

Exploration and mining in the South Central Region, British Columbia



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1. Introduction

With five major mines in operation, including the re-started **Mount Polley** mine, the South Central Region is currently the most productive copper mining district in Canada. The region's varied geology, well-established infrastructure, and access to markets also make it an important industrial minerals centre. The Cariboo area is the province's largest placer gold camp, with active permits numbering in the hundreds. Thermal coal resources in Cenozoic basins were last mined in 2013. The region has five major proposed metal mines. About 100 exploration projects were tracked in 2022, although this represents a minimum because not all exploration work is recorded.

Estimates for exploration expenditures, drilling programs, and other metrics were captured in the British Columbia Mineral and Coal Exploration Survey, a joint initiative of the Province of British Columbia Ministry of Energy, Mines and Low Carbon Innovation, the Association for Mineral Exploration in British Columbia, and EY LLP. For the South Central Region, exploration expenditures were estimated at \$108.5 million and exploration drilling at 243,180 m (Clarke et al., 2023; EY LLP, 2023). These values are lower than those for 2021, which saw \$147.6 million in expenditures and 462,500 m of drilling (Clarke et al., 2022; EY LLP, 2022). The decreases are due to a shift in some advanced projects from exploration to feasibility and resource estimation and also reflect difficulties raising exploration capital.

The largest exploration programs focussed on orogenic and epithermal gold veins, but porphyry copper-gold exploration near mine sites and at some advanced exploration projects were also significant contributors to the totals.

2. Geological overview

The tectonic and metallogenic evolution of the Canadian Cordillera are intimately linked (Fig. 1, e.g., Nelson et al., 2013). The South Central Region straddles three of British Columbia's five morphogeological belts (from west to east: Coast; Intermontane; Omineca). The mid-Mesozoic and older geological framework is represented by cratonic and pericratonic rocks in the east, and a series of Late Paleozoic

through mid-Mesozoic arc and oceanic terranes to the west (Fig. 1). Younger rocks include Jura-Cretaceous siliciclastic and local volcanic rocks, Eocene volcanic rocks, Neogene and Quaternary basalt, and Middle Jurassic to Eocene granitic intrusions.

The oldest rocks in the region are Paleoproterozoic basement gneiss complexes at the eastern boundary, such as in the Monashee complex. These are interpreted as parts of the North American craton (Armstrong et al., 1991), overlain by Neoproterozoic to Paleozoic cover deposited following rifting that formed the western margin of Ancestral North America (McDonough and Parrish, 1991; Murphy et al., 1991). To the northwest, the Cassiar terrane consists of Neoproterozoic to mid-Paleozoic siliciclastic and carbonate rocks interpreted as distal facies of the North American platform (Struik, 1988a). Also affiliated with Ancestral North America, the Kootenay terrane (deep-water basin strata on Figure 1) include Neoproterozoic to mid-Paleozoic deep-water facies equivalents deposited west of the North American platform. Lower Cambrian and older rocks are similar to North American strata to the east, but the overlying lower Paleozoic succession is characterized by units of coarse siliciclastic and mafic volcanic rocks that may reflect intermittent crustal extension (Colpron and Price, 1995). This belt also includes Devonian-Mississippian calc-alkaline to alkalic volcanic rocks and associated granitoid intrusions, found mainly in the Eagle Bay assemblage (Schiarizza and Preto, 1987), which reflect the initiation of east-dipping subduction beneath the North American plate margin. These rocks host polymetallic volcanogenic massive sulphide (VMS) occurrences, and the **Yellowhead** bulk tonnage copper deposit. Slide Mountain terrane is the easternmost tract of oceanic rocks in the Canadian Cordillera. These rocks may be the remnant of a Late Paleozoic marginal basin that formed behind a westward-retreating volcanic arc in Quesnel terrane. The Fennell Formation hosts copper-zinc-silver massive sulphide mineralization at the **Chu Chua** occurrence.

Quesnel terrane is a Late Triassic to Early Jurassic island arc complex (e.g., Mortimer, 1987; Struik, 1988a, b; Unterschutz et al., 2002). It also includes a Late Paleozoic arc sequence, represented by the Harper Ranch Group (Beatty et al., 2006)

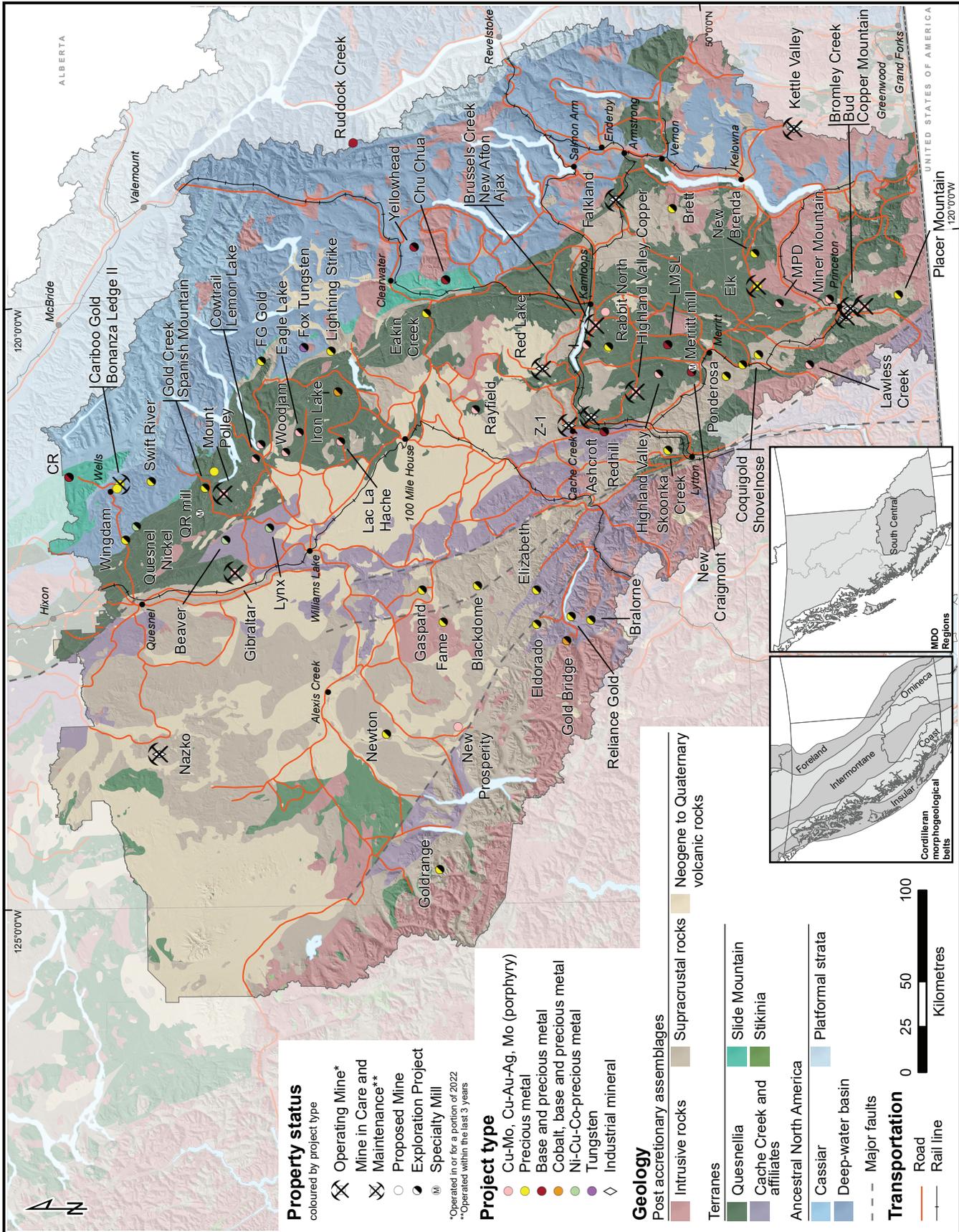


Fig. 1. Mines, proposed mines and selected exploration projects, South Central Region, 2022. Terranes after Nelson et al. (2013).

and, in the south, assemblages of oceanic rocks (Tempelman-Kluit, 1989). The Mesozoic rocks are represented mainly by Middle to Upper Triassic volcanic and sedimentary rocks of the Nicola Group, together with abundant Upper Triassic to Lower Jurassic calc-alkaline to alkaline intrusions (Preto, 1977, 1979; Mortimer, 1987; Panteleyev et al., 1996; Schiarizza et al., 2013). The Nicola Group consists mainly of volcanic and volcanic-derived sedimentary rocks, but also includes siltstone and slate intercalated with quartzite and limestone (Bloodgood, 1990; Schiarizza et al., 2013; Mihalynuk et al., 2015; Schiarizza, 2019; Mihalynuk and Diakow, 2020). The volcanic rocks are mainly augite-phyric shoshonitic basalts, but the western part of the group locally includes a belt of calc-alkaline volcanic rocks with substantial amounts of rhyolite and dacite (Preto, 1977, 1979; Mortimer, 1987). A younger stratigraphic component of Quesnel terrane consists of Lower to Middle Jurassic sedimentary rocks that unconformably overlie the western parts of the Nicola Group (Travers, 1978; Logan and Moynihan, 2009; Schiarizza et al., 2013).

Quesnel terrane is important for its porphyry copper deposits (e.g., Logan, 2013; Logan and Mihalynuk, 2014). The plutons that host these deposits conform, in part, to a pattern defined by parallel belts of calc-alkaline and alkalic plutons that become progressively younger from west to east (Schiarizza, 2014). The western (Late Triassic) calc-alkaline belt includes the Guichon Creek batholith, host to the **Highland Valley Copper** copper-molybdenum mine, and the Granite Mountain batholith, host to the **Gibraltar** copper-molybdenum mine. A well-defined belt farther east comprises younger, latest Triassic alkalic plutons, which host alkalic porphyry copper-gold deposits, including producing mines at **Copper Mountain** and **New Afton** and the **Mount Polley** mine, which has resumed operation. A third belt, younger and farther to the east, is defined by several large, Lower Jurassic calc-alkaline plutons. Cache Creek terrane, consisting of Carboniferous to Early Jurassic chert, argillite, basalt, limestone, sandstone, gabbro, and serpentinized ultramafic rocks of the Cache Creek complex, forms a belt to the west of Quesnel terrane in the central and northern parts of the region. It is interpreted, at least in part, as a subduction complex responsible for generating the Quesnel magmatic arc (Travers, 1978; Struik et al., 2001).

Cadwallader terrane, as interpreted by Schiarizza (2013), underlies parts of the Intermontane and eastern Coast belts, west of Cache Creek and Quesnel terranes. It includes a Late Permian-Early Triassic primitive oceanic arc complex, and an overlying Late Triassic-Middle Jurassic arc complex and associated siliciclastic apron.

Bridge River terrane is in the eastern Coast belt, west of Lytton and Lillooet, where it is partially enveloped by Cadwallader terrane. It is represented mainly by the Bridge River complex, comprising structurally interleaved slivers of chert, argillite, basalt, blueschist, gabbro, serpentinite, limestone, and sandstone (Schiarizza et al., 1997). Both Cadwallader and Bridge River terranes are shown as ‘Cache Creek and affiliates’ on Figure 1.

