Glacial deposits, recent alluvium, few if any Qs outcrops Qsl Landslide and rock slide debris GEOLOGICAL SURVEY OF CANADA DEPARTMENT OF ENERGY, MINES AND RESOURCES CRETACEOUS AND/OR JURASSIC GALENA BAY STOCK: muscovite-biotite granodiorite Kgd and quartz monzonite BATTLE RANGE BATHOLITH (Kgal, Kgdb, Kqmm): Kgal Pyritiferous alaskite Muscovite-biotite granodiorite, granodiorite; Kgdb includes SUGARPLUM STOCK Biotite-hornblende quartz monzonite, granodiorite; Kqmm Biotite-hornblende quartz monzonite, granodiorite; minor quartz diorite; includes BUGABOO BATHOLITH NELSON BATHOLITH (KCC to Jqd) CARIBOU CREEK PLUTON: biotite-hornblende quartz Kcc monzonite, granodiorite; minor quartz diorite and granite. All contain potash feldspar megacrysts GOATCANYON-HALIFAX CREEK and WRAGGE CREEK STOCKS: Kqmb hornblende-biotite quartz monzonite; minor quartz diorite and granodiorite SOUTH WRAGGE CREEK STOCK: hornblende leucoquartz Kqm monzonite JURASSIC AND/OR CRETACEOUS RUBY RANGE STOCK: biotite-hornblende quartz diorite, Jqdm diorite, quartz monzonite, monzonite and syenodiorite MEADOW MOUNTAIN and EAST CARIBOU STOCKS: foliated hornblende quartz diorite; minor quartz monzonite JURASSIC ___ KUSKANAX BATHOLITH AND STOCKS (JKX, JKXS, JKX): JKX Aegerine-augite leucoquartz monzonite; minor leucosyenite and leucogranite LJKX Foliated and/or lineated leucoquartz monzonite HIGH GRADE METAMORPHIC ROCKS UPPER SINEMURIAN ARCHIBALD FORMATION (?): grey argillite, shale IJp and siltstone TRIASSIC AND (?) JURASSIC PROTEROZOIC TO TRIASSIC TRIASSIC TO (?) LOWER JURASSIC (SINEMURIAN) SLOCAN GROUP RJsvb Augite meta-basalt and meta-andesite flows and tuff kJsvd Grey meta-andesite and meta-dacite tuff and flows Grey to black phyllite, argillite, quartzite; _ . Grey mica schist ksp minor tuffaceous sediments near top Grey to black limestone; minor argillite and Rsc Grey to Black quartzite BUGABOON Rscg Conglomerate, sedimentary breccia; minor sandstone Hornblende and pyroxene meta-diorite and meta-andesite (includes Poplar Creek Greenstone). Pattern used where boundaries are undefined. PRub | Serpentinite; minor talc and tremolite schist PRKv Meta-andesite flows, tuff, breccia; minor meta-dacite; rare tuffaceous phyllite MISSISSIPPIAN TO PENNSYLVANIAN OR PERMIAN UPPER MISSISSIPPIAN TO PENNSYLVANIAN OR PERMIAN MILFORD GROUP (uMmt to uMmcg) uMmt Light green to white chert uMmq Calcareous quartzite uMmp Grey and brown phyllite and meta-sandstone uMmsb Biotite schist, paragneiss uMmc Grey and white limestone, locally fossiliferous uMmsc Calc-silicate marble uMmv Amygdaloidal meta-basalt flows uMmcg Conglomerate MIDDLE DEVONIAN(?) Dgdn Biotite-hornblende granodiorite gneiss CAMBRIAN TO DEVONIAN OR OLDER LOWER CAMBRIAN TO MIDDLE DEVONIAN OR OLDER
LARDEAU GROUP (IPBC to IPigr)
BROADVIEW FORMATION (IPBC, IPBS): SHUSWAP METAMORPHIC COMPLEX* PRm Amphibolite IPsc Limestone, grey phyllitic limestone and Biotite-quartz-feldspar grey phyllite PRnb paragneiss, pegmatite, amphibolite IPBs Grey and green phyllitic grit and phyllite Calc-silicate gneiss, Prnc | amphibolite, marble, schist, JOWETT FORMATION: green phyllite, limy green MOUNT HADOW STOCK quartzite phyllite, greenstone IPSCP SHARON CREEK FORMATION: dark grey to black siliceous phyllite Carbonate-diopside Prncq Carbonate-o IPAQ AJAX FORMATION: massive grey quartzite Pkn Layered gneiss RIO TRIUNE FORMATION: grey to black siliceous Quartzite, mica schist IPTP phyllite IPTAS TRIUNE, AJAX, SHARON CREEK FORMATIONS: undivided Biotite-quartz-feldspar PRsa paragneiss, garnetiferous IPIv INDEX FORMATION (IPIv to IPIgr)
