

NORTHWEST REGION

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SUMMARY

Five mines operated during the year. Eskay Creek mine expanded mill capacity and increased gold and silver production but did not discover any new mineralized zones in its ongoing exploration program. Huckleberry mine produced copper ore from the new Main zone pit but the grade is lower than the East starter pit so copper production decreased. Endako mine lowered production cost by operating an in-pit crusher but may be unable to stave off closure due to the low price of molybdenum. Golden Bear mine completed the Ursa pit and accelerated mining of the Kodiak B deposit to achieve record gold output. However, heap-leach reserves are exhausted and the mine will close in 2002. Closed since 1992, Cassiar mine resumed production of chrysotile asbestos but, with start-up difficulties seemingly overcome, the rebuilt mill was destroyed by a fire during a Christmas shutdown.

Major drilling programs were carried out at Eskay Creek mine, the Morrison porphyry copper prospect and the Silvertip silver-lead-zinc manto deposit. A ground geophysical survey completed on the RDN property sought an Eskay Creek-type massive sulphide deposit signature; drilling is anticipated in 2001. Drill targets were also established on the Thorn epithermal precious metal property through discovery of new showings and based on results of an airborne geophysical survey. The Chisholm Lake porphyry copper project was optioned by the Hunter Dickinson Group which performed geochemical and geophysical surveys.

Exploration spending in the Northwest was \$6.5 million, a modest increase from 1999 but much lower than in the previous ten years (see Figure 1). Exploration drilling, an indicator of work on advanced properties, also showed a modest increase to 31 735 metres, but is far below the average of recent years (see Figure 2). Grassroots activity continued to languish. For the fourth successive year, the number of mineral claim units in good standing decreased as forfeitures exceeded new claims by 3195 units (see Figure 3). Major exploration projects are listed in Table 1 and their locations shown in Figure 4.

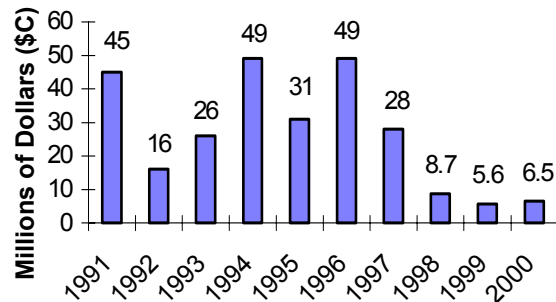


Figure 1. Mineral exploration expenditures in Northwest British Columbia.

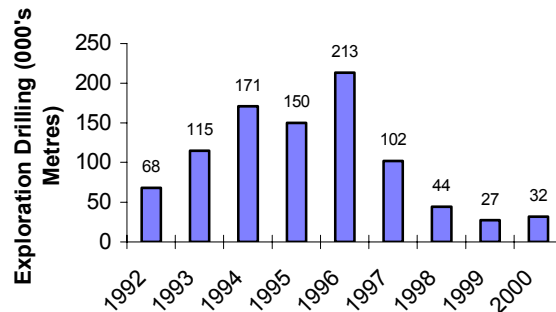


Figure 2. Exploration drilling in Northwest British Columbia.

