

Exploration and mining in the Thompson-Okanagan-Cariboo Region, British Columbia

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1. Introduction

Thompson-Okanagan-Cariboo is an administrative region in south-central BC, established after the province reorganized its natural resource agencies in 2010. Mining predates Confederation and today, the region is home to five of BC's largest metal mines, several industrial mineral mines, and many small placer operations, gravel pits, and rock quarries. Mineral products include: copper; molybdenum; gold; silver; limestone; bentonite; zeolite; diatomaceous earth; high-alumina shale; precious opal; dimension stone; and aggregate. The region's diverse geology, natural endowment, infrastructure (road, rail, power), and skilled workers sustain the search for new deposits.

In 2014, the region saw one new gold mine open (Bonanza Ledge), one mine placed on care and maintenance after a breach in a tailings dam (Mount Polley), the installation of a new crusher (Copper Mountain), and the commissioning of a new mill (Highland Valley). Most projects in the pre-application stage of environmental review made progress. One project (New Prosperity) was rejected a second time by a Federal review panel.

A Supreme Court of Canada decision in favour of the Tsilhqot'in Nation created Canada's first Aboriginal title area. Subsequently, Tsilhqot'in Nation declared a Tribal Park over a large area in the centre of the region and released a draft mining policy intended to address present and future exploration and mining activities.

Exploration focused on defining or expanding porphyry and porphyry-related deposits (copper-gold; copper-molybdenum), gold deposits of various types, and stratiform base-metal deposits. The pace of exploration slowed in 2014, continuing a decline that started in late 2011. Many projects were inactive because operators were unable to raise venture capital or unwilling to spend it in the region. Exploration expenditures for the region were included in the provincial total (Clarke et al., 2015) but for confidentiality reasons, specific expenditures are not presented herein.

2. Geological overview

The tectonic and metallogenic evolution of the Canadian Cordillera are intimately linked (Fig. 1, e.g., Nelson et al.,

2013). The Thompson-Okanagan-Cariboo region straddles three of British Columbia's five morphogeological belts (from east to west: Omineca; Intermontane; Coast). 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, not shown on Figure 1, include Jura-Cretaceous siliciclastic and local volcanic rocks, Eocene volcanic rocks, Neogene and Quaternary basalt, and Middle Jurassic to Eocene granitic intrusions.

2.1. Cratonic and pericratonic terranes

The Monashee complex, partly represented by a narrow belt along the eastern edge of the region, comprises Paleoproterozoic orthogneiss, interpreted as part of the North American craton, overlain by a Neoproterozoic to Paleozoic cover sequence that includes quartzite, pelitic schist, calc-silicate schist and marble (Armstrong et al., 1991). Basement gneisses, including the Malton gneiss, are also exposed to the north, near Blue River, where they are associated with Neoproterozoic sedimentary sequences (Windermere Supergroup) that were deposited following initial rifting that formed the western margin of ancestral North America (McDonough and Parrish, 1991; Murphy et al., 1991). Extending northwestward from there, Cariboo terrane comprises Neoproterozoic to mid-Paleozoic siliciclastic and carbonate rocks, represented by the Kaza, Cariboo and Black Stuart groups, which are interpreted as distal facies of the North American platform (Struik, 1988a).

Kootenay terrane comprises Neoproterozoic to mid-Paleozoic rocks that are interpreted as deep-water basin 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 extensional deformation (Colpron and Price, 1995). This belt also includes Devonian-Mississippian calc-alkaline to alkaline volcanic rocks and associated granitoid intrusions, found mainly in the Eagle Bay assemblage east and southeast of Clearwater (Schiarrizza and Preto, 1987), which reflect the initiation of east-dipping

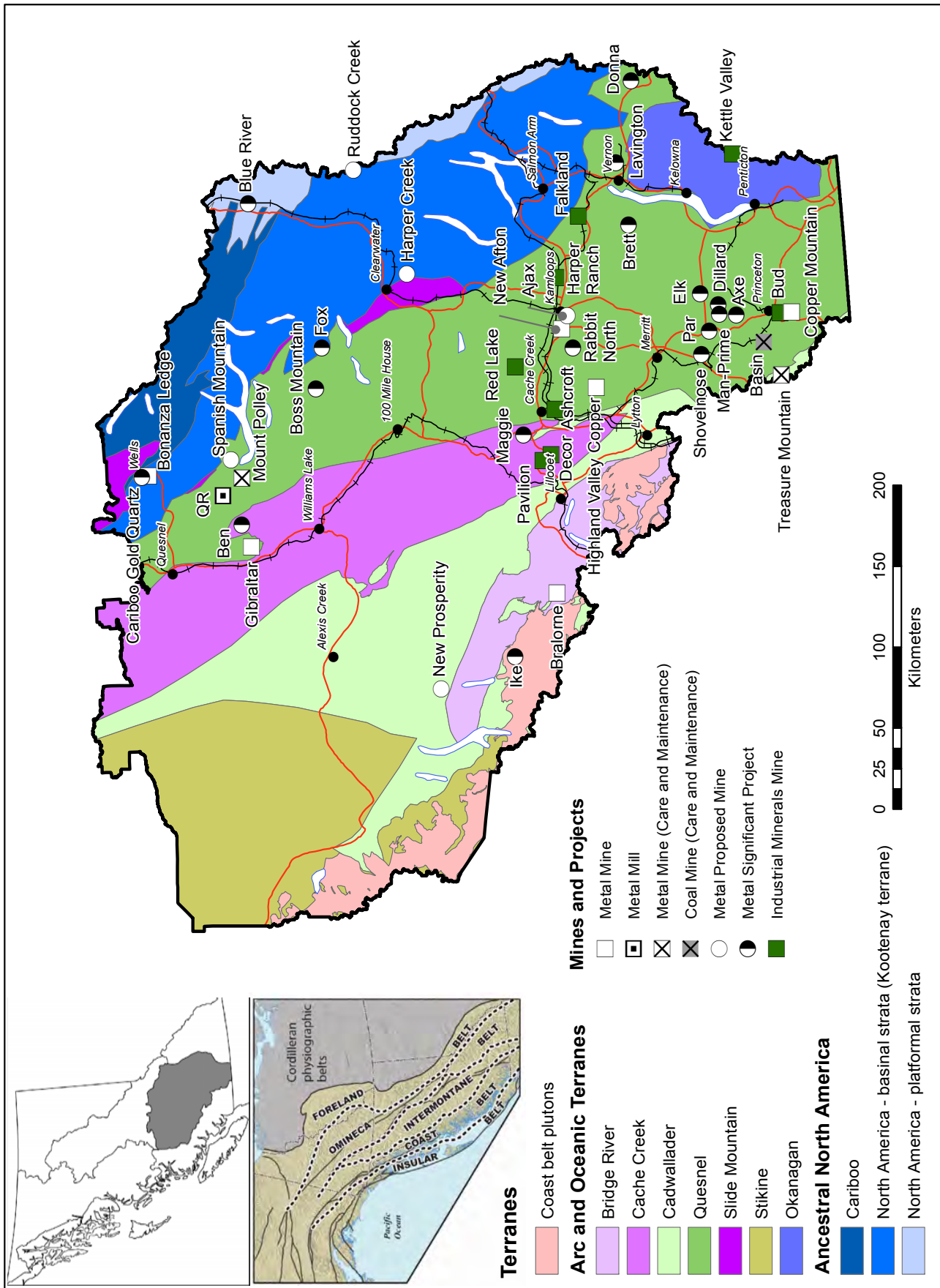


Fig. 1. Mines and selected mineral projects in the Thompson-Okanagan-Cariboo Region, 2014. Terranes modified after Colpron and Nelson (2011) and Nelson et al. (2013).

subduction beneath the North American plate margin. These rocks host polymetallic volcanogenic massive sulphide occurrences, as well as the Harper Creek bulk tonnage copper deposit.