Green phyllite, limy green phyllite, greenstone schist and gneiss Biotite-sillimanite schist, PTksbq Biotite-sillimani impure quartzite Phyllitic and arenaceous limestone;minor grey phyllite P'Rsc Marble Grey and light green phyllite; minor phyllitic limestone and quartz grit Marble, thin-bedded PRscq Marble, thin-bedded quartzite, schist IPIgr Quartz grit; minor gritty phyllite Plan Undivided IPLS Undivided: grey phyllite, siliceous phyllite, gritty phyllite, phyllitic grit, rare quartzite IPLSb Biotite schist IPLV Undivided: green phyllite, limy green phyllite, greenstone *stratigraphic order unknown IPLC Undivided: limestone, phyllitic limestone IPLSC | Calc-silicate marble LOWER CAMBRIAN IEBC BADSHOT FORMATION: Grey and white limestone IEssc Marble HADRYNIAN (WINDERMERE) AND/OR CAMBRIAN HADRYNIAN (WINDERMERE) AND/OR LOWER CAMBRIAN HAMILL GROUP (IEMp to IEMGQ) MOHICAN FORMATION (IEMP, IEMV, IEMC): Grey and brown mica schist, black phyllite; minor Grey and brown phyllite, micaceous quartzite; I€Mp minor limestone I€Hm Amphibolite Green phyllite, minor grey phyllite and limestone IEMC White to light grey limestone MARSH ADAMS FORMATION: white, grey and brown quartzite, phyllitic quartzite; minor grey and black phyllite ■ Garnet-biotite schist, micaceous quartzite IEMGQ MOUNT GAINER FORMATION (IEMGQ, IEMGV): white quartzite Tan and white quartzite, micaceous quartzite Green phyllite, greenstone HADRYNIAN (WINDERMERE) HORSETHIEF CREEK GROUP (HHCUC, HHCC, HHCIC): Upper Division: quartzofeldspathic sandstone HHCUC and siltstone, grey slate; minor quartzofeldspathic grit; rare quartz pebble conglomerate HHCC Limestone STOCK HHClc Lower Division: quartzofeldspathic sandstone and grit; grey slate, minor quartz pebble conglomerate; HHCs Undivided INTRUSIONS OF UNKNOWN AGE g Granite, quartz monzonite qmbh MOUNT CARPENTER STOCK: biotite-hornblende quartz monzonite qm Lineated biotite-muscovite quartz monzonite fp Feldspar porphyry bq Biotite quartz gabbro Geological boundary < approximate... ____ Road, all weather ... approximate.. m m NNNN Bedding, facing determined < vertical... overturned. Bedding, facing undetermined { inclined. vertical. Glacier or snowfield...... _____ Foliation (inclined, vertical, Contours (interval 100 or 200 feet)..... Height in feet above mean sea-level..... = 5000 (undetermined vergence ... northerly vergence*..... Fold (undetermined vergence, northerly vergence*)... * Vergence is the direction of the upper member of the rotational couple implied by the asymmetry of the fold. Geology by J.O. Wheeler, 1965, 1967; P.B. Read, 1962-1964, 1971-1976. Revised compilation by P.B. Read, 1976. Geological cartography by the Geological Survey of Canada, 1976. Base-map compiled and drawn by the Surveys and Mapping Branch, 1971. ADJOINS MAP 1090 A "NELSON W Magnetic declination 1957 varies from 23°00' easterly at center of west edge to 23°30' easterly 118°00 at southeast corner. Mean annual change: 3.8' westerly

