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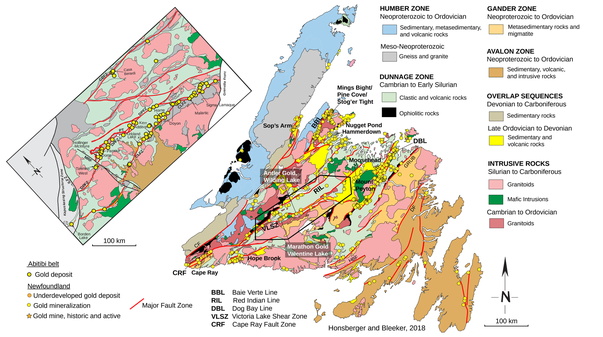
THE WILDING LAKE GOLD PROSPECT, CENTRAL NEWFOUNDLAND: A LITHOLOGICAL AND STRUCTURAL SYNTHESIS

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Introduction

Targeted gold exploration along the Rogerson Lake Conglomerate structural corridor within the Paleozoic Dunnage Zone of central Newfoundland (Williams, 1978) is revealing a pattern of gold-mineralized, structurally controlled quartz vein systems along northeast-trending fault zones between Cape Ray and Mount Peyton. With respect to geology and scale, gold-bearing fault zones throughout central Newfoundland bear strong similarity to world-class, structurally controlled, orogenic Archean gold systems of the Abitibi greenstone belt (*e.g.*, Poulsen *et al*., 2000; Dubé and Gosselin, 2007; Bleeker, 2015; Honsberger and Bleeker, 2018). As in the Abitibi, the central Newfoundland gold district is controlled by crustal-scale faults that cut middle and lower crustal sedimentary-magmatic arc terranes and preserve upper-crustal panels of synorogenic sedimentary (*e.g.*, Rogerson Lake Conglomerate) and volcanic rocks. Mineralized high-grade quartz vein systems such as those at Wilding Lake and Valentine Lake are evidence of the resource potential of central Newfoundland, and provide local geometric and kinematic constraints on the structural evolution of the regional fault systems controlling gold transport, deposition, and preservation. Detailed lithological and structural trench mapping of two structurally controlled, gold-bearing quartz vein systems (Alder Zone and Elm Zone) on Antler Gold Inc.'s Wilding Lake property indicates that the major vein systems are oblique sinistral reverse shear zones comprised of a main vein (V_{1b}) and an accompanying set of shallowly-dipping extensional veins (V_{1a}) that cut siderite-ankerite-sericite altered Rogerson Lake Conglomerate. At least three additional generations of gold mineralized extensional quartz veins (V_2, V_3, V_4) containing chalcopyrite, pyrite, tourmaline, and goethite (after pyrite and chalcopyrite), cut the main vein systems of the Alder and Elm zones. The structural evolution of the vein systems at Wilding Lake is described by a progressive history evolving from early sinistral transpression to transient phases of horizontal extension, followed by subsequent localized phases of oblique compression and dextral strike-slip.

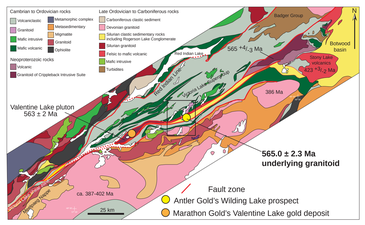
Central Newfoundland Gold District



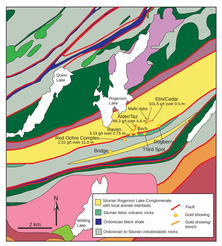
Comparison of the geology and gold-bearing fault systems for the Archean Abitibi greenstone belt (left) and Paleozoic Dunnage Zone, central Newfoundland Appalachians (right), at the same scale. Major fault zones shown in red. Rogerson Lake Conglomerate dominates the Silurian sedimentary sequence (yellow) in central Newfoundland in the vicinity of Valentine Lake and Wilding Lake

Wilding Lake Gold Prospect

Antler Gold Inc.'s Wilding Lake gold prospect in central Newfoundland spans the synformal Rogerson Lake Conglomerate structural corridor between Wilding Lake and Rogerson Lake. The gold-bearing corridor is characterized by Neoproterozoic basement granitoids of the Crippleback Intrusive Suite. These granitoids underlie Silurian synorogenic polymict conglomerate intercalated with sandstone and bimodal volcanic and shallow-level intrusive rocks that correlate with the Botwood basin to the northeast. Cambrian to Ordovician mafic volcanic and volcaniclastic rocks of the Victoria Lake Supergroup occur farther to the northwest. Structurally controlled gold mineralization in Rogerson Lake Conglomerate is well exposed in the Alder Zone and Elm Zone. The Wilding Lake prospect also shows mineralized quartz veins in felsic volcanic rocks (Third Spot Showing), disseminated mineralization in feldspar porphyry (Red Ochre Complex), and mineralization along the sheared contacts of Rogerson Lake Conglomerate with felsic volcanic rocks and an underlying Neoproterozoic gabbro-tonalite-granodiorite body that is marked by a regional magnetic anomaly. Mineralized extensional quartz veins are composed of chalcopyrite, pyrite, tourmaline, Bi-tellurides, malachite, and goethite after pyrite.