2.2. Arc and oceanic terranes

Slide Mountain terrane comprises the most inboard tract of oceanic rocks in the Canadian Cordillera. It includes the Fennell Formation, near Clearwater; the Antler Formation, near Wells; and in the intervening area, a narrow, discontinuous belt of rocks referred to as the Crooked amphibolite. The Fennell and Antler formations comprise thrust-imbricated sequences of mainly basalt, chert, diabase, and gabbro, ranging from early Mississippian to mid-Permian (Schiarizza and Preto, 1987; Struik and Orchard, 1985). 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 Cu-Mo massive sulphide mineralization at the Chu Chua occurrence.

Quesnel terrane is a Late Triassic to Early Jurassic magmatic arc complex that formed along or near the western North American continental margin (Mortimer, 1987; Struik, 1988a, b; Unterschütz et al., 2002). It also includes a Late Paleozoic arc sequence, represented by the Harper Ranch Group (Beatty et al., 2006) and, in the south, assemblages of oceanic rocks that include the Old Tom, Independence, and Shoemaker formations (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 Late Triassic to Early 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 an eastern sedimentary facies of dark grey siltstone and slate intercalated with quartzite and limestone (Bloodgood, 1990; Schiarizza et al., 2013; Mihalynuk et al., 2015). 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 that includes substantial amounts of rhyolite and dacite (Mortimer, 1987; Preto, 1977, 1979). A younger stratigraphic component of Quesnel terrane comprises Lower to Middle Jurassic sedimentary rocks (Ashcroft Formation, Windy Mountain succession, Dragon Mountain succession) that overlie western parts of the Nicola Group unconformably or disconformably (Travers, 1978; Logan and Moynihan, 2009; Schiarizza et al., 2013).

Quesnel terrane is an important metallogenic province, particularly for porphyry deposits containing Cu, Au, and Mo (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 or alkaline 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 Cu-Mo mines, and the Granite Mountain batholith, host to the Gibraltar Cu-Mo

mine. A well-defined belt farther east comprises younger, latest Triassic alkaline plutons, which host alkalic porphyry Cu-Au deposits, including producing mines at Copper Mountain, Afton and Mount Polley. A third belt, younger and farther to the east, is defined by several large, Early Jurassic calc-alkaline plutons, including the Bromley, Pennask, Wild Horse, Thuya and Takomkane batholiths (Fig. 2).

Cache Creek terrane, comprising Carboniferous to Early Jurassic chert, argillite, basalt, limestone, sandstone, gabbro and serpentized 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 includes Late Triassic blueschists farther north (Ghent et al., 1996), and is interpreted, at least in part, as an accretion-subduction complex that was responsible for generating the Quesnel magmatic arc (Travers, 1978; Struik et al., 2001).

Cadwallader terrane, as interpreted by Schiarizza (2013), forms a belt that 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. The older arc system includes bimodal volcanic rocks and associated intrusions of the Wineglass assemblage, southwest of Williams Lake, and Late Permian intrusive rocks within the Mount Lytton complex (Friedman and van der Heyden, 1992; Schiarizza, 2013). The younger arc system includes Upper Triassic volcanic and sedimentary rocks of the Cadwallader Group and Tyaughton Formation, Late Triassic intrusions in the western part of the terrane and in the Mount Lytton complex, and Lower to Middle Jurassic siliciclastic and local volcanic rocks of the Ladner Group (Schiarizza, 2013, and references therein).

Bridge River terrane occurs 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). Dated cherts and limestones range from Mississippian to late Middle Jurassic, and blueschist-facies metamorphic rocks yielded Middle to Late Triassic Ar-Ar ages (Cordey and Schiarizza, 1993; Schiarizza et al., 1997). The complex is interpreted as an accretion-subduction complex, possibly related to the Mesozoic arc volcanics of the adjacent Cadwallader terrane. Chert-bearing sequences are locally overlain by siliciclastic rocks of the Cayoosh assemblage (Journeay and Mahoney, 1994), which forms the youngest component of the terrane.

Stikine terrane is a mid-Paleozoic to Middle Jurassic arc terrane that is markedly similar to 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 Thompson-Okanagan-Cariboo region by a few scattered exposures of volcanic and sedimentary rocks correlated with the Hazelton Group (Lower to Middle Jurassic; Tipper, 1959, 1969). Upper Triassic volcanic and sedimentary rocks assigned