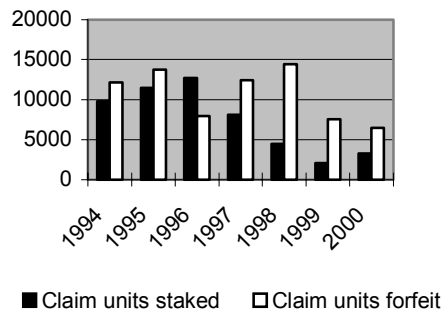
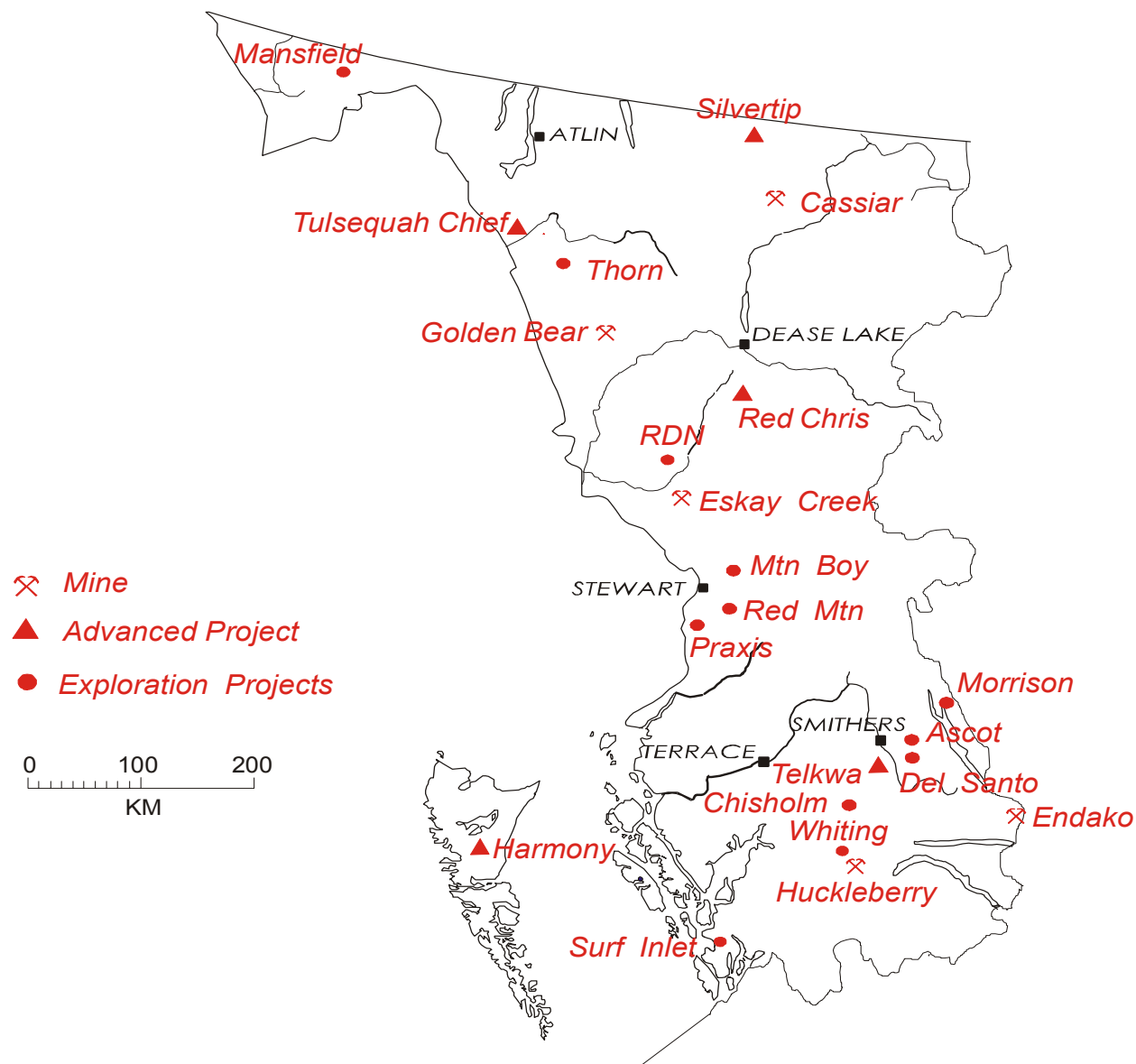


Figure 3. Claim activity summary, Northwest British Columbia.

Table 1. Major Exploration Projects, 2000

Property	Operator	MINFILE	NTS	Commodities	Deposit Type	Work Done
Eskay Creek	Homestake Canada Inc.	104B 008	104B/9	Au, Ag	Epithermal VMS	Drill access, 250 m; 51 ddh, 22 080 m
Huckleberry	Huckleberry Mines Ltd.	93E 037	93E/11	Cu, Mo	Porphyry	12 ddh, 1761 m
Morrison	Pacific Booker Minerals Inc.	93M 007	93M/1	Cu, Au	Porphyry	Trenching, 2000 m; 23 ddh, 6270 m
RDN	Rimfire Minerals Corp.	104G 144	104B/15, 104G/2	Au, Ag	Epithermal VMS	Geol; Grid, 30 km; Pulse EM & Mag, 30 km; Soil Geochem
Silvertip	Imperial Metals Corp.	104O 038	104O/16	Ag, Zn, Pb	Manto	22 Udh, 3210 m
Thorn	Rimfire Minerals Corp.	104K 031	104K/10	Au, Ag	Epithermal	Airborne EM-Mag, 385 km; Grid; Geol; Prosp; Soil geochem

Figure 4. Location map, mines and exploration projects in northwest British Columbia, 2000.