DESCRIPTIVE NOTES Righways 6, 23, 3i and 3iA pass through Lardeau west-half, provide access, and join Nakusp to Revelstoke, New Denver and Kaslo which lie just beyond the map-area (Fig. i). Logging roads allow access to the lower courses of some major creeks and rivers such as Wilson, Akolkolex and Incomappleux. Because pack trails are overgrown now, only helicopters give efficient transportation in the central and northeastern parts of the area. At the turn of the century, mining brought thousands of prospectors to settle at Trout Lake, Ferguson, Because pack trails are overgrown now, only helicopters give efficient transportation in the central and northeastern parts of the area. At the turn of the century, mining brought thousands of prospectors to settle at Trout Lake, Ferguson, Beacon, Camborne, Gerrard, Poplar, Zincton, Three Porks, and Retallack. A system of wagon roads, railroads and stermwheelers connected these mining towns. In recent years, lumbering supplemented by tourism forms the economic base.

In the last fifteen years, many detailed studies of parts of the map-area have been completed, but Walker, Bancroft and Gunning's study (1930) was the only regional one. These studies (Fig. 1) and the regional work of Wheeler (1966, 1968) are the basis for this map.

In the Selkirk and Purcell Ranges, exposures are excellent above 6,000 feet, but westward near the Columbia River and Upper Arrow Lake, vegetation and drift obscure the complex geology and diminish the certainty of geologic boundaries and relations. in the last fifteen years, many detailed notice of parts of the separate lows been completed, but while, shortful combination of the completed of the bulber of the completed of the bulber of the completed of the bulber of the completed of the c

place to place the pelite overlies different volcanic units of the Storm Group, hence the pelite overlies different volcanic units of the Storm Group, hence the contact may be an angular uncomformity.

Stratified rocks of Lardeau west-half act as host to a wide variety of alkalic and caic-aimainc plutons. These plutons belong to four intrusive complexes, which in probable order of decreasing age are:

(a) in the center of the map-area, the Martholith and askelliting stocks;

(b) In the southern part of the map-area, plutons related, stability of the southern part of the map-area, the Martholith and askelliting stocks;

(d) Galean Martholith and the stocks of the north end of Upper Arrow Lake are peripheral to the stability of t Sugaboo Batholith just east of the map-area. Based on this tentative correlation, Battle Range Batholith is probably of Cretaceous age.

Galena Bay Stock (Kgd) and a lineated biotite-muscovite quartz monzonite (qm), which may be part of Galena Bay Stock, outcrop near the head of Upper Arrow Lake and form a mile-wide belt across and west of Pingston Creek. These intrusions lie in the fringe zone on the eastern and southern margins of Thor-Odin Dome. Along the southeastern margin of the dome, a cataclasite zone produced a local fractured and brecciated augen gneiss within map-unit qm. K-Ar dating on biotite and muscovite from Galena Bay Stock gives 66 and 90 m.y. respectively, which is compatible with surrounding geological constraints but probably represents regional uplift and cooling, and not the time of intrusion and consolidation.

In Lardeau west-half, stratified rocks are complexly folded, faulted and metamorphosed. Rocks in the northeastern in Lardeau west-half, stratified rocks are complexly folded, faulted and metamorphosed. Rocks in the northeastern end of the Kootenay Arc. Westwards, this limb loses its identity because of the intrusions of the Nelson and Kuskanax Batholith, and the complex deformation and metamorphism associated with development of Valhalia, Pinnacles, and Thor-Odin Domes in the Shuswap Metamorphic Complex. These batholiths and domes effect a gradual transition into westerly trending structures of the west and south parts of Lardeau west-half. From the northeast corner, intensity of deformation increases southwestward, across trend, toward the Kuskanax Batholith. Along trend, folds are tighter northeast of the Kuskanax Batholith than either northwest or southeast of it. South and west of the batholith, intensity of deformation increases with proximity to gneiss domes. Because of a regional structural depression in the Kootenay Arc, folds southeast of Trout Lake plunge northwest and the core of Mesozoic rocks to outcrop on the flanks of Thor-Odin Dome and, beneath the core of Mesozoic