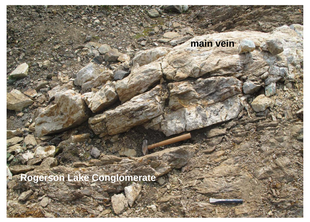


Generalized geological map of the Rogerson Lake Conglomerate strucural corridor, central Newfoundland. Map adapted from Valverde-Vaquero et al. *(2005). Ages from Dunning* et al. *(1990); Evans* et al. *(1990); McNicoll* et al. *(2008); Honsberger* et al. *(2019)*

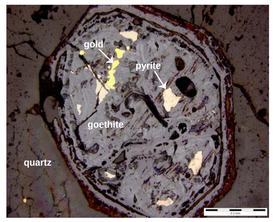


Geological map, Wilding Lake area. Map adapted from Valverde-Vaquero et al. *(2005) and Antler Gold Inc., press release, December 13, 2017*

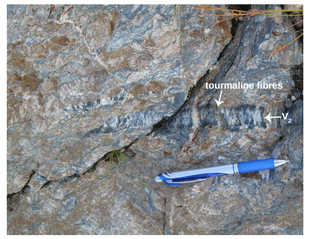
Mineralized Showings



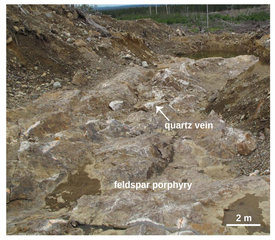
Laminated main vein (V_{1b}), Elm Zone



Gold in goethite-altered pyrite, Elm Zone



Tourmaline-bearing quartz vein (V_2), Alder Zone



Feldspar porphyry, Red Ochre Complex



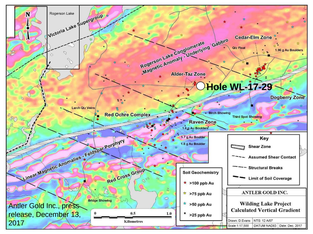
Felsic volcanic rocks, Third Spot Showing



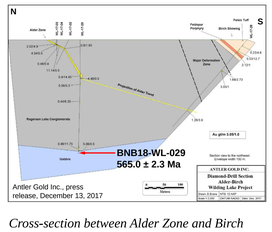
Altered conglomerate, Birch Showing

Prospective Basement Rocks

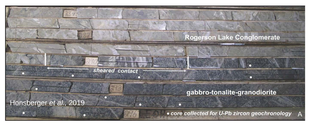
Basement rocks underlying Antler Gold Inc.'s Wilding Lake gold prospect consist of 565.0 ± 2.3 Ma deformed and altered gabbro-tonalite-granodiorite (Honsberger *et al.*, 2019) of the Ganderian Crippleback Intrusive Suite, which includes the gold-mineralized Valentine Lake pluton to the southwest. The along strike structural position, combined with the brittle nature of these granitoids, make the gabbro-tonalite-granodiorite body a prospective future drilling target for exploration.



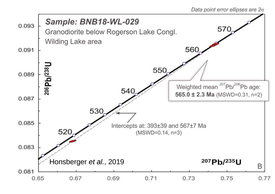
Magnetic anomaly map and gold soil geochemistry anomalies



Cross-section between Alder Zone and Birch Showing. Age from Honsberger et al. *(2019)*