Stikinia (Stikine terrane) is a mid-Paleozoic to Middle Jurassic arc terrane that is markedly similar to Quesnellia (Quesnel terrane), and forms a predominant component of the Cordillera in central and northern British Columbia. It is represented in the northwestern part of the South Central Region by a few scattered exposures of volcanic and sedimentary rocks correlated with the Hazelton Group (Upper Triassic to Middle Jurassic; Tipper, 1959, 1969). Younger stratigraphic units overlap older terranes and cover large parts of the region. These units include: Upper Jurassic to Upper Cretaceous siliciclastic rocks of the Tyaughton-Methow basin, which overlap Cadwallader and Bridge River terranes in the eastern Coast belt (Schiarizza et al., 1997); and mid-Cretaceous arc volcanic rocks of the Spences Bridge Group, which form a northwest-trending belt that overlaps Quesnel and Cache Creek terranes in the Merritt-Lillooet area (Monger and McMillan, 1989), and continues westward across the Fraser River where it overlaps Cadwallader and possibly Stikine terranes (Mahoney et al., 2013). Eocene volcanic and subordinate sedimentary rocks (e.g., Kamloops Group, Penticton Group, Princeton Group) are prominent in some locations. Neogene basalt of the Chilcotin Group overlaps Quesnel, Cache Creek, Cadwallader, and Stikine terranes throughout much of the central part of the region (Dohaney et al., 2010). Granitic plutons, ranging from late Middle Jurassic to Eocene, occur throughout the region and, in some cases, are responsible for significant mineralization (e.g., **IKE**, **New Prosperity**).

3. Mines and quarries

The region produces copper, molybdenum, gold, and silver from five large mines, and a variety of industrial minerals (bentonite, zeolite, diatomaceous earth, gypsum, scoria, opal, and dimension stone) from about ten quarries. Almost 1000 placer mines and gravel pits have active permits, but not all produce in any given year.

3.1. Metal mines

The South Central Region hosts seven of the province’s metal mines (Fig. 1; Table 1). These include the two largest copper-molybdenum producers (**Gibraltar** and **Highland Valley Copper**) and two major copper-gold mines (**New Afton** and **Copper Mountain**). A third copper-gold producer, **Mount Polley**, restarted in 2022. The region hosts two small precious metal mines, **Bonanza Ledge II**, which resumed mining mid-2021 and **Elk**, which began mining late in 2021.

3.1.1. Bonanza Ledge II (Osisko Development Corp.)

Barkerville Gold Mines Ltd. (now under Osisko Development Corp.) restarted the **Bonanza Ledge** mine in 2017 as an underground long-hole and cemented fill operation below the existing pit. Osisko Development Corp. began a second phase of underground mining at Bonanza Ledge in 2021 that was suspended in June 2022. Bonanza Ledge is considered a test mine, part of the larger Cariboo Gold project, a proposal for a larger 12-year mining operation to the north. Bonanza Ledge

Table 1. Metal mines, South Central Region.

Mine	Operator (partner)	Commodity; Deposit type; MINFILE	Forecast 2022 Production (based on Q1-Q3)	Reserves	Resource	Comments
Bonanza Ledge II	Osisko Development Corp.	Au; Au-quartz veins; 093H 140	7153 oz Au	na	M: 47 t 5.1 g/t Au I: 32 Mt 4.0 g/t Au M+I: 12,000 oz Au	Production at Bonanza Ledge was suspended June 2022.
Copper Mountain	Copper Mountain Mining Corporation 75%, Mitsubishi Materials Corporation 25%	Cu, Au, Ag; Porphyry Cu-Au, Alkalic; 092HSE001	52.8 Mlb Cu 22,600 oz Au 242,600 oz Ag	P+Pr: 702 Mt 0.24% Cu 0.10 g/t Au 0.71 g/t Ag	M+I: 1.132 Bt 0.22% Cu 0.09 g/t Au 0.64 g/t Ag	Increased resources and reserves. Resources inclusive of reserves.
Elk	Gold Mountain Mining Corp.	Au, Ag; Au quartz veins; 092HNE009, 295, 41, 261	22,164 t at 3.68 g/t Au mined in first 6 months of 2022	na	M+I: 4.359 Mt 5.6 g/t Au 11.0 g/t Ag Inf: 1.497 Mt 5.3 g/t Au 14.4 g/t Ag	Effort to improve grade control may change production in H2. Exploration is ongoing.
Gibraltar	Taseko Mines Limited 75%, Cariboo Copper Corp. 25%	Cu, Mo; Porphyry Cu±Mo±Au; 093B 012	93.9 Mlb Cu 1.0 Mlb Mo	P+Pr: 706 million short tons 0.25% Cu 0.008% Mo (sulphide mineral reserves) P+Pr: 17 short tons 0.15% (acid soluble Cu)	M+I: 1.215 million short tons 0.24% Cu 0.007% Mo (inclusive of reserves)	Trend toward improving production in Q3. Reserves increased over previous year for a 23 year projected mine life.
Highland Valley Copper	Teck Resources Limited	Cu, Mo; Porphyry Cu±Mo±Au; 092ISW012, 45	268.1 Mlb Cu 1.1 Mlb Mo	P+Pr: 338.3 Mt 0.31% Cu 0.008% Mo	M: 582.8 Mt 0.30% Cu 0.009% Mo I: 626.7 Mt 0.26% Cu 0.010% Mo Inf: 232.3 Mt 0.22% Cu 0.007% Mo	HVC 2040 project, if implemented, would extend mine life from 2028 to 2042.

Table 1. Continued.

Mount Polley	Imperial Metals Corporation	Cu, Au, Ag; Porphyry Cu-Au, Alkalic; 093A 008	>5 Mlb Cu (2.4 Mlb produced during Q3)	P+Pr: 53.8 Mt 0.34% Cu 0.30 g/t Au 0.90 g/t Ag	M+I open pit: 186.9 Mt 0.27% Cu 0.28 g/t Au 0.49 g/t Ag M+I underground: 7.4 Mt 0.29% Cu 0.29 g/t Au 6.57 g/t Ag	Reserves and resources estimated in 2016 adjusted for mining to 2020. Q3 production was a ramp-up period. Production expected to increase in Q4.
New Afton	New Gold Inc.	Au, Ag, Cu; Porphyry Cu-Au, Alkalic; 092INE023	32.1 Mlb Cu 40,800 oz Au	P+Pr: 41.3 Mt 0.67 g/t Au 1.8 g/t Ag 0.74% Cu	M+I: 64.9 Mt 0.56 g/t Au 2.0 g/t Ag 0.70% Cu (exclusive of reserves)	Underground exploration drilling results to be incorporated in 2022 year-end resource estimates.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

is permitted for production of up to 215,000 tpy of ore. The mine life of phase II is an anticipated 18 months in. Ore was trucked to the Quesnel River Mill. They have a memorandum of understanding with Nicola Mining Inc. to process approximately 15,000 t of stockpiled ore. In 2022, the mine produced 7163 oz Au at an average grade of 6.50 g/t Au from 53,352 t of mineralized material milled as of September 30.

Two types of mineralization are of interest at Bonanza Ledge: pyrite replacement and vein, which consists of native gold in quartz veins cutting pyrite-bearing, carbonaceous and chloritic phyllite of the Snowshoe Group (Proterozoic-Paleozoic).

3.1.2. Copper Mountain (Copper Mountain Mining Corporation 75%; Mitsubishi Materials Corporation 25%)

The **Copper Mountain** copper-gold open-pit mine has produced since August 2011 and, after commissioning a third ball mill, can currently mill at a rate of 45,000 tpd. Further mill expansion to 65,000 tpd, to be commissioned by 2028, is projected to increase annual production to 138 Mlb Cu. In the first nine months of 2022, the mine produced 39.6 Mlbs Cu, 16,980 oz Au, 181,953 oz Ag. Management's guidance for 2022 was 55-60 Mlb Cu. The mine is conducting trials of electric trolley assist haul trucks to reduce diesel use.

Following a resource expansion drilling program completed in early 2022, Copper Mountain increased reserves by 57% to Proven and Probable 702 Mt at average grades of 0.24% Cu, 0.10 g/t Au, 0.71 g/t Ag. Projected mine life is now 32 years (up from 21 years), accounting for the planned increase in production. Measured and Indicated mineral resources inclusive of reserves are 1.132 Bt at 0.22% Cu, 0.09 g/t Au, 0.64 g/t Ag.

The Copper Mountain ore bodies are Late Triassic alkalic porphyry Cu-Au deposits, mainly in Nicola Group rocks (Triassic) intruded by the high-level Copper Mountain intrusions (Upper Triassic). Holbek et al. (2015, 2020)

described the deposit as an alkalic porphyry Cu-Au system with strong vertical continuity.

3.1.3. Elk (Gold Mountain Mining Corp.)

Gold Mountain Mining Corp. began mining operations at the **Elk** project in November of 2021. A 2021 updated Preliminary Economic Assessment considers a 70,000 tpy open pit-only operation expanding to 324,000 tpy open pit and underground after three years. The total mine life would be 11 years with 570,388 oz Au produced. The BC Environmental Assessment Office has not designated the expansion reviewable, as it would occupy the same footprint as the current operation. Ore is trucked to New Afton for processing under an agreement with New Gold Inc.

In the first half of 2022 the company reported sales of 2455 oz Au in crushed ore and production of 22,164 t at a grade of 3.68 g/t Au. The company is testing concentration methods such as dense media separation to improve the grade of material shipped. As of December 2021, the total property combined pit-constrained and underground resources were estimated at 4.359 Mt Measured + Indicated grading 5.6 g/t Au and 11.0 g/t Ag, and 1.497 Mt Inferred grading 5.3 g/t Au and 14.4 g/t Ag. An initial 3700 m of infill drilling was carried out to assist in grade control. Exploration drilling (20,000 m to date) is continuing and the company reported discovering the 'Elusive zone' several km from the mine. Highlight intersections include: 1.31 m grading 65.37 g/t Au; 2.04 m grading 48.38 g/t Au; 1.30 m grading 59.54 g/t Au; 0.79 m grading 104.72 g/t Au; 1.47 m grading 32.32 g/t Au; and 0.95 m grading 66.60 g/t Au.

3.1.4. Gibraltar (Taseko Mines Limited 75%; Cariboo Copper Corp. 25%)

Taseko Mines Limited mined 65.7 million tons at **Gibraltar** in the first 9 months of 2022 and produced concentrate containing

70.3 Mlb Cu and 759,000 lb Mo. Production was affected by lower-than-expected head grades early in the year. Production improved in Q3 as mining progressed deeper into the Gibraltar pit, which is to be the primary source of ore in 2023. Stripping will begin at the new Connector pit. Taseko announced a new Proven and Probable reserve estimate of 706 million tons grading 0.25% Cu. Projected mine life increased to 23 years with an average annual production of 129 million lbs Cu and 2.3 million lbs Mo.

The calc-alkaline porphyry Cu-Mo deposit is in the Granite Mountain batholith (Upper Triassic; van Straaten et al., 2013; Schiarizza and Friedman, 2021) in a fault-bounded section of Nicola Group and Dragon Mountain succession volcanic and sedimentary rocks (Quesnel terrane; Schiarizza 2014, 2015, van Straaten et al., 2020) bounded by Cache Creek terrane rocks to the east and west.

3.1.5. Highland Valley Copper (Teck Resources Limited)

Management's production guidance for the year is 127,000 to 133,000 t Cu, and 0.8 to 1.3 million lb Mo. Production in the first three quarters was 91,200 t Cu and 0.8 Mlb Mo. Guidance for 2023-25 is 110,000 to 170,000 t Cu and 1.0-5.0 million lb Mo. Teck announced a temporary suspension of activity in the Valley Pit in December because of geotechnical concerns. The company announced a trial of an electric haul truck to transport concentrate to its rail loading facility in Ashcroft, a 95 km round trip made four to five times every day.

The HVC 2040 project is a proposed extension that would increase the projected mine life from about 2028 to 2042 and produce an additional 900 Mt of ore at grades of 0.254% Cu and 0.008% Mo (Valley Pit 786 Mt) and 0.178% Cu and 0.016% Mo (Highmont Pit 100 Mt). The production rate would increase from approximately 136,000 tpd to 178,000 tpd. Increases in Cu and Mo recovery are also planned. The project is advancing through the pre-application stage of environmental assessment. Progress in 2022 included completing draft application information requirements and a draft assessment plan with a proposed 180 day effects assessment and recommendation timeline if the application is accepted by the Environmental Assessment Office.

All mineralization at **Highland Valley Copper** is calc-alkaline Cu-Mo type in the Guichon Creek batholith (Upper Triassic), which has been divided into several pre-, syn- and post-mineral phases (see Byrne et al., 2013, 2020; Ryan et al., 2020).

