Unit is in disconformable contact with Permian chert. Fossil collections were made from this unit about 5 miles to the south. At 170 feet above the chert, the occurrence of *Posidonia mimer* Oeberg and *Xenocetites* cf. *subevolutus* Spath indicates age as early Upper Scythian. At 250 feet above the Permian, the fossil *Posidonia aranea* Tozer indicates a late Upper Scythian age. Covered interval in lower 100 feet or so may be underlain by Grayling Formation.	275	275

Section 14. Gully on south flank of hill 2½ miles north of junction of Horn Creek and Graham River, about 9 miles southeast of Mount Laurier summit.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Jurassic beds occur in syncline immediately to west. Contact with underlying Triassic is concealed. A wide covered interval occurs between valley west of hill and west flank of hill. Some Upper Triassic beds are concealed.		
	Upper Triassic		
12	Sandstone, dark grey and weathering dark orange-brown; fine-grained; calcareous; occurs as massive aggregates of platy beds; numerous small-scale ripple-marks and crossbeds present; unit occurs as a series of ledges on west flank of fold. Age of this unit is not known. It appears to be the stratigraphic equivalent of the upper part of the 'Grey Beds'.	500	1907
11	Limestone, light grey and weathering light grey; coarsely crystalline; contains 1-inch pockets of white calcite; massive; forms ledge. This unit is probably equivalent to middle part of the 'Grey Beds'. It does not occur on west flank of anticline. Age is unknown.	55	1407
10	Sandstone, medium grey and weathering medium brownish grey; fine-grained; calcareous; flaggy; recessive. This unit is probably equivalent to middle or lower part of the 'Grey Beds'. Age is unknown.	70	1352

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
9	Sandstone and limestone interbedded; sandstone is medium grey and weathers to light orange-brown; fine-grained; calcareous; flaggy; limestone is medium grey and weathers light grey; coarsely bioclastic; medium- to thick-bedded. This unit is probably equivalent to the lowest 'Grey Beds' (Halfway Formation?). It does not occur on west flank of anticline. Age is unknown.	245	1282
	Liard Formation(?)		
8	Siltstone, dark grey to black, and weathering black; calcareous; thick-bedded but splitting into platy layers; recessive.	40	1037
7	Sandstone and siltstone, medium grey and weathering yellowish grey; very fine grained; calcareous; massively bedded but containing fine laminations; forms ledge.	40	997
6	Siltstone, dark grey to black and weathering dark grey; calcareous; platy and massive beds alternating; recessive.	66	957
5	Sandstone and siltstone, medium to dark grey and weathering yellowish grey; fine-grained; calcareous; sandstone platy and medium-bedded; recessive.	15	891

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
4	Siltstone and sandstone, dark grey to black and weathering dark grey or orange-brown; calcareous; platy; small 1-inch black calcareous nodules present; consists of alternating beds of hard and soft thick-bedded aggregates; forms ledge. Age is unknown for this unit; possibly lowest Liard.	238	876
	Toad Formation(?)		
3	Siltstone and shale, dark grey to black, weathering orange-yellow to brownish yellow as well as dark grey to black; thin sandstones and large calcareous kettle concretions throughout make unit resistant; beds are platy and form thick-bedded aggregates.	197	638
2	Siltstone and shale, dark grey to black and weathering orange-brown to yellow-brown; calcareous; platy; recessive.	106	441
1	Siltstone, dark grey to black and weathering dark grey, calcareous; beds are platy but thick dark grey limestone beds are also present; calcareous kettle concretions up to 5 feet in diameter and 1 foot across bedding-plane occurring throughout may contain fossil fish and invertebrates; recessive. Typical Grayling beds absent. Black platy siltstones occur in disconformable contact with underlying Permian(?) chert. Base of section in core of anticline. 200 feet above Palaeozoic contact the occurrence of fish fragments, Meekoceras(?) sp.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	and certain indeterminate ammonites indicate a Lower Triassic age. 335 feet above Palaeozoic contact, Pseudomonotis cf. occidentalis Whiteaves indicates a Lower Triassic, probably early upper Scythian age.	335	335

Section 15. Hill about $2\frac{1}{2}$ miles south of upper Needham Creek, about $7\frac{1}{2}$ miles southwest of Christina Falls on Graham River.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Upper Triassic beds occur on dip slope on west flank of hill. Contact with overlying Jurassic (Fernie Group) is concealed but is presumed to be at a lower elevation.		
	Pardonet Formation		
17	Shale, siltstone and sandstone, dark grey and weathering medium greyish brown; fine-grained; calcareous; platy; soft and recessive. Unit forms dip slope leading to valley floor to west; 220 feet was measured and remainder estimated to presumed Jurassic (Fernie Group) contact.	450	3885
16	Sandstone, medium to dark grey and weathering orange-brown; fine-grained; calcareous; thin-bedded and somewhat brecciated; forms ledge. Irregular 1/4-inch calcite veins cut rock.	40	3435
15	Limestone, medium grey and weathering light grey; coarsely bioclastic with small $\frac{1}{2}$-inch pockets of bituminous material, and 1-inch pockets of white calcite; bands of black chert present; medium- to thick-bedded; forms ledge.	80	3395