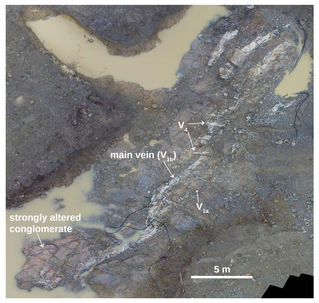


Vertical drillcore WL-17-29; numbers are metres

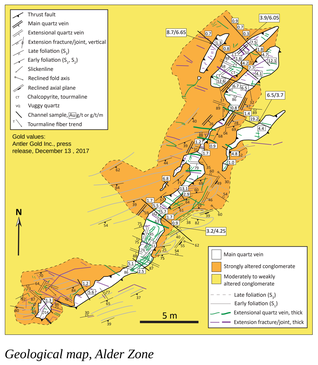


U-Pb Concordia diagram

Alder Zone

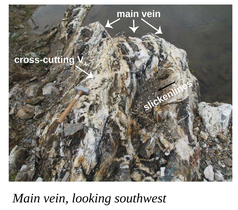


Unmanned aerial vehicle (drone) image, Alder Zone



Geological map, Alder Zone

The Alder Zone trench exposes a 5 m wide by 35 m long quartz vein corridor that cuts Rogerson Lake Conglomerate, which is strongly altered along the main vein and weakly altered farther away. Foliation varies from nearly east-west striking (S_1) away from the main vein to northeast-southwest striking (S_2) along the vein. S_1 is folded into east-southeast plunging, nearly reclined, folds. Four generations of quartz vein sets are present. The oldest extensional veins (V_{1a}) dip moderately to the southeast and are slightly older than the main vein (V_{1b}), which consists of a network of fault-fill veins that dip moderately to the southeast. Combined with shallowly south-southeast plunging slickenlines, V_{1a} and V_{1b} are consistent with oblique sinistral reverse shear. A tourmaline-bearing vein set dipping steeply to the northeast (V_2) cuts the main vein, consistent with transient subhorizontal extension. V_2 veins are cut by chalcopyrite-bearing veins that dip steeply to the northwest (V_3), compatible with oblique compression. Steeply south-southwest dipping veins (V_4) consistent with dextral strike-slip cut V_2 and V_3. Joints of variable attitudes cut all vein sets.



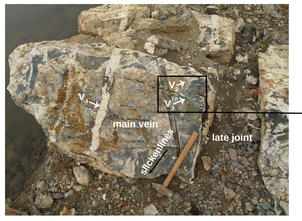
Main vein, looking southwest



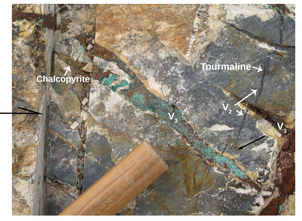
Alder vein system, looking east



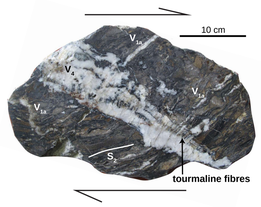
Early extensional vein (V_{1a})



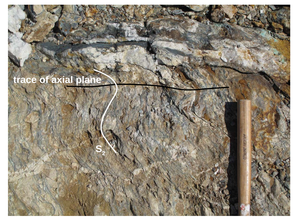
Dextral quartz vein (V_4) cutting chalcopyrite-bearing V_3, main vein



Chalcopyrite-bearing V_3 cutting tourmaline veinlets (V_2)



Dextral vein (V_4) cutting folded V_{1a}



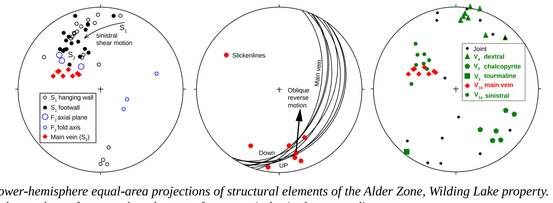
Reclined folds in conglomerate

Structural Synthesis

The Wilding Lake gold prospect occupies a portion of the gold-bearing Rogerson Lake Conglomerate structural corridor in central Newfoundland. The prospect exposes structurally controlled mineralization in Rogerson Lake Conglomerate and felsic volcanic rocks. High-grade gold mineralization of the Alder and Elm zones is controlled by regional northeast-trending oblique sinistral reverse shear zones. Three generations of chalcopyrite and/or tourmaline-bearing quartz veins (V_2, V_3, and V_4) overprint the main sinistral fault-fill (V_{1b}) and extensional (V_{1a}) vein systems, and reflect a structural evolution from early sinistral transpression to transient horizontal extension, renewed oblique compression, and, finally, local dextral strike-slip. The unexplored Neoproterozoic gabbro-tonalite-granodiorite body underlying Rogerson Lake Conglomerate is prospective for gold mineralization, as are along-strike extensions within the Silurian Rogerson Lake Conglomerate structural corridor .

Time	Deformation phase	Fabric element and tectonic structure		Mechanism of formation
↓	D_1	S_1	E-W striking early foliation in Rogerson Lake Conglomerate	Folding of Rogerson Lake Conglomerate and Ganderian basement
	D_2	S_2	NE-SW striking progressive foliation	Reverse sinistral shearing
		V_{1a}	Initial shallowly-dipping extension veins	
		V_{1b}	Main shear vein	
	D_3	V_2	NW-SE striking vertical veins	Transient horizontal extension
	D_4	V_3	NE-SW striking extension veins and fractures/joints cutting main vein	Oblique compression
	D_5	V_4	E-W striking vertical extension veins	Local dextral strike-slip
	D_6	S_3	Shallowly-dipping cleavage	Late reclined folding

Summary table of deformation events, tectonic structures, and formation mechanisms through time



Lower-hemisphere equal-area projections of structural elements of the Alder Zone, Wilding Lake property. Poles to planar features plotted, except for great circles in the centre diagram

Acknowledgments

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