		Characteristics of Fold Phases in Lardeau	West-Half
3	Phase	Style	Occurrence
	First	Rootless, isoclinal folds with well- developed, axial-plane foliation.	Mesoscopic folds sparse and macro- scopic folds rare. Deform rocks older than the Milford Group.
	Second	Open to tight folds with a crenulation axial-plane cleavage. Commonly asymmetric with N-profile looking northwest and a vertical to north- east dipping axial plane.	Mesoscopic and macroscopic ubiquitous and deform all stratified rocks.
	Third	Open to tight folds with crenulation axial-plane cleavage. Commonly asymmetric with W-profile looking northwest and a vertical to south- west dipping axial plane.	rolds of all scales are areally restricted.
	Late	Kink folds of variable orientation.	Mesoscopic folds only in phyllitic rocks

Akolkolex Anticline closing to the northeast and Drimmie Creek Syncline above Standfast Creek Fault (Thompson, 1972).

Southwards at the north end of Kootenay Lake, similar first phase folds reappear as the northwest plunging Meadow Creek and Duncan Anticlines (Fyles, 1964). In Lardeau west-half, part of the upper kimb of Meadow Creek Anticline outcrops in lower Meadow Creek.

(b) Southwards Creek. lower Meadow Creek.

(b) Second Phase: Macroscopic folds of this phase are ubiquitous and prominently affect the map distribution of rock units. Northeast of the Kuskanax Batholith, a series of asymmetric folds rise northeasterly towards the crest of the Purcell Anticlinorium. Because Battle Range Batholith intervenes on the boundary of Lardeau west-half (L.W-H), and Rogers Pass (R.P.) map-areas, correlation to major folds outside the map-area is tentative.

1. Illecillewaet Syncline (R.P.) = Finkle Creek Synform (L.W-H)

2. Ventego Syncline (R.P.) = an isoclinal syncline cored by Mohican Formation which crosses
Westfall River (L.W-H).

3. Devile Syncline (R.P.) = syncline cored by Index Formation between Westfall and
Duncan Rivers (L.W-H) = Mount Cauldron Syncline (L.E-H)*. Duncan Rivers (L. W-H) * Mount Cauldron Syncline (L. E-H)*.

*(L.E-H) = Lardeau east-half.

(c) Third Phase: Folds of all scales are areally restricted to a zone extending beyond the map-area from the southeast end of Trout Lake southeasterly between Lardeau River and the Kuskanax Batholith. Southeastwards, the intensity of this phase increases at the expense of the second phase. Kootenay lake Antiform runs along the lower course of Moadow Creek (Fyles, 1964), and farther northwest Trout Lake and Rusty Creek fold belts cross the southeast end of Trout Lake (Read, 1973). Mississippian to Jurassic rocks in the southean part of the map-area outline a complexly deformed synclinorium along Columbia River. At the southeast corner, near Kaslo, two coaxial phases of folding plunge gently northwestly, but at the western end, near Columbia River, two or more phases of non-coaxial folding plunge esterly. Third phase folds are present but whether second phase and/or a later regionally restricted phase of folding developed is uncertain.

Timing of deformation places first phase in middle Paleogoic, possibly Devonian, and second and probably third phases in middle Jurassic. A pre-late Mississippian age for first phase deformation and synchronous metamorphism rests on:

(a) An exposed angular unconformity between the basal conglomerate of the Milford Group and truncated phyllite of the underlying Broadview Formation (Read, 1975); (b) Randomly-oriented phyllitic clasts of Broadview detritus in the conglomerate (Wheeler, 1966; Read, 1975); (c) A Rb-Sr whole rock isochron on the Broadview Formation gives an age of 479 t 17 m.y.

underlying broadwise Formation (Read, 1975): and (c) A Rb-Sr whole rock isochron on the Broadwise Formation gives an age of 479 t 17 may.