3.1.6. Mount Polley (Imperial Metals Corporation)

Mount Polley resumed milling in summer 2022, producing 2.4 Mlb Cu and 5084 oz Au in the third quarter. Throughput approached 14,000 tpd in September. The mine had been on care and maintenance since 2019. Exploration, preparations for re-opening, environmental monitoring, and remediation continued during this period. Following several months of preparation and stockpiling of ore, milling began in June and throughput gradually ramped up month over month.

The deposits at Mount Polley are alkalic porphyry Cu-Au in the syenitic to monzodioritic Polley stock (Upper Triassic-Lower Jurassic), which intrudes Nicola Group volcanic rocks. At least eight discrete mineralized zones have contributed to production or host resources (see Rees, 2013, Brown et al., 2016; Rees et al., 2020).

3.1.7. New Afton (New Gold Inc.)

The **New Afton** gold-copper mine is a block cave operation that opened in mid-2012 (Hall and May, 2013). The New Afton deposits form a high-grade keel beneath the past-producing (1978-1997) Afton open-pit mine, an alkalic porphyry in the Iron Mask batholith (Upper Triassic). In the first three quarters of 2022 the mine produced 24.1 Mlb Cu and 30,610 oz Au.

New Gold received a Mines Act permit amendment allowing mining of the C-Zone in October (below and extending west of the current mining area). Development of the C-Zone is continuing, with production anticipated in 2023. Electrification is part of the plan at New Afton. An electric scoop has been in operation since 2021 and electric haul trucks were purchased in 2022.

The company reported underground exploration drilling at the mine, with underground results to be included in the 2022 year-end mineral resource estimate. Surface exploration drilling at the Cherry Creek trend 3 km west of the mine concluded and there was reconnaissance drilling (5000 m) 8 km southwest of the mine. The main targets are alkalic porphyry Cu-Au hosted by the Iron Mask batholith and volcanosedimentary rocks of the Nicola Group (Upper Triassic; Lipske et al., 2020).

3.1.8. Merritt Mill (Nicola Mining Inc.)

Nicola Mining's 200 tpd custom mill and tailings facility at the Craigmont mine site resumed operation in 2021, processing stockpiled ore from Blue Lagoon Resources Inc.'s **Dome Mountain** gold project in the Northwest Region. Shipments of concentrate to Ocean Partners UK Limited continued in 2022. Nicola signed a memorandum of understanding with Osisko Development Corp. to process stockpiled ore (see **Bonanza Ledge II**, section 3.1.1.).

3.2. Selected industrial mineral mines

More than a dozen industrial mineral quarries and processing plants are in the region (Fig. 1; Table 2). In addition, nearly 300 sand and gravel pits and 45 quarries have active Mines Act permits, although many are intermittently active. Industrial minerals producers and explorers compete in local markets and information is commonly not made public. Operations are listed here to highlight the local availability of selected products.

3.2.1. Ashcroft (IG Machine and Fibers Ltd.)

IG Machine and Fiber Ltd, a subsidiary of IKO Industries Ltd., operates the **Ashcroft** basalt quarry and roofing granule plant. They began production in 2001 and now typically produce 300,000 tpy of granules. The quarry is permitted to mine 500,000 tpy, 60% of which is processed into granule products.

Table 2. Selected industrial mineral mines and quarries, South Central Region.

Mine	Operator (partner)	Commodity; Deposit type; MINFILE	Forecast 2022 Production (based on Q1-Q3)	Reserves	Resource	Comments
Ashcroft	IG Machine and Fibers Ltd. (IKO Industries Ltd.)	Basalt (roofing granules); 092INW104	300,000 t	na	Approx. 13.3 Mt in 2002	Typically mines 500,000 t with 60% processed into granule products.
Bromley Creek (Zeotech)	Progressive Planet Products Inc. (International Zeolite Corp. 77%, Progressive Planet Solutions Inc. 23%)	Zeolite; Open system zeolites; 092HSE243	na	na	M+I (as of 2013- 06-30): 50,000 t	Progressive Planet has an agreement to acquire 50%.
Bud	Progressive Planet Products Inc.	Bentonite; 092HSE162	Approx. 20,000 t annually	na	na	Progressive Planet Solutions Inc. acquired in 2022.
Falkland	Lafarge Canada Inc.	Gypsum; 082LNW001	10,000-20,000 t annually	na	Approx. 1.8 Mt	Found alternate uses since closure of Lafarge's Kamloops cement plant.
Kettle Valley Quarries	Kelowna Sand and Gravel Ltd./Kettle Valley Stone Company	Ashlar, flagstone, thin veneer; 082ENW109, 111, 112	na	na	na	
Nazko	CanLava Mining Corporation	Lava rock; Cinder cone; 093B 060	na	na	Historical: 45 Mt	
Red Lake	Progressive Planet Products Inc.	Diatomaceous earth; Lacustrine diatomite; 092INE081	Approx. 30,000 t annually	na	na	Progressive Planet Solutions Inc. acquired in 2022.
Z-1	Progressive Planet Solutions Inc.	Zeolite; Open system zeolites; 092INW095	na	na	Approx. 800,000 t	Historical resource.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

It has reserves of about 13 Mt or 30 years of production. There was no reported change to the mine plan which extends to 2031.

3.2.2. Bromley Creek (International Zeolite Corp. 77%, Progressive Planet Solutions Inc. 23%)

Progressive Planet has an agreement with International Zeolite Corporation to acquire a 50% interest in the **Bromley Creek** zeolite mine. Progressive Planet intends to focus on marketing the Bromley Creek product as an animal feed additive, soil additive, and cement additive.

3.2.3. Bud (Progressive Planet Solutions Inc.)

Progressive Planet acquired Absorbent Products Ltd. in 2022 and renamed it Progressive Planet Products Inc. The acquisition included the **Bud** and **Red Lake** mines. Progressive Planet expects to continue producing bentonite at Bud for its own brand of cat litter. They are exploring other applications in fertilizer and geothermal systems.

3.2.4. Falkland (Lafarge Canada Inc.)

Gypsum and anhydrite mined at the **Falkland** quarry. Although the quarry no longer supplies Lafarge's cement plant

in Kamloops, it still supplies gypsum or anhydrite for other uses including agriculture. After operating intermittently for many years supplying cement to western Canada, the Kamloops cement plant and Harper Ranch limestone quarry of Lafarge Canada Inc. are now mainly on care and maintenance, although it produces some construction aggregate.

3.2.5. Kettle Valley quarries (Kelowna Sand and Gravel Ltd.)

Decorative rock and dimension stone are produced from small quarries throughout the region. Kelowna Sand and Gravel Ltd. mines gneiss, dacite tuff, and basalt at the Nipple Mountain, Kettle Valley, Canyon, and Gemini quarries and has been issued permits to explore other sites. Kettle Valley Stone Company of Kelowna produces flagstone, ashlar, facing stone, and landscape rock.

3.2.6. Nazko (Canlava Mining Corp.)

Canlava Mining Corp. produces red and black scoria from the **Nazko** quarry for geotechnical and other applications requiring lightweight fill. It is also sold for landscaping.

3.2.7. Red Lake (Progressive Planet Solutions Inc.)

With its acquisition of Absorbent Products Ltd., Progressive Planet now produces diatomaceous earth from the **Red Lake** quarry through a subsidiary Progressive Planet Products Inc. Uses include cat litter, barn deodorizer, industrial absorbents, cement additives, and carriers for agricultural products.

3.2.8. Z-1 (Progressive Planet Solutions Inc.)

The **Z-1** mine is now owned by Progressive Planet Solutions. Their zeolite product has been used as an agricultural feed additive, a growth medium, a filtration medium, a component of lightweight concrete, and for soil remediation. Progressive Planet is planning to shift focus to Bromley Creek but assessing the Z-1 product as a lightweight aggregate and component of cat litter.

4. Placer mines

The region has several hundred placer mines. Most of these operations are small, intermittent, or seasonal, and production data and details of exploration are generally unavailable.

4.1. Wingdam (Omineca Mining and Metals Ltd. 50%, Hamilton Gold Royalties Ltd. 50%)

Omineca reported that gold recovery operations had begun at **Wingdam** and development had advanced into the paleochannel hosting pay gravel. The gold-bearing placer channel is 50 m below Lightning Creek. A freeze technology allows access to this historically difficult-to-mine deposit. Gold is recovered through gravity separation. Exploration for lode gold is ongoing (see section 7.1.21).

5. Mine development

Mine development projects are those that have a positive

production decision and key government approvals, and on-site construction has begun. No major projects meet these criteria in the South Central Region.

6. Proposed mines

Proposed mines are defined as feasibility-stage projects for which the process of formal socioeconomic and environmental review has begun. For projects that exceed thresholds set by the British Columbia Environmental Assessment Act (or its federal equivalent), reviews are coordinated by the British Columbia Environmental Assessment Office and Canadian Environmental Assessment Agency. Smaller projects are reviewed by an interagency Mine Development Review Committee (MDRC) chaired by the Ministry of Energy, Mines and Low Carbon Innovation. Five projects are in this category: **Ajax**, **Cariboo Gold**, **New Prosperity**, **Ruddock Creek**, **Spanish Mountain** (Fig. 1; Table 3). Taseko Mines Limited's **Yellowhead** is active, but the environmental assessment terminated in 2018. Taseko indicates their intention to re-apply with a new project description. Ajax was rejected by both provincial and federal levels of government, and New Prosperity's provincial certification expired in early 2022. In neither of these cases has the operator abandoned their project.

6.1. Proposed metal mines

6.1.1. Ajax (KGHM Ajax Mining Inc.)

The **Ajax** porphyry copper-gold project, owned by KGHM Ajax Mining Inc., is an 80:20 joint venture between KGHM Polska Miedz S.A. and Abacus Mining and Exploration Corporation. Mineralization is in the Iron Mask batholith, a multi-phase Triassic alkalic intrusive complex. A revised Feasibility Study released in 2016 modelled Ajax as a 65,000 tpd open-pit mine with a projected 18-year life. In December 2017, the project was denied certification by the British Columbia Ministry of Environment and Climate Change Strategy and Ministry of Energy, Mines and Petroleum Resources. In June 2018, Natural Resources Canada, Fisheries and Oceans Canada, and the Canadian Coast Guard denied federal certification. Although KGHM Ajax has not announced plans for the site, Abacus issued an update stating that the project remains a priority and that KGHM is continuing to engage with First Nations.

6.1.2. Cariboo Gold (Osisko Development Corp.)

Osisko Development Corp. acquired the **Cariboo Gold** project in 2019 through a purchase of Barkerville Gold Mines. The property consolidates several historic gold mines. The company engaged in the British Columbia environmental assessment process in 2019, and the application is now in the development and review phase with an updated project description. A 2022 Preliminary Economic Assessment incorporates an updated underground resource and changing costs. The study models an initial 2000 tpd mine expanding to 8000 tpd. It would have a 12 year life with average annual production of 236,000 oz Au. Measured and Indicated resources

Table 3. Selected proposed mines or quarries, South Central Region.