METAL MINES

The **Eskay Creek** underground gold-silver mine, owned by Homestake Canada Inc., developed new stopes, expanded the mill and began construction of a new tailings disposal site while, once again, completing the largest exploration drilling program in the region. Metal production amounted to 10 363 kg (333 167 oz) of gold and 458 408 kg (14.7 million oz) of silver at a cost of about \$155 per ounce of gold equivalent. There are 236 employees and contractors. The mine produced 105 150 tonnes (about 280 tpd) of ore from the 21B zone that grade 80.2 g/t gold and 3512 g/t silver and was shipped directly to smelters in Japan and Quebec. Mill ore from the NEX, HW, 109 and, beginning in 2000, the 21C zones amounted to 87 527 tonnes that averaged 32.1 g/t gold and 1263 g/t silver. The mill, which produces a bulk sulphide concentrate, was enlarged from 200 to 250 tonnes per day. Mill recoveries were 92.7% for gold and 95.1% for silver.

The 21B zone is a moderately dipping stratiform sheet composed of sulphosalt and sulphide beds at the base of the contact mudstone. The NEX zone is the northern extension of this stratiform ore which, together with hanging wall ore beds in the HW zone, comprise a series of complexly folded and faulted lenses in the core of a north plunging anticline. New mill ore stopes were developed in NEX and HW zones as the main decline ramp was deepened. Ore from these high grade zones was blended with lower grade ore from the 109 and 21C zones in the foot-wall rhyolite. Definition drilling of southern 21C encountered high water flow that will make it more difficult to mine. The 21C zone consists of disseminated gold-silver ore in a gently plunging, rod-shaped body within rhyolite that underlies the contact mudstone. A new pipeline to a larger tailings disposal site in Tom MacKay Lake is under construction and will be operational in 2001. Reserves at Eskay Creek mine on January 1, 2001 comprise 705 200 tonnes of direct shipping ore containing 65.5 g/t gold and 3036 g/t silver, and 761 800 tonnes of mill ore grading 25.8 g/t gold and 1092 g/t silver. Mineral resources, primarily in the 21C zone, stand at 420 000 tonnes that grades 12.9 g/t gold and 405 g/t silver.

Exploration drilling at Eskay Creek focused on the north plunge of the Eskay anticline in search of other exhalative ore lenses. The area of best potential appears to lie between the Pumphouse and Andesite Creek faults where the contact mudstone is thickest and the altered rhyolite is best developed. The mud-

stone horizon on the east and west limbs of the fold was also tested by drilling.

At the **Endako** open pit molybdenum mine, Thompson Creek Mining Ltd. continued to focus on minimizing operating costs to offset the two-year price slump for molybdenum. The mill treated 9 217 853 tonnes of ore containing 0.0693% Mo and yielding 4 949 239 kg of Mo metal as float concentrate. The metal is sold as molybdic oxide and ultra pure molybdenum sulphide. Production increased from the previous year as a result of higher grade mill feed and a full 12 months of operation (the mine shut down for one month in 1999). Low haulage cost was achieved by mining from the shallow Denak West pit, mining the south wall of the Endako pit and recovering ore from the low-grade stockpile. Denak West ore did not contain an anticipated elevated lead content which would have been deleterious to concentrate quality. In October, an in-pit crusher began operation on the 798 metre bench of the Endako pit. It delivers ore to the mill via a 700 metre conveyor which climbs the north wall of the pit. By December, the new crusher and a reduction in the amount of stripping contributed to the lowest production cost ever achieved at Endako. Despite this Thompson Creek notified the mine's 199 employees that Endako could close in May, 2001, unless the price of molybdenum rises. Temporary provisions continue for a reduced power rate and other cost savings that were negotiated in 1999 under the auspices of the British Columbia Job Protection Commission.

The **Huckleberry** porphyry copper mine produced ore from a new open pit developed in the Main zone following two years of mining in the East starter pit. The mine, operated by Imperial Metals Corporation, employs 204 workers and is located 122 kilometres south of Houston. Cost reduction arrangements facilitated by the Job Protection Commission expired, reducing the mine's ability to repay its debt. A pebble crushing circuit which cost \$3.4 million was installed to increase mill capacity from 19 000 to 21 000 tonnes per day. The mill treated about 7 145 600 tonnes, all from the Main zone, which graded 0.502% Cu. Metal production amounted to 33 489 370 kg of copper, 596,290 kg of molybdenum, 344 kg of gold and 8590 kg of silver. Production costs (operating plus capital but excluding transportation and smelting) were US\$0.54 per pound of copper. About 1.4 million tonnes more ore than predicted from exploration data was delineated by blast holes at the north end of the Main pit. Although most of the Main zone was re-drilled in the 1990's, the north end was defined by older holes that



Figure 5. The Ursa fault sets gold-bearing graphitic limestone against light-coloured cherty dolomite near the bottom of the Ursa pit. Orientation of the Ursa fault changes upward from steep west dipping, as shown here, to steeply east near the surface.