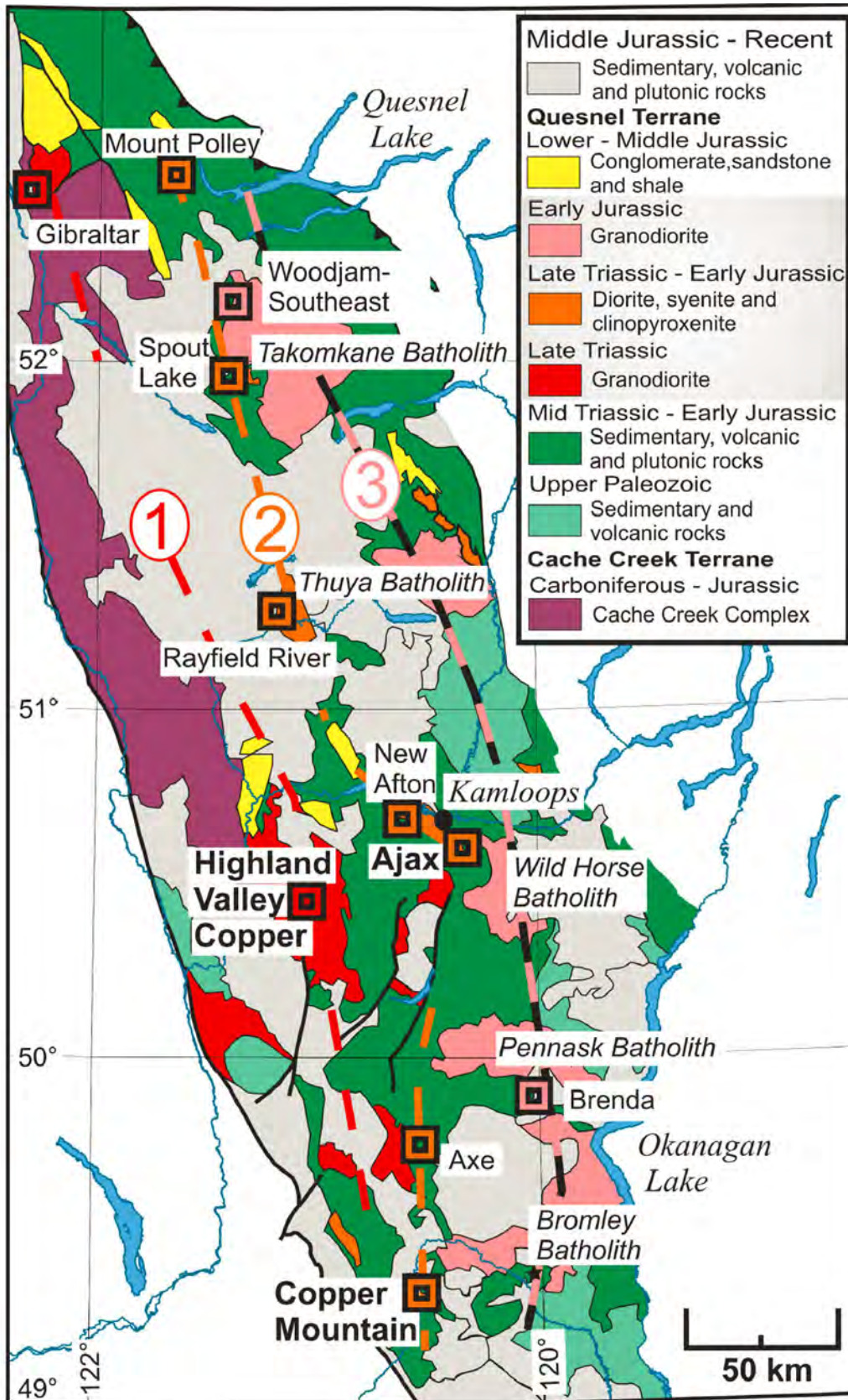


Fig. 2. Generalized geology of southern Quesnellia and Cu±Mo±Au deposits. Mesozoic arc plutons align along the length of southern Quesnellia to define three, north-trending, temporally distinct belts that get younger to the east: 1) Late Triassic; 2) Late Triassic-Early Jurassic; and 3) Early Jurassic. Discrete porphyry copper mineralizing events are directly linked to each of these magmatic episodes. From Logan (2013).

to the Mount Moore and Mosely formations, in the eastern Coast belt west of Chilko Lake, are also assigned to Stikine terrane (Rusmore and Woodsworth, 1991).

2.3. Late Jurassic and younger rocks

Older terranes are overlapped by younger stratigraphic units that, although not shown in Figure 1, cover large parts of the region. These 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 (Scharizza 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 rocks are predominant in some locations, and 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 in age from late Middle Jurassic to Eocene, occur throughout the region, but are shown only in the southwest, where they form part of the Coast Plutonic complex (Fig. 1).

3. Operating mines and quarries

3.1 Metals

With five major operating mines, the Thompson-Okanagan-Cariboo region hosts roughly half of the province's metal mines (Fig.1, Table 1). The Geological Survey of Canada and the British Columbia Geological Survey continue to develop surficial geology methods for detecting buried porphyry-style mineral deposits in drift-covered areas, conducting glacial dispersion, indicator mineral, and basal till geochemical studies near the Highland Valley, Gibraltar, and Mount Polley mines (e.g., Ferbey et al., 2014).

Three years after receiving all necessary permits, **Bonanza Ledge** mine began production in March (Fig. 3). Owned and operated by Barkerville Gold Mines Ltd., the mine is near Wells. It is an open pit, truck and shovel operation with a mine life of four years. Ore is processed at the company's mill at QR mine 100 km away. Ore consists of native gold in quartz veins within pyrite-bearing, carbonaceous and chloritic phyllite. Stated reserves (as of August 2009) include 130,724 tonnes grading 10.227 g/t Au in the proven category and 166,808 tonnes grading 8.114 g/t Au in the probable category.

New Afton gold-copper mine (Fig. 2) is a block cave operation owned by New Gold Inc. that opened in mid 2012 (Hall and May, 2013). Following tests of higher mining and milling rates in 2013, the company laid plans to increase mill capacity from a design rate of 11,000 t/d to 14,000 t/d. Construction of new facilities began late in 2014. Exploration drilling continued expand resources in the C zone, a down-plunge extension of the area now being mined. The deposit forms a high-grade keel beneath the past-producing Afton open pit mine, an alkalic



Fig. 3. Bonanza Ledge, first gold pour in July, 2014. Courtesy of Barkerville Gold Mines Ltd.

porphyry in the Iron Mask batholith (Triassic).

Copper Mountain copper-gold mine, near Princeton (Fig. 2) has been producing since August 2011 (see Holbek and Joyes, 2013). It is operated by a partnership of Copper Mountain Mining Corporation (75%) and Mitsubishi Materials Corporation (25%). The rate of mining has met or exceeded guidance figures, but milling operations have struggled to achieve the targeted 35,000 t/d. A new secondary crusher, completed on budget and on schedule, processed its first ore on 4 August 2014 (Fig. 4). Quarterly mine production in 2014 has exceeded 2013's output by 9 to 27%. A multi-year exploration program seeks to upgrade resources, test ore depths and find mineralization outside the current mine plan. Results of recent British Columbia Geological Survey mapping in southern Quesnellia near Copper Mountain and north to Merritt can be found in Mihalynuk et al. (2013a, b, 2014, 2015).

The **Gibraltar** copper-molybdenum mine operated by Taseko Mines Limited and Cariboo Copper Corp., began



Fig. 4. Parts for new secondary crusher on the way to Copper Mountain mine. Photo courtesy of Copper Mountain Mining Corporation.

Table 1. Operating metal mines, Thompson-Okanagan-Cariboo Region, 2014 (listed alphabetically).

Mine	Operator	Commodity; deposit type; MINFILE	Production	Reserves/Resources	Near-mine exploration	Website
Bonanza Ledge (operations started March 2014)	Barkerville Gold Mines Ltd.	gold; vein; 093H 140	Not available	Reserves (as of 2009-08-17; cut-off 2.8 g/t Au): Proven: 130,700 tonnes grading 10.2 g/t Au (containing 43,000 oz Au); Probable: 166,800 tonnes grading 8.1 g/t Au (containing 43,500 oz Au)		www.barkervillegold.com
Bralorne	Avino Silver and Gold Mines Ltd.	gold; vein; 093JNE001	Not available	Reserve data not available. Resources (M+I as of 2012-08-31): 154,750 tonnes grading 9.11 g/t Au		www.avino.com/s/bralorne
Copper Mountain	Copper Mountain Mining Corporation, Mitsubishi Materials Corporation	copper, gold, silver; alkalic porphyry; 092HSE001	80.8 million lbs Cu; 22,100 oz Au; 456,800 oz Ag	Proven and probable reserves (as of 2013-12-31; 0.18% Cu cut-off): 145 million tonnes grading 0.34% Cu, 0.1 g/t Au and 1.38 g/t Ag; containing 1080 million lbs Cu; 0.54 million oz Au; 6.4 million oz Ag		www.cumtn.com
Gibraltar	Taseko Mines Ltd.	copper, molybdenum; calc-alkalic porphyry; 093B 012	144.5 million lbs Cu; 2516 thousand lbs Mo	Proven and probable reserves (as of 2013-12-31; 0.20% Cu cut-off): 682 million tonnes grading 0.30% Cu; 0.008% Mo; containing 4.5 billion pounds of copper; (4.0 billion pounds recoverable). (Molybdenum data not reported)		www.tasekomines.com/gibraltar
Highland Valley Copper	Teck Highland Valley Copper Partnership	copper, molybdenum; calc-alkalic porphyry; 092ISW012	122,700 tonnes Cu; 5 million lbs Mo	Proven and probable reserves (as of 2013-12-31; cut-off not stated): 663.4 million tonnes grading 0.29% Cu; 0.008% Mo. (Recoverable metal: 1,680,000 tonnes Cu; 30,000 tonnes Mo)	Drilling at Bethlehem; engineering studies	www.teck.com
Mount Polley (operations suspended August 2014)	Imperial Metals Corporation	Copper, gold, silver; alkalic porphyry; 093A 008	Production to August 2014: 24.5 million lbs Cu; 25,900 oz Au; 74,770 oz Ag	Proven and probable reserves (as of 2014-01-01; cut-off not stated): 86 million tonnes grading 0.295% Cu; 0.3 g/t Au; 0.6 g/t Ag; containing 559.5 million lbs Cu; 838,100 oz Au; 1.7 million oz Ag		www.imperialmetals.com/s/MountPolleyMine
New Afton	New Gold Inc.	copper, gold; alkalic porphyry; 092INE023	85.4 million lbs Cu; 102,700 oz Au; 244,200 oz Ag	Probable reserves (as of 2013-12-31): 48.8 million tonnes grading 0.56 g/t Au; 2.2 g/t Ag and 0.84% Cu; containing 879,000 oz Au; 3,500,000 oz Ag; 904 million lbs Cu	Drilling C-zone below current workings	www.newgold.com/properties/operations/new-afton
QR (mine on care and maintenance; mill operates)	Barkerville Gold Mines Ltd.	gold; skarn; 093A 121	Not available	QR deposit depleted. Mill processes ore from Bonanza Ledge mine near Wells		www.barkervillegold.com
Treasure Mountain (on care and maintenance)	Huldra Silver Inc.	silver, lead, zinc; vein; 092HSW016	Not available	Not available		www.huldrasilver.com