Project	Operator (partner)	Commodity; Deposit type; MINFILE	Reserves	Resource	Comments
Ajax	KGHM Ajax Mining Inc. (KGHM Polska Miedź SA 80%, Abacus Mining and Exploration Corporation 20%)	Cu, Au; Alkalic porphyry; 092INE012, 13	P+Pr (NSR cut-off US\$7.10/t): 426 Mt 0.29% Cu, 0.19 g/t Au, 0.39 g/t Ag	M+I (NSR cut-off US\$7.10/t): 568 Mt 0.26% Cu, 0.18 g/t Au, 0.35 g/t Ag	Environmental certification denied by provincial (2017) and federal ministers (2018). Proponents are investigating a possible resubmission.
Cariboo Gold	Osisko Development Corp.	Au; Au-quartz veins; 093H 140, 139, 19, 6	na	M+I: 27.1 Mt 4.0 g/t Au Inf: 14.4 Mt 3.5 g/t Au (total of multiple zones)	Feasibility study in progress.
New Prosperity	Taseko Mines Limited	Cu, Au; Porphyry; 092O 041	P+Pr (NSR cut-off \$5.50/t): 831 Mt 0.23% Cu, 0.41 g/t Au containing (recoverable) 3.6 Blb Cu, 7.7 Moz Au	M+I (cut-off 0.14% Cu): 1010 Mt 0.24% Cu, 0.41 g/t Au	Granted provincial environmental certificate (expired) but denied federal approval. Taseko and T̄silhqot'in Nation in discussions.
Ruddock Creek	Ruddock Creek Mining Corporation (Imperial Metals 100%)	Pb, Zn, Ag; Broken Hill- type; 082M 082	na	M+I (cut-off 4.0% Pb+Zn): 6.2 Mt 6.50% Zn, 1.33% Pb Inf: 6.678 Mt 6.33% Zn, 1.20% Pb	Project at environmental assessment pre-application stage. Feb. 2013 resource before 2018-19 drilling. Imperial Metals now owns 100%.
Spanish Mountain	Spanish Mountain Gold Ltd.	Au, Ag; Au-quartz veins; 093A 043	P+Pr: 95.9 Mt 0.76 g/t Au, 0.71 g/t Ag	M+I: 294 Mt 0.50 g/t Au, 0.72 g/t Ag Inf: 18 Mt 0.63 g/t Au, 0.76 g/t Ag	Re-entered BC environmental assessment process with a new project description. Feasibility work is continuing.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

are 27.102 Mt grading 4.0 g/t Au. Ore crushing, sorting, and a flotation circuit on site would produce a flotation concentrate to be trucked to the Quesnel River mill. Tailings would be disposed of as paste backfill on site and at the Quesnel River mill with a filtered stack tailings storage facility. Initial capital costs are estimated at \$121.5 million and the expansion at \$716.1 million. A feasibility study was to be completed near the end of 2022. A portal was constructed for a proposed 2200 m drift and 10,000 t bulk sample, but this part of the project paused while focussing on feasibility work. There was infill drilling at 12.5 m centres in the sample area.

6.1.3. New Prosperity (Taseko Mines Limited)

Taseko Mines Limited's **New Prosperity** project was

denied a 12-month extension of its provincial environmental certificate for a 70,000 tpd open pit copper-gold mine. New Prosperity received provincial certification in 2010 but in 2014 the Government of Canada refused to authorize the project. Taseko has a standstill agreement with the T̄silhqot'in Nation pending a dialogue between the parties to arrive at a long-term resolution of differences about the project.

6.1.4. Ruddock Creek (Imperial Metals Corporation 100%)

Imperial Metals Corporation has been 100% owner of the **Ruddock Creek** project since 2021 when it purchased the interests held by Japanese partners in Ruddock Creek Mining Corporation. The project remains in the pre-application phase of the British Columbia Environmental Assessment process.

A 2014 revised project description referred to a 3000 tpd underground lead-zinc mine with an 8-year life. A mineral resource estimate, released in February 2013, reported 6.246 Mt grading 6.5% Zn and 1.33% Pb (Indicated) and 6.678 Mt grading 6.33% Zn and 1.20% Pb (Inferred), using a 4.0% combined Pb+Zn cut off. This estimate does not incorporate 2018-19 drilling. The deposit is described as sedimentary exhalative, Monashee, or Broken Hill-type, in marble, gneiss, and calc-silicate rocks.

6.1.5. Spanish Mountain (Spanish Mountain Gold Ltd.)

Spanish Mountain Gold Ltd. continued engineering, metallurgy, and environmental baseline monitoring and mobilized a crew in September for work (including drilling) to advance project evaluation. Spanish Mountain completed a Pre-feasibility study in 2021. In 2022, the project re-entered the BC Environmental Assessment process with an initial project description based on a 20,000 tpd 14-year operation that would produce 2.1 Moz Au and 0.9 Moz Ag. The mine would exploit the Main zone, with estimated Proven and Probable reserves of 95.9 Mt grading 0.76 g/t Au and 0.71 g/t Ag for 2.34 Moz Au.

The **Spanish Mountain** deposit consists of disseminated gold in graphitic argillite and gold-bearing quartz veins in siltstone, greywacke, and tuff. Host rocks are Upper Triassic and mineralization is Late Jurassic, older than that at the **Cariboo Gold** project (Allan et al., 2017).

6.2. Proposed industrial mineral and aggregate quarries

The proposed quarries in the region are below environmental assessment thresholds, and not treated herein because details are not widely reported.

7. Selected exploration activities and highlights

Exploration spending in 2022 was predominantly for gold, although exploration for porphyry copper remained significant. Some projects targeted different types of deposits; in the summaries below, such projects are treated according to the type where most of the 2022 exploration took place.

7.1. Selected precious metal projects

The South Central Region has many precious metal deposit types including orogenic veins, transitional veins, epithermal veins, hot spring systems, replacements, skarns, sediment-hosted, and intrusion-related breccias (Fig. 1; Table 4).

7.1.1. Bralorne (Talisker Resources Ltd.)

Talisker Resources Ltd. drilled 140,476 m in 286 holes at **Bralorne** between February 2020 and October 2022. They expect to release a resource estimate by the end of 2022 that would replace the 2020 estimate. Drilling has extended from surface to a depth of about 700 m. Most of the resource area is between historic mines. Talisker has reported numerous narrow, high-grade intersections from the current drilling. Highlight intersections include 1.3 m of 42.61 g/t Au within 3.70 m of 15.51 g/t Au. Average vein width is 1.6 m in the resource area.

Talisker acquired the Bralorne project in 2019 and subsequently assembled a larger contiguous land position in the Bridge River Camp, which comprises the Congress and Royale properties. The camp produced more than 4 Moz of gold between 1900 and 1971 at average grades of about 15 g/t Au. Veins have characteristics typical of orogenic gold deposits; the age of mineralization is estimated at ca. 68-64 Ma ($^{40}\text{Ar}/^{39}\text{Ar}$ muscovite; Hart and Goldfarb, 2017). Historical development traced veins to a depth of 1900 m (Church and Jones, 1999).

7.1.2. Brett (Ximen Mining Corp.)

Ximen reported airborne magnetic and lidar surveys at the **Brett** property. The magnetic survey covered 54 km² at 50 m spaced lines, lidar covered 12 km². The target at Brett is epithermal gold mineralization.

7.1.3. Coquigold (Cariboo Rose Resources Ltd., CMP Minerals Inc.)

Cariboo Rose reported soil geochemistry and airborne magnetic, radiometric, and VLF-EM surveys (490 line km) at **Coquigold**. In December they announced starting to drill up to four holes. The target is epithermal precious metals in the Spences Bridge belt. CMP Minerals Inc. has an option to earn up to 70%.

7.1.4. CR (Eastfield Resources Ltd.)

Eastfield started drilling late in the year at **CR**, testing part of an induced polarization anomaly to determine if it represents a zone of gold-bearing silicification. The target is gold mineralization as identified in surface samples returning anomalous gold and arsenic values.

7.1.5. Eakin Creek (Trailbreaker Resources Ltd.)

Trailbreaker Resources conducted soil geochemical and induced polarization surveys at **Eakin Creek**. They identified a 1000 by 600 m Au-Ag-Cu-Sb mobile metal ion soil anomaly with coincident resistivity and chargeability anomalies. Grab samples returned up to 8.2 g/t Au and 130 g/t Ag. The target is intrusive-related gold. Trailbreaker indicated that this grassroots property is available for option.

7.1.6. Eldorado (Gelum Resources Ltd.)

Gelum Resources Ltd. completed three holes (800 m) of a planned 11 hole (3000 m) program at **Eldorado** late in 2022. The company also completed an airborne magnetic and VTEM survey (890 line km). The target is orogenic vein gold.

7.1.7. Elizabeth, Blackdome-Elizabeth (Tempus Resources Ltd.)

Tempus Resources Ltd. focussed on their **Elizabeth** property, the southern portion of the linked **Blackdome-Elizabeth** project, with 40 holes drilled for a total of approximately 9760 m. The Blue Vein, a 2021 discovery, was targeted by 21 holes and the No. 9 vein was targeted by 10 holes. Initial

Table 4. Selected exploration projects, South Central Region.

Project	Operator (partner)	Commodity; Deposit type; MINFILE	Resource (NI 43-101 compliant unless indicated otherwise)	Comments
Beaver-Lynx	Inomin Mines Inc.	Ni, Co; Ultramafic-mafic; 093B 073, 285	na	Ground magnetic survey at Lynx. Highlight of 2021 drilling at Beaver: 252 m grading 20.6% Mg, 0.16% Ni, and 0.33% Cr.
Bralorne	Talisker Resources Ltd.	Au; Au-quartz veins; 092JNE001	M+I: 260,000 tons 0.351 oz/ton Au Inf. 317,000 tons 0.231 oz/ton Au	Multi-year drilling campaign continued. New resource estimate in preparation.
Brett	Ximen Mining Corp.	Au, Ag; Epithermal Au-Ag-Cu low sulphidation; 082LSW110, 131	na	Airborne magnetic and lidar surveys.
Brussels Creek	Recharge Resources Ltd.	Cu, Au, Pd; Porphyry Cu-Au (alkalic); 092INE089	na	Initiated drilling late in 2022.
Chu Chua	Newport Exploration Ltd.	Cu, Zn, Ag, Au; Cyprus massive sulphide; 092P 140	Inf: 2.29 Mt 2.11% Cu, 0.30% Zn, 9.99 g/t Ag, 0.50 g/t Au	2022 updated resource estimate.
Coquigold	Cariboo Rose Resources Ltd. (CMP Minerals Inc.)	Au, Au; Epithermal Au-Ag-Cu low sulphidation; 092HNE062	na	Soil geochemistry. (453 samples), airborne magnetic, VLF-EM (490 line km), drilling started (3-4 holes).
Cowtrail	Cariboo Rose Resources Ltd. (BRS Mining Resources Ltd.)	Au, Cu; Alkalic porphyry Cu-Au; 093A 266, 116	na	Soil geochemistry.
CR	Eastfield Resources Ltd.	Au	na	Drilling started late in 2022.
Eagle Lake	Trailbreaker Resources Ltd.	Cu, Au, Ag; Alkalic porphyry Cu-Au; 093A 268, 255	na	Soil geochemistry, drill core re-logging.
Eakin Creek	Trailbreaker Resources Ltd.	Au; Plutonic-related Au quartz veins; 092P 103, 172, 26	na	Soil geochemistry. IP, grab samples up to 8.2 g/t Au and 130 g/t Ag.
Eldorado	Gelum Resources Ltd.	Au, Cu; Polymetallic veins, Au- quartz veins; 092O 026, 092JNE105, 95, 45	na	Magnetic and VTEM survey (890 line km). Drilling 3 holes, 800 m.
Elizabeth (Elizabeth- Blackdome)	Tempus Resources Ltd.	Au, Ag; Au quartz veins, Epithermal Au-Ag-Cu low sulphidation; 092O 053, 12	Inf: 522,843 t 12.26 g/t Au	Drilling 40 holes, 9760 m. Initial highlight 2.11 m grading 87.0 g/t Au.
Fame	Longhorn Exploration Corp.	Au; Epithermal Au-Ag-Cu low sulphidation; 092O 019	na	Airborne magnetic and soil geochemistry surveys.

Table 4. Continued.