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
14	Siltstone and sandstone, dark grey and weathering dark greyish brown; fine-grained; calcareous; platy; recessive. The fossil Meleagrinella sp. indicates an Upper Triassic age.	220	3315
13	Siltstone, sandstone and shale all interbedded; medium to dark grey and weathering dark greyish brown; fine-grained; calcareous; thin-bedded; resistant ledge. Occurrence of Monotis subcircularis Gabb indicates age as Upper Triassic, Norian, Monotis subcircularis zone.	110	3095
12	Sandstone, platy siltstone and grey limestone all interbedded; clastic rocks are dark grey and weather dark yellowish grey; calcareous and thin- to medium-bedded; limestone is medium grey and weathers lighter grey; bioclastic and medium- to thick-bedded; unit consists of a series of small ledges, and is generally resistant. Fossils chiefly from upper 20 feet: Monotis scutiformis pinensis Westermann, Placites sp., Himavatites sp. indicate age as Upper Triassic, Norian, Himavatites zone.	235	2985

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	'Grey Beds' (Formations that occupy this interval to the east are not recognized here).		
11	Shales, siltstones and sandstones, dark grey and weathering light yellowish brown; beds platy; recessive. Age not known but probably Upper Triassic.	200	2750
10	Sandstone, dark grey and weathering yellowish brown; fine-grained; calcareous; platy; recessive.	270	2550
9	Siltstones and shales with minor interbedded bioclastic limestone; beds are dark grey and weather yellowish brown; calcareous; numerous small-scale current ripple-marks on bedding planes exposed on dip slope; generally recessive.	460	2280
8	Sandstone, medium to dark grey and weathering orange-brown to yellow-brown; fine-grained but coarser in upper part; several 3-foot bioclastic limestone beds throughout unit; minor thin-bedded, grey limestone is interbedded; beds occur as thick aggregates of platy sandstones and siltstones; small-scale crossbedding present; unit forms upper part of cliff and is resistant. Age not known but is lithologically similar to basal 'Grey Beds' in range 5 miles east.	480	1820

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Liard Formation(?)		
7	Sandstone, medium to dark grey and weathering brownish yellow; fine-grained; calcareous; medium-bedded and flaggy; small-scale crossbedding present; unit is resistant on cliff face.	300	1340
6	Sandstone and limestone, dark brownish grey and weathering medium brownish yellow; fine-grained; calcareous; 6-inch 'cannon ball' concretions which weather below general rock surface; thick-bedded; forms ledge. The fossils Daonella elegans McLearn, Nathorstites mcconnelli (Whiteaves) and Paratrachyceras sutherlandi McLearn indicate age as Middle Triassic, Ladinian, Nathorstites zone.	100	1040
5	Shale, siltstone and fine sandstone, with minor thin limestone; dark brownish grey and weathering medium brownish yellow; calcareous; platy; poorly preserved ammonites; recessive. Age not known but unit taken as basal Liard on basis of lithological similarity to other units, together with position in the section.	210	940

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Toad Formation(?)		
4	Siltstone and fine sandstone; dark brownish grey and weathering yellowish brown; calcareous; massive but weathering into 1-inch plates; some thicker units contain slump structures; poorly preserved pelecypod impressions present; unit is slightly resistant, and forms ledge.	185	730
3	Sandstone, dark grey and weathering orange-brown; very fine-grained; calcareous; platy, but beds occur in thick aggregates.	235	545
2	Siltstone and minor sandstone, dark grey and weathering orange-brown; calcareous; platy; form ledge.	200	310
1	Siltstone and shale, dark grey and weathering medium orange-brown; calcareous; flaky and platy; kettle concretions up to 3 feet in diameter and fossils in some; recessive. Base of section concealed. The fossils Pseudomonotis occidentalis (Whiteaves), Xenocetites sp. indicate age as Lower Triassic, early Upper Scythian.	110	110

Section 16. In Short Creek (locally called "White Creek") 1 mile east of big bend in Graham River, and about 12 miles southeast of Christina Falls and 4 miles due west of Hackney Hills.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Contact with Upper Triassic beds and overlying Jurassic (Fernie Group) is concealed just above waterfall.		
	Pardonet Formation		
2	Siltstone and limestone with minor thick sandstone, dark grey and weathering yellowish grey; aggregates of platy siltstone beds are generally thick but limestone beds are less than 1 foot; beds highly bituminous and fossiliferous, and in part, coquinoid; Icthyosaur bones present. Following collections made: at base, in concretions, Halobia sp. and Malayites sp., indicating age as Upper Triassic, late Karnian; 130 feet from base, Proclydonautilus natosini McLearn, Drepanites hyatti rutherfordi McLearn, Halobia sp. Monotis alaskana Smith, indicating age as Upper Triassic, early Norian. (This collection may contain representatives from more than one zone.) At 145 feet from base, in concretions, Himavatites columbianus McLearn, Pseudosirenites sp., Distichites sp., Parathisbites oineus McLearn, Hypisculites sp., Halobia sp., and Monotis alaskana Smith, indicate age as Upper Triassic, early Norian.		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	At 160 feet from base, Monotis subcircularis Gabb, indicates Upper Triassic, late Norian age. At 173 feet from base and in upper 62 feet, Monotis subcircularis Gabb indicates age as Upper Triassic, late Norian.	235	275
	'Grey Beds' (Baldonnel Formation)		
1	Limestone, dark grey and weathering grey; fine-grained; contains black chert nodules and lenses 2 to 6 inches thick and up to several feet in length along bedding planes; stylolites common, also vugs containing calcite crystals; beds massive, forms ledge at core of anticline.		
	Remainder of section concealed.	40	40

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