production in 1972 and completed its first full year of operation after modernization in 2013. The mine has met guidance of 85,000 t/d from combined mills. The mine was chosen the winner of the 2013 Mining and Sustainability Award by the Mining Association of BC and BC government. The mine is hosted by the Granite Mountain batholith (Late Triassic; see van Straaten et al., 2013 for detailed mine geology). Despite a long production history, the origin of the deposit has been contentious, and it has remained unclear if it formed in Cache Creek terrane or Quesnel terrane. New mapping, stratigraphic, geochronologic, and paleontologic studies by Schiarizza (2014, 2015) demonstrate that the Granite Mountain batholith cuts rocks characteristic of Quesnel terrane (Nicola Group) rather than Cache Creek terrane, and is part of a Late Triassic magmatic belt that includes the Guichon Creek batholith, which hosts the Highland Valley deposit (Fig. 2).

The **Highland Valley Copper** copper-molybdenum mine, operated by Teck Highland Valley Copper Partnership (97.5% Teck and 2.5% Highmont Mining Company Ltd.), is the largest base metal mine in Canada. Mine production focused on the Valley pit as pre-stripping continued for the Lornex pit extension. In March the company commissioned their new mill (Fig. 5). This \$475 million investment will help extend mine life to 2026. The company has achieved throughputs of 139,000 tonnes per day, exceeding its rated capacity of 130,000 tonnes per day. Following ground geophysical survey and drilling programs that started in 2012, Teck Highland Valley Copper Partnership continued to explore targets near the past-producing **Bethlehem** mine and their **Valley** pit. One hundred million tonnes of ore have been delineated at Bethlehem Phase 1. Engineering studies are underway. The company drilled 30 000 metres in 2014. A detailed description of the deposit may be found in Byrne et al. (2013).

Mining at the **Mount Polley** copper-gold-silver mine of Imperial Metals Corporation (Fig. 2) came to an abrupt halt on 4 August 2014 when a tailings dam failed (Fig. 6). Several million cubic metres of water, tailings and construction materials flowed into nearby Polley Lake, Hazeltine Creek and Quesnel Lake. Following this event, government commissioned a panel of experts to examine the cause of the failure and ordered a review of all tailings dams in the province. The panel will deliver its report in early 2015. Before shutdown, the mill had begun processing the first ore extracted from underground workings at the Boundary zone. The alkalic intrusive complex at Mount Polley has at least 8 discrete zones with a total resource inventory of ~411 million tonnes at 0.48% copper equivalent (Measured and Indicated; as of 1 January 2013). Rees (2013) provides a comprehensive review of the Mount Polley deposit.

The **QR** mine of Barkerville Gold Mines Ltd. has operated sporadically in recent years due to depleting ore. Early in 2014, the mill processed ore stockpiled in 2013. In March, QR mill began processing ore trucked in from Bonanza Ledge mine 100 km away.

The **Treasure Mountain mine**, 40 kilometres west of Princeton, was on care and maintenance in 2014 while its



Fig. 5. In March, Highland Valley Copper mine commissioned their new mill, shown here under construction in 2013. Photo courtesy of Teck Highland Valley Copper Partnership.



Fig. 6. Repairing the breached tailings dam at Mount Polley mine, September 2014. Photo courtesy of Imperial Metals Corporation.

owner, Huldra Silver Inc., restructured under the Companies' Creditors Protection Act. The Treasure Mountain deposit is described as a stacked series of high-grade silver-lead-zinc veins in Cretaceous sedimentary rocks of the Pasayten Group in the Methow terrane (Fig. 1). A resource estimate (indicated, non-NI 43-101 compliant) prepared in 2009 was 33,000 tonnes grading 828 g/t Ag, 4.16% Pb, and 3.8% Zn, at a 311 g/t Ag cut-off. Other targets near the mine have not been drilled but have returned high-grade grab samples. Huldra's mill is at the former Craigmont tailings facility, near Merritt.

Through most of 2014, the mill at **Bralorne** gold mine processed approximately 80 t/d from stockpiled and underground resources. In October, Avino Silver and Gold Mines Ltd. acquired Bralorne Gold Mines Ltd. and control of the mine. After takeover, Avino stated that it is reviewing operations and, although the mine has been operating steadily (producing 3842 oz Au in fiscal 2013), considers the mine still

in the exploration and evaluation stage. Ore comes from gold-bearing mesothermal quartz veins between three former mines (Bralorne, King and Pioneer).

3.2. Coal

The region's only coal mine was on care on maintenance in 2014, pending restructuring under the Companies' Creditors Protection Act. Coalmont Energy Corporation started production in June 2013 at their **Basin** mine (Table 2), 18 kilometres west of Princeton. The mine's initial production rate was 250,000 tonnes per year of thermal coal, but the company has permits to increase production to 350,000 tonnes per year. The mine uses a 250 tonne per hour Parnaby wash plant, which eliminates the need for a tailings pond. Cleaned coal moves by truck and barge to Texada Island for shipment to local and overseas markets. Production comes from Eocene rocks in a half graben; the Main seam is about 32 metres thick and has four coal units separated by thin layers of siltstone, tuff or ironstone. Twenty-seven metres below the Main seam is the Lower seam (7 metres thick), which remains an exploration target.

3.3. Industrial minerals

Over ten industrial mineral quarries and processing plants operate in the region (Fig. 1; Table 3). These operations employ more than 250 people.

The **Kamloops** cement plant and **Harper Ranch** limestone quarry of Lafarge Canada Inc. continue to supply cement to meet demand in western Canada. Lafarge also draws materials from the **Falkland** gypsum quarry. **Buse Lake** quarry, which supplied alumina-silica rock to Lafarge, closed in 2013. A loess deposit near the plant provides suitable alternative material.