FG Gold and Gold Creek	Karus Gold Corp.	Au, Ag; Au-quartz veins; 093A 061	M: 5,600,000 t 0.812 g/t Au I: 9,570,000 t 0.755 g/t Au Inf: 27,493,000 t 0.718 g/t Au	Announced 2021 results. Highlights included 59.35 m grading 1.13 g/t Au including 17.87 m grading 2.23 g/t Au at FG Gold and 80.65 m grading 0.5 g/t Au including 46.4 m grading 0.74 g/t Au at Gold Creek. Filed technical report. 2015 resource estimate considered historical by Karus.
Fox Tungsten	Happy Creek Minerals Ltd.	W; W skarns; 093A 259, 260, 261, 211	I: 582,000 t 0.826% WO ₃ Inf: 565,400 t 1.231% WO ₃	Released 2021 drill results. Highlights included 6.7 m grading 0.43% WO ₃ with 1.2 m grading 1.83% WO ₃ in the Nightcrawler zone. Some 2022 surface work.
Gaspard	Falcon Gold Corp.	Au; Epithermal	na	Airborne magnetic and radiometric survey (347 line km).
Gold Bridge	Blackstone Minerals Ltd.	Cu, Ni, Co, Au; 5 element veins?; 092JNE068, 108	na	Reported results of 2021 drilling. Highlights included 81 m grading 0.21% Ni at the Western Gem prospect and 0.9 m grading 1.45% Cu, 0.56% Ni, and 0.19% Co at the Jewel prospect. Reconnaissance prospecting and geophysical modelling.
Goldrange	Kingfisher Metals Corp.	Au, Ag; Au and Cu±Ag quartz veins; 092N 058, 59, 47, 57, 48	na	Rotary air blast and diamond drilling (10,000 m) Initial results include 40 m grading 2.86 g/t Au.
Highland Valley	Happy Creek Minerals Ltd.	Cu, Mo, Au, Ag, Re; Porphyry Cu±Mo±Au; 092ISE199	na	Reported porphyry targets, expanded land holdings.
Iron Lake	Tech-X Resources Inc.	Cu, Au, Pt, Pd, Co; Alkalic porphyry Cu-Au and ultramafic hosted; 092P 132, 113, 182, 222	na	Drilling 23+ holes as of November. Tech-X is a private company.
Lac La Hache	Engold Mines Ltd.	Cu, Au, Ag, Fe; Alkalic porphyry Cu-Au, Cu skarn; 092P 120, 108, 2, 153	Aurizon Inf: 1.99 Mt 2.32 g/t Au, 0.6% Cu, 5.37 g/t Ag Spout zone open pit I: 6.5 Mt 0.33% Cu, 1.34 g/t Ag, 0.05 g/t Au, 11.62% magnetite Spout zone open pit Inf: 7.66 Mt 0.27% Cu, 0.99 g/t Ag, 0.04 g/t Au, 9.5% magnetite Spout zone underground Inf: 0.39 Mt 1.0% Cu, 2.58 g/t Ag, 0.13 g/t Ag, 10.33% magnetite G1 underground Inf: 1.71 Mt 1.25% Cu, 6.45 g/t Ag, 0.19 g/t Au, 30.94% magnetite	Drilling (more than 3100 m) at Au (Aurizon) and Ann North Cu-Au porphyry targets.

Table 4. Continued.

Lawless Creek	Tech-X Resources Inc.	Cu, Mo, Au; Porphyry Cu±Mo±Au; 092HNE006, 39	na	Private company; reported drilling.
Lemon Lake	Acme Gold Company Ltd.	Cu, Au, Ag; Alkalic porphyry Cu-Au; 093A 002, 272, 338	na	Drilling, 2 holes, 501 m.
Lightning Strike	Cariboo Rose Resources Ltd.	Au, Ag; Au-quartz veins; 093A 250	na	RC drilling 11 holes, 1465 m.
LMSL	ArcPacific Resources Corp.	Cu, Au, Mo, W; Porphyry Cu±Mo±Au, W skarn; 092ISE027, 94, 128, 129	na	Surface sampling highlight 20.1 g/t Au, 3.6% Cu.
Miner Mountain	Sego Resources Inc.	Cu, Au; Alkalic porphyry Cu-Au; 092HSE203, 78	na	7 holes, 1582 m. Highlight assay 80 m 0.95 g/t Au.
MPD	Kodiak Copper Corp.	Cu, Au; Alkalic porphyry Cu-Au; 092HNE243, 55, 191, 244	na	41 holes, 26,103 m drilling, IP, soil surveys, trenching. Southern Gate zone highlights included 735.4 m grading 0.24% Cu, 0.14 g/t Au and 0.71 g/t Ag. Within this was a 117 m interval grading 0.69% Cu, 0.46 g/t Au and 2.22 g/t Ag.
Newton	Carlyle Commodities Corp.	Au, Ag; Epithermal Au-Ag-Cu (high sulphidation)	Inf.: 42,396,600 t 0.63 g/t Au, 3.43 g/t Ag	Updated resource estimate 2022. Preparation for late 2022-early 2023 drilling.
New Brenda	Flow Metals Corp.	Au, Ag, Cu; Au-quartz veins; 092HNE289, 302, 303	na	Geological mapping, sampling, up to 53.5 g/t Au, 32.3 g/t Au.
New Craigmont	Nicola Mining Inc.	Cu, Au; Cu skarn; 092ISE035	18.669 Mt 0.13% Cu. Craigmont waste dumps in Portal Area and Southern Dump 0.06% Cu cut off.	Permitting, ZTEM and soil geochemistry.
Placer Mountain	Damara Gold Corp.	Au, Ag; Au quartz veins; 092HSE262, 263	na	2021 results released, highlight 3.0 m grading 39.2 g/t Au.
Ponderosa	Au Gold Corp.	Au, Ag; Au-quartz veins; 092ISE192	na	20 holes totalling 2335 m. Anomalous Au and Ag reported.
Quesnel Nickel	Green River Gold Corp.	Ni, Co, talc; Mafic-ultramafic; 093A 130, 093H 061, 139	na	Portable drill results include Mg, Ni, Co, Cr values.
Rabbit North	Tower Resources Ltd.	Cu, Au; Alkalic porphyry Cu-Au; 092INE045, 147	na	Drilling of gold discovery (Lightning zone), another new gold target identified based on trail of gold in till. Initial drill results included 95.0 m grading 1.40 g/t Au including and interval of 19.2 m with 4.21 g/t Au.
Rayfield	Golden Sky Minerals Corp.	Cu, Au; Alkalic porphyry Cu-Au; 092P 005	na	Soil geochemistry.
Redhill	Bessor Minerals Inc.	Zn, Cu, Ag, Au; Kuroko massive sulphide; 092INW042, 57	na	Drilling, 1 hole.

Table 4. Continued.

Reliance Gold	Endurance Gold Corporation	Au, Ag, Sb; Au quartz veins, Stibnite veins and disseminations; 092JNE033, 136, 191	na	Drilling of Eagle zone and feeder structures.
Shovelnose	Westhaven Gold Corp.	Au, Ag; Epithermal Au-Ag-Cu low sulphidation; 092HNE309, 308	I: 10,592,000 t 2.32 g/t Au, 11.43 g/t Ag Inf: 9,177,000 t 0.89 g/t Au, 3.47 g/t Ag	Pit-constrained resource at South zone, 0.35 g/t AuEq cut off.
Skoonka Creek	Westhaven Gold Corp.	Au, Ag; Epithermal Au-Ag-Cu low sulphidation; 092ISW104, 129, 105, 126	na	Drilling 16 holes, 3340 m. Initial results included 5.66 m grading 6.83 g/t Au and 1.90 m grading 21.15 g/t Au.
Swift River (and other Barkeville area)	Hawkeye Gold and Diamond Inc.	Ag, Au, Pb, Zn, Cu	na	Regional reconnaissance.
Wingdam	Omineca Mining and Metals Ltd.	Au; Au-quartz veins; 093H 012	na	Drilling lode gold targets. Began placer gold recovery.
Woodjam	Vizsla Copper Corp.	Cu, Au; Alkalic porphyry Cu-Au; 093A 269, 78	Southeast zone Inf: 227.5 Mt 0.31% Cu Deerhorn zone Inf: 32.8 Mt 0.49 g/t Au, 0.22% Cu Takom zone Inf: 8.3 Mt 0.26 g/t Au, 0.22% Cu	Vizsla Copper to acquire Consolidated Woodjam Copper.
Yellowhead	Taseko Mines Limited	Cu, Au, Ag; Noranda/Kuroko; 082M 008, 9	M+I: 1292 Mt 0.25% Cu, 0.028 g/t Au, 1.2 g/t Ag Inf: 109 Mt 0.24% Cu, 0.026 g/t Au, 1.2 g/t Ag, 0.15% Cu cut off	Engineering and community relations.

M = Measured; I = Indicated; Inf = Inferred

results included 2.11 m of 87.0 g/t Au at the No. 9 vein. The Ella zone, SW vein, and Main/West zone were also drilled. The linked Blackdome and Elizabeth properties were the subject of a 2010 Preliminary Economic Assessment in which mining would occur at both sites, with processing at an existing mill at Blackdome.

Blackdome is a low-sulphidation epithermal deposit in Cenozoic intermediate to felsic volcanic rocks. Elizabeth, 30 km to the south, is a series of veins in a Paleocene quartz diorite intrusion in the Shulaps ultramafic complex. Historically they have been compared to the Bralorne-Pioneer orogenic deposits.

7.1.8. Fame (Longhorn Exploration Corp.)

Longhorn Exploration Corp. completed an airborne magnetic survey and soil geochemistry at the **Fame** property. They reported gold-in-soil anomalies and magnetic lows, one of which coincides with known showings. Targets include epithermal precious metals.

7.1.9. FG Gold and Gold Creek (Karus Gold Corp.)

Karus Gold Corp. announced results of 2021 drilling at its **FG Gold** and **Gold Creek** projects in 2022. Among the highlights was 59.35 m grading 1.13 g/t Au including 17.87 m grading 2.23 g/t Au at FG Gold and 80.65 m grading 0.5 g/t Au including 46.4 m grading 0.74 g/t Au at Gold Creek. The company filed a technical report covering both properties. The company also announced signing a non-binding letter of intent to be acquired by Kenadyr Metals Corp., valuing Karus at \$19.7 million. Karus' principal assets are its Cariboo district gold properties.

7.1.10. Gaspard (Falcon Gold Corp.)

Falcon Gold Corp. expanded its **Gaspard** property and flew a 347-line km airborne magnetic and radiometric survey. The target is epithermal gold mineralization at the northern end of the Spences Bridge gold trend.

7.1.11. Goldrange (Kingfisher Metals Corp.)

Kingfisher Metals Corp. conducted an induced polarization

survey, rotary air blast (RAB) and diamond drilling (total approximately 10,000 m as of October) on its **Goldrange** project in 2022. Results of RAB drilling at the Day Trip zone included 4.6 m of 2.7 g/t Au, 12.2 m of 0.5 g/t Au, 4.6 m of 2.1 g/t Au, and 9.1 m of 0.8 g/t Au. The company reported anomalous portable X-Ray fluorescence analyses at the Langara zone and intervals of vein, breccia, and disseminated sulphide at the Cloud Drifter trend. Initial diamond drill results at the Cloud Drifter included 40 m grading 2.86 g/t Au, with 9 m grading 5.56 g/t Au, 1 m grading 58.88 g/t Au, 2 m grading 19.54 g/t Au, 1 m grading 10.39 g/t Au, and 2 m grading 9.55 g/t Au. Mineralization at the Cloud Drifter includes a 35 m interval of strongly altered and mineralized quartz diorite.

7.1.12. Lightning Strike (Cariboo Rose Resources Ltd.)

Cariboo Rose Resources Ltd. completed reverse circulation drilling of 11 holes totalling 1465 m at their **Lightning Strike** project, following up on 2021 drilling. The target is shale-hosted orogenic gold as targeted at Spanish Mountain and FG.

7.1.13. Miner Mountain (Sego Resources Inc.)

Sego Resources Inc. drilled at the Southern Gold zone of its **Miner Mountain** project in spring 2022 with seven holes totaling 1582 m. Results included 80 m of 0.95 g/t Au, consistent with 2020-21 results that attracted the company's focus to the gold target. The project also has several alkalic Cu-Au targets (Britten et al., 2020).

7.1.14. New Brenda (Flow Metals Corp.)

At **New Brenda**, Flow Metals Corp. followed up 2021 airborne magnetic results with geological mapping and sampling. Highlight samples returned 53.5 g/t and 32.3 g/t Au, with highly anomalous bismuth and tellurium in a hand-trenched quartz vein carrying visible gold and bismuthinite.

