



a place of mind

Orogenic gold mineralization of the eastern Cordilleran gold belt of B.C.

Structural ore controls in the Cariboo, Cassiar, and Sheep Creek mining districts

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Orogenic gold mineralization of the eastern Cordilleran gold belt, British Columbia: Structural ore controls in the Cariboo (093A/H), Cassiar (104P) and Sheep Creek (082F) mining districts Geoscience BC Report 2017-15









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Available for download tomorrow from the Geoscience BC website:

Geoscience BC Report 2017-15

- Report
- Digital Sheep Creek geology (W.H. Mathews, 1953)
- Digital field data (.kmz)
- Sample & thin section photo archive
- Structural data
- U-Pb and Ar-Ar geochronology

- Historically significant gold camps along the eastern margin of the Intermontane terranes, instrumental in economic development of western Canada
- Each camp dominated by orogenic gold, i.e., structurallycontrolled quartz-Au veins that formed during regional deformation.

MINERALIZATION AGES*:

Cassiar Cariboo Sheep Creek	143 – 129 Ma 149 – 134 Ma ~133 Ma		
		(Klondike	160 – 144 Ma)
		(Atlin	171 – 156 Ma)







CARIBOO Mosquito Ck. Mine



SHEEP CREEK Hwy 3 near Salmo Main goal of the study is to link brittle and ductile strain features into a common structural framework



BULLETIN NO. 31

GEOLOGY OF THE SHEEP CREEK CAMP

By W. H. Mathews



VICTORIA, B.C. Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty 1953





pre-1951

736,000 oz Au (13.3 g/t)

365,000 oz Ag 377,000 lbs Pb 312,000 lbs Zn













Geologic map of the Sheep Creek mining district, BC

W.H. (Bill) Mathews, 1953 B.C. Department of Mines Bulletin 41

digital version available for download with Geoscience BC Report 2017-15





biotite granite at base of Queen shaft (Mathews, 1953)

after Mathews, 1953

Sheep Creek – vein distribution

Section along trace of Western anticline:



Mathews, 1953

Ν





Sheep Creek – geochronology (Allan et al., 2017)



Sheep Creek – ⁴⁰Ar/³⁹Ar analysis of ore sericite (Nugget)



Sheep Creek – ⁴⁰Ar/³⁹Ar analysis of host rocks



Cumulative % ³⁹Ar Released



Sheep Creek – Summary

- Gold-bearing shear veins of the Sheep Creek camp are the last brittle expression of Cordilleran deformation in the Early Cretaceous (orogen-normal shortening)
- Sheep Creek camp surrounded and partly underlain by mid-Cretaceous granitoids
 - Cordierite-andalusite contact metamorphic assemblages
 - Ore and host rocks locally texturally recrystallized
 - ⁴⁰Ar/³⁹Ar ages reset by magmaticthermal pulse



SYNTHESIS

- Best age estimate for gold mineralization is ~133 Ma age of quartz vein formation outside the influence of mid-K thermal overprint
- Sheep Creek unrelated to mid-K granitoids, as previously suggested





HISTORIC LODE: **~1.3 Moz** HISTORIC PLACER : **~3.2 Moz**









Ferri and Schiarizza, 2006 (GAC SP45)











After Ferri and Schiarizza (2006)

















Regional structure – D2

L-S tectonites defined by S2/S1 intersection and mineral stretching lineation (L2) L2 intersection/stretching lin. n = 303





(View to N)







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Two main types of mineralization:

1. Quartz-carbonate-sulphide veins

- Extensional veins
- Shear veins
- "Strike veins"

2. Replacement-style

- Massive pyrite
- Elongate parallel to F2 fold axes / L2 plunge
- e.g., Island Mountain, Bonanza Ledge





Wells-Barkerville Camp:



Island Mountain

Rod-shaped geometry of pyritic cb-replacement ore (preferentially forms along F2 fold axes)







Extensional veins

Shear veins







Kinematic synthesis: Cariboo







Kinematic synthesis: Cariboo **Progressive D**₂ Ν σ 1 e.g., BC Vein e.g., Island Mtn σ3 quartz-carbonate-pyrite vein pyrite replacement body





 Accretion / Imbrication
 NE-SW shortening NW-SE attenuation





Mylonite in footwall of Pundata thrust \rightarrow top-to-NW transport



Accretion / Imbrication
 NE-SW shortening
 NW-SE attenuation
 NW lateral escape





Accretion / Imbrication
 NE-SW shortening
 NW-SE attenuation
 NW lateral escape

3. Mineralization







Accretion / Imbrication
 NE-SW shortening
 NW-SE attenuation
 NW lateral escape

3. Mineralization



4. N-trending dextral faults





Cariboo structural model on end:

Archaean Val d'Or model:



Poulsen and Robert, 1989

Same relative geometric relationships between extensional veins, faults/shear veins, and principle stresses









Historic lode gold production ~240,000 oz









Shear vein (Bain)

Rhys, 2009

Extensional veins (Taurus)

Thrust-filling vein (Vollaug)







Relationship between low-angle shears, shear veins, and steep extensional veins



Rhys, 2009















Summary

- 1. Host rocks in all gold districts have undergone significant orogen-normal shortening & orogen-parallel extension
- 2. Quartz veins formed from onset of brittle behaviour during progressive, coaxial deformation
- 3. Vein geometries and kinematics are predictable from ductile rock fabrics







Summary

4. Kinematic evidence in Cariboo and Cassiar show that thrust-bound elements of Slide Mountain terrane were transported to the NW

(lateral escape)

5. Orogenic gold mineralization signals the transition from collisional deformation to orogenic collapse in Late Jurassic to Early Cretaceous





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