The **Decor** pit of Pacific Bentonite Ltd., 20 kilometres west of Cache Creek, supplies alumina-rich burnt shale to the Lafarge cement plant in Kamloops. The property also hosts a large bentonite deposit, which is being investigated for municipal engineering and tile manufacturing applications. Deeper in the same section is the Hat Creek coal deposit. A few kilometres farther west, Graymont Western Canada Inc. operates the **Pavilion** limestone quarry and lime plant. The operation produces quicklime, high-calcium limestone fines, screened high-calcium stone products, lime kiln dust and rip rap. Graymont has a forty-year lease with the Ts'kw'aylaxw First Nation to mine on their reserve, and most of the operation's employees are Ts'kw'aylaxw. Five kilometres east of Ashcroft, IG Machine and Fiber Ltd., a subsidiary of IKO Industries Ltd., operates the **Ashcroft** basalt quarry and roofing granule plant.

In January 2014 Craigmont Industries Ltd. started producing magnetite from their new recovery plant at **Mount Polley** mine. Operations halted in August due to the tailings dam failure. The plant captures magnetite from the mine's tailings stream and produces a dense media for coal washing operations.

At their plant in Kamloops, Absorbent Products Ltd. manufactures cat litter, barn deodorizer, industrial absorbents, and carriers for agricultural products prepared from diatomaceous earth from the **Red Lake** quarry, 45 kilometres northwest of Kamloops, and bentonite from the **Bud** quarry 7 kilometres south of Princeton.

In September, Canadian Mining Company Inc. concluded its option agreement with Heemskirk Canada Ltd. and in October regained full control of the **Zeotech/Bromley Creek** zeolite quarry, 6 kilometres east of Princeton. Zeolite from the quarry has agricultural and absorbent applications.

Opal Resources Canada Inc. produces gem quality fire opal from the **Klinker** property, 25 kilometres northwest of Vernon. Opal forms fracture and vesicle-fillings in andesitic to basaltic lahars and breccias in the Kamloops Group (Eocene).

Decorative rock and dimension stone are produced at small quarries throughout the region. Kelowna Sand and Gravel mines gneiss, dacite ash, 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 processes this material to produce flagstone, ashlar, facing stone, and landscape rock. In 2010, Spectral Gold Corp. began developing the **Lady King Basalt** deposit, near Vernon, selling basalt columns as landscape rock.

3.4. Placer, aggregate, and rock

Fifty six quarries, 480 sand and gravel pits and 704 placer mines (701 surface operations and 3 underground) were 'active' in 2014. 'Active' refers to the status of the permit and therefore also includes mines undergoing reclamation and closure. Most of these operations are small, intermittent or seasonal, and lack production data.

4. Proposed mines

Five projects are in this category: **New Prosperity, Ajax, Ruddock Creek, Spanish Mountain** and **Harper Creek** (Fig. 1, Table 4).

The **New Prosperity** project of Taseko Mines Limited, 125 km southwest of Williams Lake, is described as a gold-copper porphyry with Proven and Probable reserves of 830 million tonnes grading 0.42 g/t Au and 0.23% Cu. In February, the Federal government announced it would not issue the

Table 2. Operating coal mine, Thompson-Okanagan-Cariboo region, 2014.

Mine	Operator	Commodity; MINFILE	Production	Reserves	Near-mine exploration	Website
Basin	Coalmont Energy Corp.	Thermal coal; 092HSE157	On care and maintenance in 2014	Not available	Not reported	coalmontenergy.com

Table 3. Industrial mineral mines, Thompson-Okanagan-Cariboo Region, 2014, (listed alphabetically).

Mine	Operator	Commodity; MINFILE	Production	Reserves/ Resources	Website
Ashcroft	IG Machine and Fibers Ltd. (IKO Industries Ltd.)	Basalt (roofing granules); 092INW104	350,000 t		www.iko.com
Bromley Creek (Zeotech)	Canadian Mining Company Inc.	Zeolite; 092HSE 243	On care and maintenance in 2014	Measured and Indicated Resources (2013-06-30): 550,000 t	www.canadianmining.ca
Bud	Absorbent Products Ltd.	Bentonite; 092HSE162	Not available		www.absorbentproductsltd.com
Decor	Pacific Bentonite Ltd.	Alumina, landscape rock; 092INW084	100,000 t		pacificbentonite.com
Falkland	Lafarge Canada Inc.	Gypsum; 082LNW001	6000 t		None
Harper Ranch	Lafarge Canada Inc.	Limestone; 092INE001	220,000 t		www.lafarge-na.com/wps/portal/na/en/2_8_3-OurPlants
Kettle Valley Quarries	Kelowna Sand and Gravel Ltd. / Kettle Valley Stone Company	Ashlar, flagstone, thin veneer: 082ENW109, 111, 112	Not available		www.kettlevalleystone.com
Klinker	Opal Resources Canada Inc.	Opal; 082LSW125	Intermittent operation		www.opalscanada.com
Lady King Basalt	Spectral Gold Corp.	Basalt columns; N/A	Intermittent operation		www.lady-king-basalt.com
Mount Polley Magnetite	Craigmont Industries Ltd.	Magnetite (recovered from tailings); 093A 008	Not available. Plant operated January-August 2014		www.craigmontmag.com
Pavilion	Graymont Western Canada Inc.	Limestone; 092INW081	190,000 t		www.graymont.com/en/locations/lime-plants/western-canada/lime-plant/pavilion
Red Lake	Absorbent Products Ltd.	Diatomaceous earth; 092INE081	Not available		www.absorbentproductsltd.com

authorizations needed for the project to proceed. Taseko is now seeking judicial reviews of the Federal decision.

KGHM International continued engineering and baseline studies to advance their **Ajax** porphyry copper-gold project, on the outskirts of Kamloops. The company expects to enter federal and provincial environmental review processes in the second quarter of 2015. Early in 2014 the company changed their mine plan to address concerns raised by residents of Kamloops. Dry tailings piles were replaced by conventional tailings ponds and some waste piles were moved farther from city limits. Late in the year the company released revised application information and environmental impact statements for public review. During the year, the company explored nearby deposits such as DM-Audra and Rainbow. All mineralization occurs in the Iron Mask

batholith, a multi-phase, alkaline intrusive complex (Fig. 2).

At the **Ruddock Creek** massive sulphide prospect, 75 kilometres northeast of Clearwater (Fig. 1), Imperial Metals Corporation focused on metallurgical testing of a new sample from the Upper E zone, and collecting environmental baseline data in preparation for future permitting requirements. In July, the Canadian Environmental Assessment Agency agreed that, for the environmental review of this project, the Province of BC's process is an appropriate substitute for the federal process. As a result, in October the BC Environmental Assessment Office formally established the scope, procedures, and methods for the forthcoming environmental review.

The project is owned by Imperial Metals Corporation (50%) and joint venture partners Mitsui Mining and Smelting

Table 4. Proposed mines, Thompson-Okanagan-Cariboo Region, 2014. Reserve categories are Proven and Probable, resource categories are Measured and Indicated.