7.1.15. Newton (Carlyle Commodities Corp.)

Carlyle Commodities Corp. updated the resource estimate at **Newton** to a pit-optimized Inferred 42.4 Mt 0.63 g/t Au and 3.43 g/t Ag with a 0.25 g/t Au cut off. They have a permit to drill and completed some preparatory work. As of December, a 14 hole infill and step-out program was scheduled to begin.

7.1.16. Placer Mountain (Damara Gold Corp.)

Damara Gold Corp. completed a drilling program at its **Placer Mountain** gold vein project in December 2021. Highlight results released in 2022 included 1.40 m grading 34.12 g/t Au and 87.74 g/t Ag, 3.0 m grading 39.2 g/t Au and 80.4 g/t Ag, 1.35 m grading 46.51 g/t Au and 32.2 g/t Ag, and 1.30 m grading 31.80 g/t Au and 47.3 g/t Ag. The company expanded their land holdings in 2022.

7.1.17. Ponderosa (Au Gold Corp.)

In the Spences Bridge belt, Au Gold Corp. drilled 20 holes totalling 2335 m at **Ponderosa**, partially testing two of four epithermal target areas in pyroclastic volcanic rocks. They

intersected silicification and anomalous gold and silver values at shallow depths.

7.1.18. Rabbit North (Tower Resources Ltd.)

Tower Resources Ltd. identified the source of a gold grain anomaly in till and reported an initial drill intersection of 95.0 m grading 1.40 g/t Au including an interval of 19.2 m with 4.21 g/t Au in this new discovery, referred to as the 'Lightning zone' (Fig. 2). Follow up in 2022 included additional drilling and till sampling that indicated another gold dispersal train, called the Central Train, 400 m west of the Lightning zone. Seventeen new samples yielded between 40 to 452 gold grains per sample leading to a target under young (possibly Miocene) basalts. The **Rabbit North** project also hosts alkalic porphyry Cu-Au targets.



Fig. 2. Silicified (±sericitized) Nicola Group crystal-lithic tuff with disseminated pyrite. This type of rock has returned significant gold values in Lightning zone intersections. Tower Resources Ltd., Rabbit North project.

7.1.19. Reliance Gold (Endurance Gold Corporation)

Endurance Gold Corporation reported 38 diamond-drill holes totalling 8274 m and 33 reverse circulation holes totalling 2455 m at **Reliance Gold** in 2022. The primary targets were the Eagle zone and structures interpreted as feeders to that shallowly dipping, near-surface target. Highlight feeder zone (Eagle South Feeder) intersections included 11.6 m grading 7.31 g/t Au, 12.1 m grading 4.95 g/t Au, 13.5 m grading, 8.06 g/t Au, 11.9 m grading 8.31 g/t Au, and 4.3 m grading 16.66 g/t Au. Highlight intersections from the overlying Eagle zone included 12.0 m grading 7.68 g/t Au, and 30.48 m grading 6.64 g/t Au (Fig. 3). Significant intersections in the Eagle South Feeder zone span about 400 m strike length. Endurance expanded their land holdings in the Gold Bridge area in 2022.

7.1.20. Shovelnose (Westhaven Gold Corp.)

In January, Westhaven Gold Corp. announced an initial pit-constrained mineral resource estimate for the South zone of **Shovelnose** of 10.6 Mt grading 2.32 g/t Au and 11.43 g/t Ag Indicated and 9.2 Mt grading 0.89 g/t Au and 3.47 g/t Ag Inferred. Drilling in 2022 (approximately 100 holes, 40,000 m)



Fig. 3. Brecciated quartz veins and sulphides from a drill sample grading 16 g/t Au. Eagle zone, Reliance project, Endurance Gold Corporation.

included peripheral targets off the main mineralized structure, a 4 km trend including the South zone, FMN and Franz targets. The company discovered a gold-bearing zone 1.2 km northeast of the South zone resource area. Highlight results at the FMN zone included 23.03 m grading 37.24 g/t Au and 209.52 g/t Ag, and 14.96 m grading 5.96 g/t Au and 343.57 g/t Ag. Detailed mapping at a 1:100 scale of the Franz zone was carried out to guide surface sampling and complement earlier drilling. The Shovelnose project includes multiple low-sulphidation epithermal precious metals prospects and targets in the Spences Bridge gold belt.

7.1.21. Skoonka Creek (Westhaven Gold Corp.)

Westhaven Gold Corp. drilled 3340 m in 16 holes at **Skoonka Creek**, another of their properties in the Spences Bridge belt. The program was designed to step out from previous drilling on an epithermal vein system. Initial results included 5.66 m grading 6.83 g/t Au and 1.90 m grading 21.15 g/t Au.

7.1.22. Wingdam (Omineca Mining and Metals Ltd.)

In addition to the paleoplacer project at **Wingdam** (section 4.1.), Omineca Mining and Metals Ltd. resumed lode gold exploration drilling in the late summer and fall. Targets included Skopos, about 900 m south of the placer mine and Mary Creek, about 6 km northwest of the mine.

7.2. Selected porphyry projects

Most of the large projects in the South Central Mining Region targeted gold in 2022, as was the case in 2021. Kodiak Copper continued a major drill program at **MPD**, Engold Mines tested porphyry targets at **Lac La Hache**, and Nicola Mining is targeted porphyry and skarn mineralization at **New Craigmont**. Several smaller and grassroots projects also targeted porphyry mineralization.

7.2.1. Brussels Creek (Recharge Resources Ltd.)

Recharge Resources Ltd. announced the imminent start

of 1100 m drill program at **Brussels Creek** late in the year. Preparatory work included archaeological studies. The drilling is permitted, and funded. The target is alkalic porphyry Cu-Au mineralization.

7.2.2. Cowtrail (Cariboo Rose Resources Ltd., BRS Mining Resources Ltd.)

Cariboo Rose Resources Ltd. extended a soil grid at **Cowtrail**. BRS Mining Resources Ltd. has entered an option agreement to earn a 60% interest in the drill-permitted property.

7.2.3. Eagle Lake (Trailbreaker Resources Ltd.)

Trailbreaker Resources Ltd. identified an 850 by 700 metre Au-Cu-Ag-Mo mobile metal ion soil anomaly at **Eagle Lake** and re-logged 2011 core drilled by Newmont Canada Corporation. The anomaly lies near a contact between Copper Mountain suite and Takomkane suite intrusive rocks.

7.2.4. Highland Valley (Happy Creek Minerals Ltd.)

Happy Creek Minerals Ltd. reported three new porphyry Cu-Mo targets at their high **Highland Valley** project arising from 2021 field work. They acquired the adjoining Mystery property in 2022.

7.2.5. Lac La Hache (Engold Mines Ltd.)

The **Lac La Hache** project includes Cu-Fe skarn, Au vein and breccia, and porphyry Cu targets. Resource estimates exist for several (Table 4). Drilling in 2022 at the Aurizon gold deposit returned an initial highlight of 7.11 m grading 5.7 g/t Au, 0.90% Cu, 0.60 g/t Ag, and 2.5 m grading 8.8 g/t Au, 1.02% Cu, 81.8 g/t Ag. Deep drilling at the Ann North alkalic porphyry target encountered a 655 m interval of low-grade Cu mineralization grading 0.10% Cu, 0.04 g/t Au, 0.03 g/t Ag. Engold Mines reported some 2021 results in 2022 including 34 m grading 0.48% Cu, 0.07 g/t Au, 1.57 g/t Ag from south of the G-1 skarn deposit. The company engaged Goldspot Discoveries Ltd. to generate targets using artificial intelligence exploration techniques.

7.2.6. Lawless Creek (Tech-X Resources Inc.)

Tech-X Resources Inc. was active at **Lawless Creek** in 2022. As a private company, they are not obliged to make details public, although some assessment reports are no longer on confidential status. Targets include Cu-Mo porphyry mineralization.

7.2.7. Lemon Lake (Acme Gold Company Ltd.)

Acme Gold Company Ltd. drilled two holes (501 m) at two targets at the **Lemon Lake** property and intersected anomalous Cu and Au.

7.2.8. LMSL (Arcpac Resources Corp.)

Arcpac Resources Corp. reported initial results of surface sampling at its **LMSL** project, a consolidation of the **Lucky Mike** and **Silver Lode** properties. Highlights included grab

samples grading 20.1 g/t Au and 3.6% Cu. An initial targeting program was completed by GoldSpot Discoveries Corp. using artificial intelligence systems. Priority targets include porphyry Cu-Au-Mo-Ag mineralization.

7.2.9. MPD (Kodiak Copper Corp.)

Kodiak Copper Corp. continued to drill at their **MPD** project, with a 41 hole, 26,103 m program, and conducted induced polarization and soil geochemical surveys. Southern Gate zone highlights included 735.4 m grading 0.24% Cu, 0.14 g/t Au and 0.71 g/t Ag. Within this was a 117 m interval grading 0.69% Cu, 0.46 g/t Au and 2.22 g/t Ag. The Gate zone was traced along a 1 km strike length and to a depth of 900 m. Kodiak reported discovering a near-surface Au-Ag target south of the Gate zone and Man zone. Highlights from trenches included 2 m grading 9.11 g/t Au and 24 g/t Ag, 2 m grading 5.29 g/t Au and 27.7 g/t Ag

MPD is a consolidation of the Man, Prime, and Dillard alkalic porphyry Cu-Au targets, which had historically been explored to about 200 m depth. The Gate zone, a 2019 discovery, indicated that significant Cu-Au mineralization extended to greater depths (Fig. 4).



Fig. 4. Semi-massive chalcopyrite (+pyrite+magnetite). The orange staining is probably hematitic rather than from potassic alteration. The green interpreted as propylitic alteration (mainly epidote). Kodiak Copper Corp., MPD project.

7.2.10. Rayfield (Golden Sky Minerals Corp.)

Golden Sky Minerals Corp. conducted soil geochemical surveys at **Rayfield**. They report three possible porphyry Cu-Au drill targets. A permit application for drilling is in process.

7.2.11. Woodjam (Vizsla Copper Corp.)

Consolidated Woodjam Copper Corp. announced 2021 drill results early in 2022, including a highlight of 24.0 m grading 3.12 g/t Au, and 0.18% Cu at Deerhorn. In September, Vizsla Copper Corp. announced an agreement to acquire Consolidated Woodjam Copper Corp. for Vizsla shares. The deal has shareholder and court approval and Consolidated Woodjam will de-list when the transaction closes. **Woodjam** comprises six zones in a cluster approximately 5 km in diameter. The Deerhorn zone has an Inferred resource of 32.8 Mt grading 0.49 g/t Au and 0.22% Cu. Mineralization exhibits both alkaline and calc-alkaline characteristics (del Real et al., 2020).

7.3. Selected polymetallic base and precious metal projects

The region has numerous polymetallic massive sulphide prospects, including those hosted by the Eagle Bay assemblage (e.g., **Samatosum, Rea, Yellowhead**) and other Paleozoic strata.

7.3.1. Chu Chua (Newport Exploration Ltd.)

Newport Exploration Ltd. updated the resource estimate for the **Chu Chua** deposit in December 2021. At a 1% Cu cut off the pit-constrained Inferred resource is 2.289 Mt grading 2.11% Cu, 0.30% Zn, 9.99 g/t Ag, and 0.5 g/t Au. They propose infill and step out drilling.

7.3.2. Redhill (Bessor Minerals Inc.)

Bessor Minerals Inc. drilled one hole at the **Redhill** property. Redhill is a Kuroko type VMS Cu-Zn-Ag-Au target in rocks that may be correlated with the Kutcho Assemblage (Schiarizza, 2013).

7.3.3. Swift River and other Barkerville area (Hawkeye Gold and Diamond Inc.)

Hawkeye Gold and Diamond Inc. reported reconnaissance field work including mapping and prospecting at several grass roots properties in the Barkerville area (**Keithley Creek, Seller Creek, 2 Aces, Swift River, Cariboo Valley**). They reported initial anomalous sample results for several elements at Swift River, including Ag.