Restriction of the second and third phases of deformation and accompanying post-kinematic metamorphism to an interval between 164 and 178 m.y. depends on: (a) a K-Ar radiometric date of 178 m.y. from the core of the pre- to syn-tectonic Kuskanax Batholith; (b) an episodic lead loss at 175 to m.y. in zircons from the core of Thor-Odin Dome (Wanless and Russor, 1975); and (c) radiometric dates at least as old as 164 m.y. for the post-tectonic, northern part of the Nelson Batholith and Mount Carlyle Stock (Nguyen, Sinclair and Libby, 1968). This timing is consistent with rocks as young as Hall Formation (Middle Bajocian) in Nelson west-half being involved in regional deformation.

Two periods of regional metamorphism and later contact metamorphism affect stratified rocks. At Mount Thompson, the basal conglomerate and Rb-Sr dating of the Broadwise require a pre-late Mississippian and probably Devonian age for metamorphism. Widespread polymetamorphic textures in the Lardeau Group and their absence in the Milford Group (Read, 1973) indicate the regional extent of this greenschist facies metamorphism which may be obliterated to the west in the Shuswap Complex and may die out to the east, towards the crest of the Purcell Anticlinorium.

The pattern of metamorphic isograds developed shortly after middle Jurassic deformation. Metamorphic grade increases from northeast to southwest with isograds subsparallel to the structural trends. Locally isograds transect structural and stratigraphic levels. Near the Kuskanax Batholith, upper Paleozoic Milrord and Saksio Groups are in amphibolite facies but northeastward the Madrynian Morsechief Creek Group is in lower greenschist facies. In the southern part of the map-area, Milford and Slocan Groups display chlorite and biotic zones of metamorphism. Isograds parallel the structural grain into the southwest corner of the map-area where high grade

Early in the century, mining played an important part in the economy of the region. Silver-lead-zinc vein deposits have been the largest producers. Relevant data on all mineral deposits are summarized in an accompanying open file map of mineral deposits of the map-area.

Table II Relationships among deposition.

Paleonfologic age

BATTLE RANGE BATHOLITE GALENA BAY STOCK

SLOCAN

BROADVIEW

Cairnes, C. E. 1934: Slocan Mining Camp, British Columbia; Geol. Surv. Can., Mem. 173. Emmens, N. W.
1914: The mineral resources of Lardeau and Trout Lake mining divisions;
British Columbia Bur. Mines, Bull. 2. yles, J. T. 1964: Geology of the Duncan Lake area, Lardeau District, British Columbia; British Columbia Dept. Mines Petrol. Resources, Bull. 49.

1967: Geology of the Ainsworth-Kaslo area, British Columbia; British Columbia Dept. Mines Petrol Resources, Bull. 53. Tyles, J. T. and Eastwood, C.E.P.
1962: Geology of the Ferguson area, Lardeau District, British Columbia;
British Columbia Dept. Mines Petrol. Resources, Bull. 45. tedley, M. S.
1945: Geology of the Whitewater and Lucky Jim mine areas, Slocan District,
British Columbia; B.C. Dept. Mines, Bulletin 22.

1952: Geology and ore deposits of the Sandon area, Slocan mining camp, British Columbia; B.C. Dept. Mines, Bulletin 29. Hyndman, D. W. 1968: Petrology and structure of Nakusp map-area, British Columbia; Geol. Surv. Can., Bull. 161. Jones, A. G. 1959: Vernon map-area, British Columbia; Geol. Surv. Can., Mem. 296.