Mine	Operator	Commodity; deposit type; MINFILE	Reserves and Resources	Work program	Significant results	Website
Ajax	KGHM Ajax Mining Inc.	Cu, Au; Alkalic porphyry 092INE 012, 13	Resources (M+I): 512 million tonnes grading 0.31% Cu; 0.19 g/t Au	Baseline and engineering studies; exploration and condemnation drilling	Revised mine layout; draft AIR and EIS reports.	www.ajaxmine.ca/
Harper Creek	Yellowhead Mining Inc.	Cu, Au, Ag; Stratiform, volcanic-hosted 082M 008, 9	Reserves (P+P; cut-off 0.14% Cu): 716 million tonnes grading 0.26% Cu; 0.029 g/t Au; 1.18 g/t Ag	Baseline and engineering studies	Revised resource estimate.	www.yellowheadmining.com
New Prosperity	Taseko Mines Ltd.	Cu, Au; Calc-alkalic porphyry; 092O 041	Reserves (P+P; cut-off not stated): 831 million tonnes grading 0.23% Cu and 0.41 g/t Au; containing (recoverable) 3.6 billion lbs Cu; 7.7 million oz Au	Legal review of Federal EA decision	Pending.	newprosperityproject.ca
Ruddock Creek	Ruddock Creek Mining Corporation	Pb, Zn, Ag; Monashee-type sediment-hosted massive sulphide; 082M 082	Resources (M+I; cut-off 4.0% Pb+Zn): 6.2 million tonnes grading 6.50% Zn, 1.33% Pb	Baseline and engineering studies; design of review process	Government support for streamlined review process.	www.imperialmetals.com
Spanish Mountain	Spanish Mountain Gold Ltd.	Au, Ag; Sediment-hosted gold; 093A 043	Resources (M+I; cut-off 0.20 g/t Au): 237.8 million tonnes grading 0.46 g/t Au; 0.69 g/t Ag; containing 3.5 million oz Au; 5.28 million oz Ag	Reverse circulation drilling; baseline and engineering studies	Improved data for resource evaluation.	www.spanishmountaingold.com

Co. Ltd. (30%) and Itochu Corporation (20%). The operator and manager of the joint venture is the Ruddock Creek Mining Corporation. The deposit is described as sedimentary exhalative, Monashee or Broken Hill-type, in marble, gneiss and calc-silicate rocks. A mineral resource estimate, released in March 2012, reported 4.65 million tonnes grading 6.77% Zn and 1.38% Pb (Indicated) and 5.38 million tonnes grading 6.69% Zn and 1.31% Pb (Inferred), using a 4.0% combined Pb+Zn cut-off.

The **Harper Creek** copper-gold-silver project, 90 km north of Kamloops, is described as a stratiform, disseminated volcanogenic deposit in metamorphosed volcanic and sedimentary rocks of the Eagle Bay Formation. In November, Yellowhead Mining Inc. submitted an application for an environmental assessment certificate to provincial and federal authorities, concluding a 10-month process of updating and revising an earlier application. If accepted, this will mark

the start of formal review for the **Harper Creek** project. Earlier in the year, the company released an updated, and positive, feasibility study (Merit Consultants, 2014). Proven and Probable mineral reserves now stand at 716 million tonnes grading 0.26% copper; 0.029 grams per tonne gold and 1.2 grams per tonne silver. The study proposes a 70,000 t/d operation with a mine life of 28 years. Initial capital costs would exceed \$1 billion.

Spanish Mountain Gold Ltd. continued to drill reverse-circulation holes in the proposed open pit area (Main zone) of its **Spanish Mountain** sediment-hosted gold deposit (Fig. 7), 70 kilometres northeast of Williams Lake, in order to refine resource estimates. This method of drilling results in better recovery of friable material than diamond drilling and allows more accurate sampling of mineralized layers. In April the company released an updated resource estimate. Measured and Indicated resources (using a cut-off grade of 2 grams per tonne)



Fig. 7. Upper Triassic metamorphosed siliciclastic rocks host disseminated and vein-controlled gold at Spanish Mountain.

are 237.8 million tonnes grading 0.46 grams per tonne gold and 0.69 grams per tonne silver. Baseline environmental studies continue as the company prepares for formal environmental review.

5. Exploration highlights

Exploration in 2014 focused on defining or expanding porphyry and porphyry-related deposits (copper-gold; copper-molybdenum), gold deposits of various types, and stratiform base-metal deposits. Herein, projects are grouped by deposit type and location (Fig. 1; Table 5).

5.1. Porphyry and porphyry-related deposits

Over the past few years, the southern end of the Quesnel terrane, between Aspen Grove and Princeton, has seen renewed exploration interest (see also Mihalynuk et al., 2013a, b, 2014, 2015 for results of recent British Columbia Geological Survey mapping, and Logan and Mihalynuk 2014 for a review of Cordilleran porphyry deposits). From north to south, some of the larger properties (and their operators or owners) include: **Big Kidd** (Julian Resources Inc.); **Par/Aspen Grove** (60% Kaizen Discovery Inc./40% Itochu Corp.); **Man-Prime** (Sunrise Resources Ltd.); **Dillard** (Fjordland Exploration Inc./Sumac Mines Ltd.); **Allison Lake**; **Hit/Aspen Grove South** (Colorado Resources Ltd.); **Axe** (Copper Mountain Mining Corp./Weststar Resources Corp.); **Castle** (Blue River Resources Ltd.); **Miner Mountain** (Sego Resources Inc.); **Copper Mountain** mine (Copper Mountain Mining Corp.); and **Princeton** (Anglo Canadian Mining Corp.).

In November, Fjordland Exploration Inc. and Sumac Mines Ltd. released preliminary results from drilling at their **Dillard** porphyry copper-gold project, 35 kilometres north of Princeton. Dillard West (7 holes; 3160 metres) tested coincident soil geochemistry and IP targets in a target area that measures 1400 by 1200 metres. The company trenched and sampled the Dillard East target, which now measures 2000 by 1500 metres, and drilled 3160 metres in 7 holes. Assays ranged from

0.1 to 0.25% copper over drill lengths of 6 to 153 metres. The company will release a detailed analysis in 2015.

In November, Colorado Resources Ltd. announced they had consolidated ownership of a large block of claims covering their **Hit-Aspen Grove** property (over 21,000 hectares). Earlier they announced plans to continue surface geochemical and geophysical surveys and compile historical data. Results are pending.

In December, Kaizen Discovery Inc. released preliminary results from drilling at the **Par** prospect on their Aspen Grove property, 45 kilometres north of Princeton. One hole intersected 9 metres grading 0.24% copper, 0.8% zinc and 6.4 grams per tonne silver. Another hole intersected 16 metres grading 0.3% copper. Mineralization occurs in variably altered Nicola Group volcanic and volcanoclastic rocks. To account for diverse mineralogy, alteration, and chemistry, the company suggests there may have been two superimposed mineralizing events: an early stage, massive to semi-massive volcanogenic event followed by a hybrid high-level porphyry-high sulphidation epithermal system. The company plans further work in 2015 to test the extent of mineralization and their exploration model.

In August, Sunrise Resources Ltd. announced plans to drill the **Man-Prime** property to follow up on their 2013 drill intersection on 124 metres of 0.25% copper and 0.08 grams per tonne gold.

In 2013, Copper Mountain Mining Corporation optioned the **Axe** property from Weststar Resources Corporation. Late in 2014 Copper Mountain commenced a 1500 metre drill program to test geophysical anomalies at the Main, West and Adit zones. The exploration target at Axe is a copper (molybdenum, gold, silver) porphyry in volcanic and sedimentary rocks of the Nicola Group (Triassic) that have been intruded by diorite-monzonite stocks of similar age. Resources at Axe (based on pre-2006 drilling, but compatible with NI43-101 standards) include 39 million tonnes grading 0.38% copper (Indicated) and 32 million tonnes grading 0.38% copper (Inferred).