7.3.4. Yellowhead (Taseko Mines Limited)

Yellowhead is a feasibility-stage bulk-tonnage copper project, previously in the environmental assessment process as the Harper Creek project. Taseko Mines Limited is focussing on re-entering the environmental assessment process through engineering work and engagement with local communities, including First Nations. The company is also collecting baseline data and developing models that will be used to support environmental assessment and permitting. Taseko announced results of an updated Feasibility Study in 2020, including a new development plan and resource estimate. Proven and Probable reserves now stand at 817 Mt grading 0.28% Cu at a 0.17% cut off.

Although porphyry-like in its bulk tonnage and grade, Yellowhead is generally considered a marine volcanogenic and syngenetic deposit. It is hosted by metavolcanic and metasedimentary rocks of the Eagle Bay assemblage (Lower Cambrian to Mississippian).

7.4. Selected skarn projects (tungsten, copper, gold)

Historically, copper skarns have been important sources of high-grade ore. One, the Craigmont mine, has been reactivated as the **New Craigmont** exploration project, which also targets porphyry mineralization. One tungsten skarn project, **Fox Tungsten** was drilled in 2021, with results reported in 2022. **LMSL** and **Lac La Hache** both host copper skarn targets but they are treated in the porphyry section (7.2.5.).

7.4.1. Fox Tungsten (Happy Creek Minerals Ltd.)

At **Fox Tungsten**, Happy Creek Minerals Ltd. carried out prospecting and mapping in 2022 and reported results of 2021 drilling, including 6.7 m grading 0.43% WO₃ with 1.2 m grading 1.83% WO₃ in the Nightcrawler zone. This zone is 5-6 km south of the existing resource area.

7.4.2. New Craigmont (Nicola Mining Inc.)

Nicola Mining Inc. conducted a 1029 line-km ZTEM survey and a soil geochemical survey at the **New Craigmont** project. They obtained a permit for drilling up to 190 holes, trenching (up to 12 km), and conducting an induced polarization survey. The Craigmont mine was a copper skarn, but current targets include porphyry copper mineralization.

7.5. Selected mafic- and ultramafic-hosted projects

The South Central Region saw several early-stage Ni-Co, Cu-Ni-Co, Au-Co projects hosted by, or spatially related to, mafic and ultramafic rocks.

7.5.1. Beaver-Lynx (Inomin Mines Inc.)

The **Beaver** and **Lynx** projects are on linked properties in the Cache Creek complex; Mg-Ni-Cr-Co mineralization is targeted at the Beaver and Ni mineralization at the Lynx. Inomin Mines Inc. reported results of 2021 drilling at the Beaver, which included a highlight of 252 m grading 20.6% Mg, 0.16% Ni, and 0.33% Cr, and conducted a ground magnetic survey at the Lynx. They expanded both properties. A highlight of drilling included 252 m grading 20.6% Mg, 0.16% Ni, 0.33% Cr at Beaver. They used a sodium peroxide digestion intended to discriminate between sulphide and silicate Ni.

7.5.2. Gold Bridge (Blackstone Minerals Limited)

Blackstone Minerals Limited reported 2021 results from its **Gold Bridge** project. They reported 81 m grading 0.21% Ni at the Western Gem prospect and 0.9 m grading 1.45% Cu, 0.56% Ni, and 0.19% Co at the Jewel prospect. They also reported conducting reconnaissance prospecting and geophysical modelling.

7.5.3. Iron Lake (Tech-X Resources Inc.)

Optionee Tech-X Resources Inc., who optioned the **Iron Lake** property from Eastfield Resources Ltd., drilled 23 holes (ongoing as of November). This work followed a target definition program started in 2021, which included induced polarization and airborne surveys, mapping, and trenching. Tech-X is a private company, but some initial results released by Eastfield include Cu, Ni, Co, Pt, and Re values.

Iron Lake is underlain by the Iron Lake mafic-ultramafic intrusive complex in Nicola Group rocks. Magmatic Cu-Ni-Co-Pt-Pd mineralization is among the target types. Nicola rocks and the mafic-ultramafic complex are in contact with Takomkane batholith. Porphyry Cu and Au mineralization are also targets.

7.5.4. Quesnel Nickel (Green River Gold Corp.)

Green River Gold Corp. was active at its **Quesnel Nickel** project with portable drilling and remotely piloted aircraft-based magnetic surveys. They report initial Mg, Ni, and Cr results including 79 m grading 20.1% Mg, 0.177% Ni, 0.138% Cr, and 0.01% Co. Metallurgical analyses were in process.

7.6. Niobium, tantalum, and rare earth elements

Significant new work on pegmatite, carbonatite or alkaline intrusion related specialty metals targets (rare earths, Nb, Ta) was not reported in the South Central region. Some reconnaissance work targeting Sc was reported with sparse details and is not treated here.

7.7. Industrial minerals

Although work on industrial minerals projects was permitted and reported to regulators, information is not generally made public.

8. Geological research

Schiarizza (2022) released a 1:50,000 bedrock geology map of the Stump Lake-Salmon River area of the Thompson Plateau, and Schiarizza and Friedman (2023) reported U-Pb igneous and detrital zircon data from the Cadwallader terrane along the Chilcotin River, 50 km southwest of Williams Lake. Continuing work to detect mineralization buried beneath drift cover in the South Central Region, Plouffe et al. (2022) provided a case study from the Gibraltar deposit, Ferbey et al. (2023) and Elia et al. (2023) tested remotely piloted aircraft systems (RPAS, or drones) carrying radiometric, aeromagnetic, and lidar instrumentation at the **Mount Polley**, **Woodjam**, and **Highland Valley** deposits, and Sacco et al. (2022) reported on surficial geology mapping (including till sampling suitability and drift thickness maps), and re-analysis of archived till samples from a large area in the Interior Plateau. Damant and Enkelmann (2022) reported collecting samples from across the southern Intermontane belt that will be analyzed using apatite and zircon (U-Th)/He and fission-track thermochronology to establish the timing and magnitude of exhumation in the region and the implications for porphyry deposit exploration. Zou et al. (2022) used samples from **Highland Valley** porphyry copper deposits to evaluate machine learning models that were trained using large magmatic zircon trace-element datasets to distinguish zircons from mineralized and nonmineralized systems, an approach that may be effective in greenfield and brownfield exploration.

References cited

- Allan, M.M., Rhys, D.A., and Hart, C.J.R., 2017. 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, 108 p.
- Armstrong, R.L., Parrish, R.R., van der Heyden, P., Scott, K., Runkle, D., and Brown, R.L., 1991. Early Proterozoic basement exposures in the southern Canadian Cordillera: Core gneiss of Frenchman Cap, Unit I of the Grand Forks Gneiss, and the

- Vaseaux Formation. *Canadian Journal of Earth Sciences*, 28, 1169-1201.
- Beatty, T.W., Orchard, M.J., and Mustard, P.S., 2006. Geology and tectonic history of the Quesnel terrane in the area of Kamloops, British Columbia. In: Colpron, M. and Nelson, J., (Eds.), *Paleozoic Evolution and Metallogeny of Pericratonic Terranes at the Ancient Pacific Margin of North America*, Canadian and Alaskan Cordillera. Geological Association of Canada, Special Paper 45, pp. 483-504.
- Bloodgood, M.A., 1990. Geology of the Eureka Peak and Spanish Lake map areas, British Columbia.; British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 1990-3, 36 p.
- Britten, R.M., Watson, A., and Stevenson, J.P., 2020. The Miner Mountain property-Upper expression of an alkalic porphyry copper-gold deposit, southern British Columbia. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume 57*, pp. 711-725.
- Brown, R., Roste, G., Baron, J., and Rees, C., 2016. Mount Polley Mine 2016 Technical Report. Report for Imperial Metals Corporation, effective date 1 January 2016, report date 20 May 2016, 203 p.
(Downloaded from SEDAR: <http://www.sedar.com/homepage_en.htm>)
- Byrne, K., Stock, E., Ryan, J., Johnson, C., Nisenson, J., Jimenez, T.A., Lapointe, M., Stewart, H., Grubisa, G., and Sykora, S., 2013. Porphyry Cu-(Mo) deposits in the Highland Valley district, southcentral British Columbia. In: Logan, J., and Schroeter, T.G., (Eds.), *Porphyry Systems of Central and Southern BC: Prince George to Princeton*. Society of Economic Geologists Field Trip Guidebook Series 44, pp. 99-116.
- Byrne, K., Lesage, G., Gleeson, S.A., Piercey, S.J., Lypaczewski, P., and Kyser, K., 2020. Linking mineralogy to litho geochemistry in the Highland Valley copper district: Implications for porphyry copper footprints. *Economic Geology* 115, 871-901.
- Church, B.N., and Jones, L.D., 1999. Metallogeny of the Bridge River Mining Camp (092J10, 15 & 092O02). British Columbia Ministry of Energy and Mines, British Columbia Geological Survey GeoFile 1999-01, 64 p.
- Clarke, G., Northcote, B., Corcoran, N., and Hancock, K., 2022. Exploration and Mining in British Columbia, 2021: A summary. In: *Provincial Overview of Exploration and Mining in British Columbia, 2021*. British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey Information Circular 2022-01, pp. 1-42.
- Clarke, G., Northcote, B., Corcoran, N.L., Heidarian, H., and Hancock, K., 2023. Exploration and Mining in British Columbia, 2022: A summary. In: *Provincial Overview of Exploration and Mining in British Columbia, 2021*. British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey Information Circular 2023-01, pp. 1-48.
- Colpron, M., and Price, R.A., 1995. Tectonic significance of the Kootenay terrane, southeastern Canadian Cordillera: An alternative model. *Geology*, 23, 25-28.
- Damant, K.A. and Enkelmann, E., 2022. Upper-crustal cooling history of the Intermontane belt in southern British Columbia (parts of NTS 082E,092I, P, 093A, B, C). In: *Geoscience BC Summary of Activities 2021: Minerals*. Geoscience BC, Report 2022-01, pp. 11-20.
- del Real, I., Bouzari, F., and Sherlock, R., 2020. The magmatic and hydrothermal evolution of the Woodjam Cu-Au and Cu-Mo porphyry district, central British Columbia, Canada. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume 57*, pp. 601-619.
- Dohaney, J., Andrews, G.D.M., Russell, J.K., and Anderson, R.G., 2010. Distribution of the Chilcotin Group, Taseko Lakes and Bonaparte Lake map areas, British Columbia. Geological Survey of Canada, Open File 6344 and Geoscience BC, Map 2010-02-1, 1:250,000 scale.
- Elia, E.A., Ferbey, T., Ward, B.C., Best, M., Shives, R.B.K., and Martin-Burtart, N., 2023. Remotely piloted aircraft systems (RPAS) data for subglacial tills of the Highland Valley and Mount Polley porphyry areas. British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey GeoFile, in press.
- EY LLP, 2023. British Columbia Mineral and Coal Exploration Survey 2022 Report.
- Ferbey, T., Elia, E.A., Best, M., Shives, R.B.K., Martin-Burtart, N., and Ward, B.C., 2023. Remotely piloted aircraft-borne radiometric data from subglacial tills of the Highland Valley and Mount Polley porphyry areas. British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey Open File, in press.
- Hall, R.D., and May, B., 2013. Geology of the New Afton porphyry copper-gold deposit, Kamloops, British Columbia, Canada. In: Logan, J., and Schroeter, T.G., (Eds.), *Porphyry Systems of Central and Southern BC: Prince George to Princeton*. Society of Economic Geologists Field Trip Guidebook Series 44, pp. 117-128.
- Hart, C.J.R., and Goldfarb, R.J., 2017. Constraints on the metallogeny and geochronology of the Bridge River gold district and associated intrusions, southwestern British Columbia. *Geoscience BC report 2017-08*, 18 p.
- Holbek, P.M., Joyes, R., and Cromwell, E., 2020. The Copper Mountain alkalic porphyry copper-gold deposit, southern British Columbia. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume 57*, pp. 690-710.
- Holbek, P.M., Joyes, R., and Frost, G., 2015. NI 43-101 Technical Report on Resources and Reserves of the Copper Mountain Mine, Princeton, British Columbia. Prepared for Copper Mountain Mining Corp., effective date 30 March 2015, 91 p.
<http://www.sedar.com/homepage_en.htm>
- Lipske, J.L., Wade, D., Hall, R.D., and Petersen, M.A., 2020. Geology and mineralization of the New Afton Cu-Au alkalic porphyry deposit, Kamloops, British Columbia. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume 57*, pp. 648-667.
- Logan, J.M., 2013. Porphyry systems of central and southern BC: Overview and field trip road log. In: Logan, J., and Schroeter, T.G., (Eds.), *Porphyry Systems of Central and Southern BC: Prince George to Princeton*. Society of Economic Geologists Field Trip Guidebook Series 44, pp. 1-45.
- Logan, J., and Mihalynuk, M.G., 2014. Tectonic controls on paired alkaline porphyry deposit belts (Cu-Au±Ag-Pt-Pd-Mo) within the Canadian Cordillera. *Economic Geology*, 109, 827-858.
- Logan, J.M., and Moynihan, D.P., 2009. Geology and mineral occurrences of the Quesnel River map area, central British Columbia (NTS 093B/16). In: *Geological Fieldwork 2008*, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2009-1, pp. 127-152.
- Mahoney, J.B., Hickson, C.J., Haggart, J.W., Schiarizza, P., Read, P.B., Enkin, R.J., van der Heyden, P., and Israel, S., 2013. Geology, Taseko Lakes, British Columbia. Geological Survey of Canada, Open File 6150, 1:250,000 scale.
- McDonough, M.R., and Parrish, R.R., 1991. Proterozoic gneisses of the Malton Complex, near Valemount, British Columbia: U-Pb ages and Nd isotopic signatures. *Canadian Journal of Earth Sciences*, 28, 1202-1216.
- Mihalynuk, M.G., and Diakow, L.J., 2020. Southern Nicola arc geology. British Columbia Ministry of Energy, Mines and