Kerr, J. 1964: Geology of the Sproat Mountain ultrabasic intrusion; unpub. 8.Sc. thesis, Dept. Geology, Univ. British Columbia. Little, H. W. 1960: Nelson map-area, west half, British Columbia (82F W.): Geol. Surv. Can., Mem. 308. Mathews: W. H. 1952: British Columbia Dept: Mines, Geological Assessment Rept. No. 86.

Nguyen, K. K., Sinclair, A. J. and Libby, W. G. 1968: Age of the northern part of Nelson batholith; Can. Jour. Earth Sci., v. 5, p. 955-957. Okulitch, A. V., Wanless, R. K. and Loveridge, W. D. 1975: Devonian plutonism in south-central British Columbia; Can. Jour. Earth Sci., v. 12, p. 1760-1769.

Read. P. B.
1973: Petrology and structure of Poplar Creek map-area, British Columbia;
Geol. Surv. Can., Bull. 193. 1975: Lardeau Group, Lardeau map-area, west half (82K W₂), British Columbia; Geol. Surv. Can., Paper 75-1, Pt. A, p. 29-30. Read, P. B. and Okulitch, A. V. The Triassic unconformity in south-central British Columbia; in preparation.

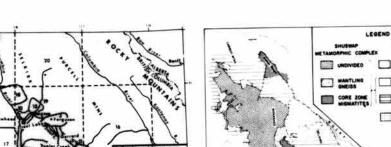
Reesor, J. E.

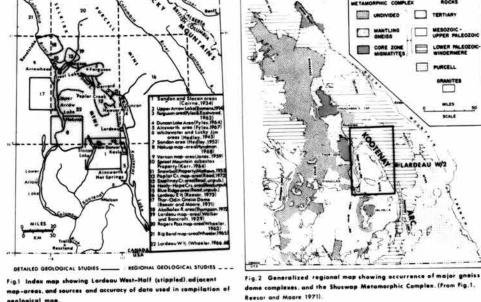
1965: Structural evolution and plutonism in Valhalla gneiss complex,
British Columbia; Geol. Surv. Can., Bull. 129. 1973: Geology of the Lardeau map-area, east-half, British Columbia; Geol. Surv. Can., Mem. 369. Reesor, J. E. and Moore, J. M.
1971: Petrology and structure of Thor-Odin gneiss dome, Shuswap metamorphic complex, British Columbia; Geol. Surv. Can., Bull. 195.

Rice, H. M. A. 1941: Nelson map-area, east half, British Columbia; Geol. Surv. Can., Mem. 228. Thompson, R. I.
1972: Geology of the Akolkolex River area mear Revelstoke, British Columbia;
unpub. PhD thesis, Dept. Geol. Sci., Queen's Univ.

Walker, J.F., Bancroft, M.F. and Gunning, H.C. 1929: Lardeau map-area, British Columbia; Geol. Surv. Can., Mem. 161. Wanless, R. K. and Reesor, J. E. 1975: Precambrian zircon age of orthogneiss in the Shuswap metamorphic complex, British Columbia; Can. Jour. Earth Sci., v. 12, p. 326-332. Wheeler, J. O. 1963: Rogers Pass map-area, British Columbia and Alberta (82N W_d); Geol. Surv. Can., Paper 62-32.

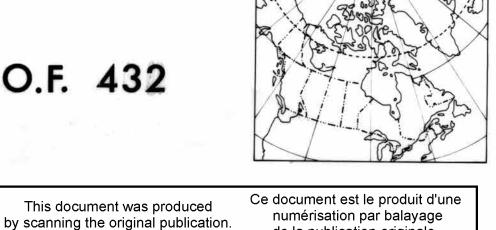
1965: Big Bend map-area, British Columbia (82M E.); Geol. Surv. Can., Paper 64-32. 1966: Lardeau (west-half) map-area (82K W;); Geol. Surv. Can., Paper 66-1, p. 102-103. 1968: Lardeau (west-half) map-area, British Columbia (82K W₂); Geol. Surv. Can., Paper 68-1, Part A, p. 56-58.





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GEOLOGY LARDEAU WEST-HALF BRITISH COLUMBIA Scale 1:125,000