Teck Resources Limited continued to explore targets near its **Highland Valley** copper-molybdenum mine hosted by the Guichon batholith (Fig. 2) with a focus on the Valley and Bethlehem pits. To date drilling has confirmed 100 million tonnes of new ore at Bethlehem. Ongoing engineering studies will determine how to mine and process it.

Tower Resources Ltd. announced results from their **Rabbit North** project, 25 kilometres southwest of Kamloops. Rabbit North comprises porphyry-style mineralization and alteration in Nicola Group volcanosedimentary rocks and coeval Durand stock. Tower reported extensions of known zones and the discovery of two new copper-gold targets: Kwil and KV.

In March, Constantia Resources Ltd. completed the first phase of drilling at the **Maggie** project, a porphyry copper-molybdenum prospect north of Cache Creek. Results are being evaluated. As part of their ongoing community engagement, Constantia opened a community office in Cache Creek, announced \$30,000 in scholarships to help ten students become drill core technicians, and reached a cooperation and benefits

Table 5. Selected exploration projects, Thompson-Okanagan-Cariboo Region, 2014 (listed alphabetically).

Property	Operator	MINFILE	Commodity	Deposit type	Work program	Significant results	Website
Axe	Copper Mountain Mining Corporation	092HSE040, 142, 143	Cu, Au	Porphyry	Drilling	Not available	www.cumtn.com; www.weststarresources.com
Brett	Ximen Mining Corp.	082LSW110	Au	Vein/disseminated	Geology, geochemistry; geophysics; drilling	New targets; improved geological model	ximenminingcorp.com
Ben	Westhaven Ventures Inc.	n/a	Au, Co, Ni	Uncertain	Geophysics; drilling	New targets; improved geological model	www.westhavenventures.com
Bethlehem	Teck Highland Valley Copper Partnership	092ISE001	Cu, Mo	Porphyry	Drilling; engineering studies	Resource definition	www.teck.com
Cariboo Gold Quartz (Cow Mountain)	Barkerville Gold Mines Ltd.	093H019	Au	Vein/Breccia	Drill core re-assay program; resource evaluation	Improved resource definition	www.barkervillegold.com
Dillard	Fjordland Exploration Inc./Sumac Mines Ltd.	092HNE042	Cu	Porphyry	Geochemistry, trenching; drilling	Mineralized zones extended	www.fjordlandex.com
Donna	Interconnect Ventures Corporation	082LSE016	Au, Ag	Vein/stockwork	Drilling	Not available	www.alpha-aex.com
Elk (Siwash North)	Gold Mountain Mining Corporation	092HNE096	Au, Ag	Vein/Breccia	Bulk sampling; metallurgy	Improved recovery	www.aumtn.com
Fox / Ridley Creek	Happy Creek Minerals Ltd.	093A 259	W, Mo, Ag	Skarn	Geology	New prospects	www.happycreekminerals.com
Ike	Amarc Resources Ltd.	092O 025	Cu, Mo, Ag	Porphyry	Geology, geochemistry; geophysics; drilling	New Cu-Mo-Ag discovery	www.amarcresources.com
Lavington	Asher Resources Corporation	082LSW120	Au	Vein/shear zone	Drilling	Mineralized zone extended; improved geological model	www.asher-resources.com
Maggie	Constantia Resources Ltd.	092INW015	Cu, Mo, Ag	Porphyry	Drilling; community engagement	Drill results not available	www.constantiaresources.com
Man-Prime	Sunrise Resources Ltd.	092HNE243	Cu, Au	Porphyry	Drilling	Not available	www.sunriseresourcesltd.ca
Par (Aspen Grove)	Kaizen Discovery Inc.	092HNE169	Cu, Zn, Mo, Ag, Au	Mixed (porphyry/VMS)	Drilling	Mineralized zone extended; improved geological model	www.kaizendiscovery.com
Rabbit North	Tower Resources Ltd.	n/a	Cu, Au	Porphyry	Prospecting; geophysics; geochemistry	New mineral zones	www.towerresources.ca
Shovelnose	Westhaven Ventures Inc.	092HNE309	Au	Vein/Breccia	Drilling	Mineralized zone extended	www.westhavenventures.com

agreement with High Bar First Nation. Maggie is described as a typical, calc-alkaline porphyry deposit in which copper and molybdenum occur in stockwork veins and as disseminations. The intrusive is a multi-phase, Tertiary(?) quartz monzonite porphyry. Host rocks are part of the Carboniferous to Permian Cache Creek assemblage, consisting of deformed sedimentary and volcanic sequences of low metamorphic grade that are intruded by pyroxenite dikes and sills.

In October, NMC Resource Corporation completed a drilling program at **Boss Mountain**, a past-producing molybdenum mine in the Takomkane batholith, 90 kilometres east of 100 Mile House. Drilling in the existing open pit confirmed the tenor of mineralization and demonstrated extensions to depth. The company plans more drilling in 2015.

Amarc Resources Ltd. drilled the **Ike** property in the South Chilcotin Mountains, 110 kilometres northwest of Lillooet. The target is copper-molybdenum-silver porphyry mineralization in an extensive alteration zone in the Coast Plutonic complex. The project includes the Tasco (or Chilcotin Belle) mineral occurrence. In November, the company announced discovering copper and molybdenum mineralization in an area measuring 1200 x 600 metres. Drill intersections range from 90 to 310 metres grading ~0.3% copper, ~0.03% molybdenum and ~2 grams per tonne silver. Mineralization occurs as replacements and veins in granitic rocks that show evidence of repeated pulses of magmatism (Fig. 8). The mineralized zone has been tested to depths of 500 metres and remains open in all directions.

5.2. Skarn

Happy Creek Minerals Ltd. continued surface exploration at its **Fox** tungsten skarn property, 115 kilometres east of Williams

Lake. Prospecting and sampling expanded known zones and discovered new areas of favourable host rock with indications of tungsten mineralization. The company plans more work next year. Skarn mineralization is in flat lying Neoproterozoic to Lower Paleozoic Snowshoe Group sedimentary rocks that have been intruded by the Deception stock, a mid-Cretaceous (106 Ma) pluton that ranges in composition from quartz monzonite to muscovite-biotite granite.

GWR Resources Inc. was again unable to mount an exploration program this year at their **Lac La Hache** Project. The project embraces a large area (400 km²) with multiple deposit types and exploration targets, ranging from high-grade, massive to semi-massive, skarns, veins, replacements and breccias to lower grade porphyries and disseminations.

5.3. Gold deposits (including vein, breccia, disseminated, sediment-hosted)

In December 2013, Ximen Mining Corp. acquired **Brett**, an epithermal gold property in Kamloops Group volcanic rocks, 30 kilometres west of Vernon, on the west side of Okanagan Lake. Brett has seen intermittent exploration since its discovery in 1985 and, in 1995, briefly produced ore from pits and underground workings. Ximen conducted new mapping and geophysical surveys. Alteration on the property destroyed magnetite so magnetic lows can be suitable targets. Drilling at one large magnetic low, northeast of the main vein, intersected zones of silicified breccias similar to those found at Blackwater and Newton gold prospects. Further results will be released in 2015.