- Petroleum Resources, British Columbia Geological Survey Geoscience Map 2020-01, 1:50,000 scale.
- Mihalynuk, M.G., Diakow, L.J., Logan, J.M., and Friedman, R.M., 2015. Preliminary geology of the Shrimpton Creek area (NTS 092H/15E, 16W) southern Nicola arc project. In: Geological Fieldwork 2014, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2015-1, pp. 129-163.
- Monger, J.W.H., and McMillan, W.J., 1989. Geology, Ashcroft, British Columbia (92I). Geological Survey of Canada, Map 421989, sheet 1, 1:250,000 scale.
- Mortimer, N., 1987. The Nicola Group: Late Triassic and Early Jurassic subduction-related volcanism in British Columbia. *Canadian Journal of Earth Sciences*, 24, 2521-2536.
- Murphy, D.C., Walker, R.T., and Parrish, R.R., 1991. Age and geological setting of Gold Creek gneiss, crystalline basement of the Windermere Supergroup, Cariboo Mountains, British Columbia. *Canadian Journal of Earth Sciences*, 28, 1217-1231.
- Nelson, J.L., Colpron, M., and Israel, S.K., 2013. The Cordillera of British Columbia, Yukon, and Alaska: tectonics and metallogeny. In: Colpron, M., Bissig, T., Rusk, B., and Thompson, J.F.H., (Eds.), *Tectonics, Metallogeny, and Discovery—the North American Cordillera and similar Accretionary settings*. Society of Economic Geologists, Special Publication 17, pp. 53-109.
- Panteleyev, A., Bailey, D.G., Bloodgood, M.A., and Hancock, K.D., 1996. Geology and mineral deposits of the Quesnel River-Horsefly map area, central Quesnel Trough, British Columbia. *British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Bulletin* 97, 155 p.
- Plouffe, A., Kjarsgaard, I.M., Ferbey, T., D.H.C. Wilton, D.H.C., Petts, D.C., Percival, J.B., Kobylinski, C.H., and R. McNeil, R., 2022. Detecting buried porphyry Cu mineralization in a glaciated landscape: A case study from the Gibraltar Cu-Mo deposit, British Columbia, Canada. *Economic Geology*, 117, 777-799. <<https://doi.org/10.5382/econgeo.4891>>
- Preto, V.A., 1977. The Nicola Group: Mesozoic volcanism related to rifting in southern British Columbia. In: Baragar, W.R.A., Coleman, L.C., and Hall, J.M., (Eds.), *Volcanic Regimes in Canada*. The Geological Association of Canada, Special Paper 16, pp. 39-57.
- Preto, V.A., 1979. Geology of the Nicola Group between Merritt and Princeton. *British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Bulletin* 69, 90 p.
- Rees, C., 2013. The Mount Polley porphyry Cu-Au deposit, southcentral British Columbia, Canada. In: Logan, J., and Schroeter, T.G., (Eds.), *Porphyry Systems of Central and Southern BC: Prince George to Princeton*. Society of Economic Geologists Field Trip Guidebook Series 44, pp. 67-98.
- Rees, C., Gillstrom, G., and Riedell, K.B., 2020. The Mount Polley porphyry copper deposit, south-central British Columbia. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume* 57, pp. 567-600.
- Ryan, J., Hollis, L., Castillo, A., Byrne, K., Bayliss, S.M., Cronin, N., and Grubisa, G., 2020. Geology of the Highland Valley porphyry Cu-(Mo) deposits, south-central British Columbia. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume* 57, pp. 668-689.
- Sacco, D.A., Janzen, B., and Jackaman, W., 2022. Mineral exploration in the central interior copper-gold research projects area, central British Columbia (parts of NTS 093A, B, G, J, K, O): new tools for a proven approach to exploration under cover. In: *Geoscience BC Summary of Activities 2021: Minerals*. Geoscience BC, Report 2022-01, pp. 1-10.
- Schiarizza, P., 2013. The Wineglass assemblage, lower Chilcotin River, south-central British Columbia: Late Permian volcanic and plutonic rocks that correlate with the Kutcho assemblage of northern British Columbia. In: *Geological Fieldwork 2012*, British Columbia Ministry of Energy, Mines and Natural Gas, British Columbia Geological Survey Paper 2013-1, pp. 53-70.
- Schiarizza, P., 2014. Geological setting of the Granite Mountain batholith, host to the Gibraltar porphyry Cu-Mo deposit, southcentral British Columbia. In: *Geological Fieldwork 2013*, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2014-1, pp. 95-110.
- Schiarizza, P., 2015. Geological setting of the Granite Mountain batholith, south-central British Columbia. In: *Geological Fieldwork 2014*, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2015-1, pp. 19-39.
- Schiarizza, P., 2019. Geology of the Nicola Group in the Bridge Lake-Quesnel River area, south-central British Columbia. In: *Geological Fieldwork 2018*, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2019-01, pp. 15-30.
- Schiarizza, P., 2022. Bedrock geology, Stump Lake-Salmon River, parts of NTS 82L/05 and 92I/08. *British Columbia Ministry of Energy, Mines and Resources British Columbia Geological Survey Open File* 2022-03, 1:50,000 scale.
- Schiarizza, P., and Friedman, R.M., 2021. U-Pb zircon dates for the Granite Mountain batholith, Burgess Creek stock, and Sheridan Creek stock, Gibraltar Mine area, south-central British Columbia. In: *Geological Fieldwork 2020*, British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey Paper 2021-01, pp. 23-35.
- Schiarizza, P., and Friedman, R.M., 2023. U-Pb zircon dates for rhyolite and sandstone of Cadwallader terrane, lower Chilcotin River area, south-central British Columbia. In: *Geological Fieldwork 2022*, British Columbia Ministry of Energy, Mines and Low Carbon Innovation, British Columbia Geological Survey Paper 2023-01, pp. 65-84.
- Schiarizza, P., and Preto, V.A., 1987. Geology of the Adams Plateau/Clearwater-Vavenby area. *British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper* 1987-2, 88 p.
- Schiarizza, P., Gaba, R.G., Glover, J.K., Garver, J.I., and Umhoefer, P.J., 1997. Geology and mineral occurrences of the Taseko Bridge River area. *British Columbia Ministry of Employment and Investment, British Columbia Geological Survey Bulletin* 100, 291 p.
- Schiarizza, P., Israel, S., Heffernan, S., Boulton, A., Bligh, J., Bell, K., Bayliss, S., Macauley, J., Bluemel, B., Zuber, J., Friedman, R.M., Orchard, M.J., and Poulton, T.P., 2013. Bedrock geology between Thuya and Woodjam creeks, south-central British Columbia, NTS 92P/7, 8, 9, 10, 14, 15, 16; 93A/2, 3, 6. *British Columbia Ministry of Energy, Mines and Natural Gas, British Columbia Geological Survey Open File* 2013-05; 4 sheets, 1:100,000 scale.
- Struik, L.C., 1988a. Crustal evolution of the eastern Canadian Cordillera. *Tectonics*, 7, 727-747.
- Struik, L.C., 1988b. Regional imbrication within Quesnel Terrane, central British Columbia, as suggested by conodont ages. *Canadian Journal of Earth Sciences*, 25, 1608-1617.
- Struik, L.C., Schiarizza, P., Orchard, M.J., Cordey, F., Sano, H., MacIntyre, D.G., Lapierre, H., and Tardy, M., 2001. Imbricate architecture of the upper Paleozoic to Jurassic oceanic Cache Creek Terrane, central British Columbia; *Canadian Journal of Earth Sciences*, 38, 495-514.
- Tempelman-Kluit, D.J., 1989. Geological map with mineral occurrences, fossil localities, radiometric ages and gravity field

- for Penticton map area (NTS 82E), southern British Columbia. Geological Survey of Canada, Open File 1969, 1:250,000 scale.
- Tipper, H.W., 1959. Quesnel, British Columbia. Geological Survey of Canada, Map 12-1959, 1:253,440 scale.
- Tipper, H.W., 1969. Geology, Anahim Lake. Geological Survey of Canada, Map 1202A, 1:253,440 scale.
- Travers, W.B., 1978. Overtuned Nicola and Ashcroft strata and their relations to the Cache Creek Group, southwestern Intermontane Belt, British Columbia. *Canadian Journal of Earth Sciences*, 15, 99-116.
- Unterschutz, J.L.E., Creaser, R.A., Erdmer, P., Thompson, R.I., and Daughtry, K.L., 2002. North American margin origin of Quesnel terrane strata in the southern Canadian Cordillera: Inferences from geochemical and Nd isotopic characteristics of Triassic metasedimentary rocks. *Geological Society of America Bulletin*, 114, 462-475.
- van Straaten, B.I., Oliver, J., Crozier, J., and Goodhue, L., 2013. A summary of the Gibraltar porphyry copper-molybdenum deposit, south-central British Columbia, Canada. In: Logan, J., and Schroeter, T.G., (Eds.), *Porphyry Systems of Central and Southern BC: Prince George to Princeton*. Society of Economic Geologists Field Trip Guidebook Series 44, pp. 55-66.
- van Straaten, B.I., Mostaghimi, N., Kennedy, L., Gallagher, C., Schiarizza, P., and Smith, S., 2020. The deformed Gibraltar porphyry copper-molybdenum deposit, south-central British Columbia, Canada. In: Sharman, E.R., Land, J.R., and Chapman, J.B., (Eds.), *Canadian Institute of Mining, Metallurgy and Petroleum Special Volume 57*, pp. 546-566.
- Zou, S., Chen, X., Brzozowski, M.J., Leng, C.-B., and Xu, D., 2022. Application of machine learning to characterizing magma fertility in porphyry Cu deposits. *Journal of Geophysical Research: Solid Earth*, e2022JB024584. <<https://doi.org/10.1029/2022JB024584>>