At the **Elk** project, between Merritt and Peachland, Gold Mountain Mining Corporation continued work on their open pit bulk sample test. One goal of the project is to compare assay

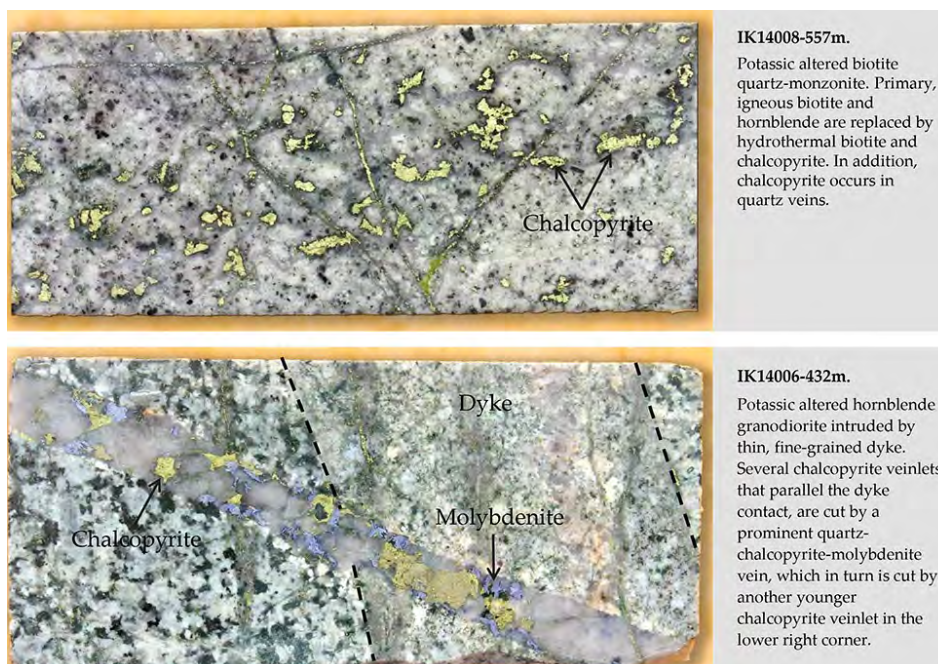


Fig. 8. Copper-molybdenum mineralization from the Ike discovery, South Chilcotin Mountains. Image courtesy of Amarc Resources Ltd.

results from mined material and exploration holes drilled the same area.

In 2013, Interconnect Ventures Corporation optioned the **Donna** property from Alpha Exploration Inc. Late in 2014, Interconnect commenced a 500 metre drill program to test a bulk-tonnage gold-silver target in sedimentary, volcanoclastic, and carbonate rocks of the Thompson assemblage (Carboniferous to Permian) intruded by a quartz diorite stock. Mineralization occurs in veins and stockworks related to a north-trending fault system near the intrusive contact. Results are expected in 2015.

Asher Resources Corp. drilled the Lavington prospect, 10 kilometres east of Vernon. Their target is shear-hosted gold in altered Nicola Group rocks. Drilling intersected long intervals of low-grade gold mineralization and extended mineralization to depth.

Barkerville Gold Mines Ltd. reported progress on their **Cariboo Gold Project**, 85 km east of Quesnel. The project is exploring a block of claims that covers more than 117,000 hectares and includes three historic groups of Crown grants (Cariboo Group, Island Mountain Group, and Mosquito Creek Group). In 2014, the company focused on systematic resampling of drill core to improve the quality of data for future resource estimates. Independent consultants Snowden Mining Industry Consultants Inc. and APEX Geoscience Ltd. are directing the work.

Berkwood Resources Ltd. conducted ground geophysics on their **Prospect Valley** property, 30 km west of Merritt, and extended a prospective trend 1200 metres south from the South Discovery zone. Quartz-chalcedony veins and silicified rocks have helped define a new prospective area (the QCA zone) which the company plans to follow up in 2015. Mineralization discovered to date is described as a low-grade, epithermal gold system with potential for higher grade zones. Drilling has outlined an NI 43-101 compliant mineral resource. Taken together, the North and South Discovery zones have approximately 10 million tonnes grading 0.5 g/t Au (Inferred; using 0.3 g/t Au cut off). A number of geophysical and geochemical targets remain to be tested.

Westhaven Ventures Inc. is working to acquire a 70% interest in the **Shovelnose** property, 30 kilometres south of Merritt, under an option agreement with Strongbow Exploration Inc. In 2014 Westhaven explored the Tower Creek zone, a recently recognized epithermal gold system. Au-Ag mineralization occurs in quartz stockworks and silicified zones in felsic tuffs. Six holes encountered anomalous gold and extended the area of known mineralization. Mineralization extends over an area at least 2 km east-west and 100 metres north-south, hosted in felsic volcanic rocks of the Spences Bridge Group (Cretaceous).

5.4. Stratiform base metal deposits

In the Adams Plateau area, 35 kilometres northeast of Barriere, SolidusGold Inc. (formerly Mantra Capital Inc.) commenced preliminary exploration on the **Honeymoon** project optioned from prospector David Piggitt. Grab samples with 0.6 to 0.8% copper and 6 to 35 grams per tonne silver

occur in metasedimentary rocks of the Eagle Bay assemblage.

In the Mabel Lake area, 60 kilometres northeast of Vernon, prospectors Robert Thompson, Renee Hetherington, and Colin Dunn used biogeochemical (Fig. 9) and geophysical methods to find new showings of Monashee-type massive sulphide mineralization in dense forests on the **TL** and **CD** properties. Grab samples returned up to 19% zinc.



Fig. 9. At the TL project, Mabel Lake area, biogeochemistry helps find massive Pb-Zn sulphides in dense forest with no outcrop.

5.5. Nickel

Westhaven Ventures Inc. reported positive results for nickel from drilling at the **Ben** project, 50 kilometres north of Williams Lake. Best intersections returned almost 20 metres of 0.3% nickel. The property is underlain by Cache Creek terrane. Nickel-cobalt mineralization appears to be related to ultramafic rocks; other parts of the Ben property have gold mineralization. The unusual geochemical association may represent superimposed mineralizing systems, or faults juxtaposing disparate assemblages.

6. Outlook for 2015

Foreseeable economic conditions seem to offer few incentives for exploration. Financing grassroots or early stage projects may be especially challenging. Some mines may reduce production or be placed on care and maintenance as a result of weak commodity prices.

Uncertainties also stem from the Supreme Court of Canada's landmark decision on Aboriginal title. Creation of this new form of title has raised questions about the applicability or validity of federal and provincial statutes, regulations, tenure and permits. Future years may see new claims for Aboriginal title areas in the region.

It is likely that the Tsilhqot'in National Government will develop management plans for the Dasiqox Tribal Park and release further drafts of their mining policy. Future work in the Chilcotin Range or Taseko Lakes area (e.g., New Prosperity; Ike; Ridgestake; Chita) may be affected because they lie within

the proposed boundaries of the tribal park. Technical analysis of the Mount Polley tailings dam failure may shape mining practices in the years ahead.

Two projects (Harper Creek and Ajax) should enter formal environmental review. Legal decisions on New Prosperity appeals may take more than one year to resolve. Most of the exploration projects that were active in 2014 generated positive results and are likely to continue. If economic conditions improve, grassroots exploration should pick up in the Eagle Bay assemblage near Barriere, and the Quesnel terrane, in particular between Merritt and Princeton and between 100 Mile House and Quesnel.

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