did not recover all the fracture-controlled chalcopyrite, leading to an underestimation of reserves. Drilling on the northeast and southeast periphery of the East ore body encountered moderately long mineralized intercepts. As a result, the company made modest revision to ore reserves and adjusted the design of the East zone ultimate pit. Reserves in Main and East zones on December 31 2000 are 56 498 000 tonnes grading 0.494% Cu, 0.014% Mo, 0.059 g/t Au and 2.805 g/t Ag. A glacial dispersion study of the Huckleberry area by V. A. Levson of the British Columbia Geological Survey found copper-bearing granodiorite boulders 2 kilometres west of the Main zone. The source might be an undiscovered mineralized zone lying along the east-west trend of intrusions and mineralization at Huckleberry, or could simply represent glacial dispersion from the Main zone. Exploratory drilling will test the area west of the tailings pond early in 2001.

The **Golden Bear** heap-leach gold mine produced 2939 kg (94 500 oz) of gold for Wheaton River Minerals Ltd. at a cost of \$180 per ounce. The

mine operated from April until November with up to 120 workers. The company completed mining of the Ursa open pit and accelerated underground mining of the Kodiak B deposit. Although development only had been scheduled for this year, the company mined out the Kodiak B deposit. The Ursa pit produced 295 026 tonnes of ore containing 8.3 g/t Au that was crushed and stacked on the Totem heap leach pad. The ore consists of graphitic limestone that was brecciated, decalcified and mineralized with gold near the Ursa fault (see Figure 5). The Kodiak B deposit occurs in siliceous dolomite along the Fleece fault and is cut by a narrow, strongly clay-altered intermediate dike. Poor heap leach recovery is realized from ore mined close to the dike. The ore zone was developed by a decline and 185 181 tonnes extracted from four sub-levels. Of this, 85 581 tonnes grading 7.2 g/t Au was placed on the heap leach pad and the remainder, 99 600 tonnes containing 10.0 g/t Au, was stockpiled at the portal to be crushed and trucked to the leach pad next season. Underground evaluation of the Kodiak C deposit, a resource of 276 000 tonnes containing 7.8 g/t Au, determined

that gold recovery by leaching is too low to warrant mining. There are no plans to mine Kodiak C or other refractory gold resources in the Grizzly zone at Golden Bear.

INDUSTRIAL MINERALS AND GEMSTONES

At **Cassiar**, the refurbished mill of Cassiar Magnesium Inc. was destroyed by a tragic fire on December 25, 2000 during a Christmas-period shut-down. Cause of the fire is under investigation. The mill began production of chrysotile asbestos in January 2000 and, except for one month, it operated throughout the year and employed up to 65 people. The ore came from stockpiles left by Cassiar Mining Corporation which closed in 1992. These comprise about 2.4 million tonnes of talus in the Cirque dump that contains 7% recoverable fiber, 2.5 million tonnes of rock reject (at the former crusher site at the edge of the open pit) that yields 2% fiber, and 300 000 tonnes at two aerial tram stations (beside the old crusher site) with 8 to 10% recoverable fiber.

Stockpile material was up-graded by screening and the company trucked 220 000 tonnes to supplement the mill stockpile for winter operation. At first, only high fiber grade was recovered but by mid-year the mill operated as designed and produced the full range of former Cassiar grades (AK, AX, AY and AZ). Output increased steadily from 45 to 80 tonnes of bagged fiber per day. Total production amounted to 11 749 tonnes from a mill throughput of 222 248 tonnes. The company described product acceptance as excellent, with shipments to traditional and new customers in the Middle East, India and southeast Asia. Customer orders were sufficient for the sale of all anticipated 2001 production.

Nephrite jade was mined from three localities in the Turnagain River area east of Dease Lake. About five percent of the material mined is gemstone quality. The Jade West Group shipped about 100 tonnes from the **Jadex** deposit (104I 078) and 65 tonnes from the **Polar** deposit (104I 083). Jedway Enterprises Ltd. produced about 35 tonnes from the **Blue Jay** claim.

PLACER MINING

by **Daryl Hanson, P. Eng. (Geol)**

Placer gold production in the Northwest Region decreased significantly from 1999 levels. Mining

activity increased in the McDame Creek area of the Liard Mining Division but decreased in the Atlin Mining Division. Three principal factors contributed to the overall decrease: low gold prices, high fuel costs, and scarcity of shallow pay dirt. Approximately 125 kilograms (4000 oz) of gold was produced from 30 mining operations with a total of 67 seasonal workers. There were 30 mining projects and 44 exploration programs granted permits during the year.

In the Atlin district, work continued to concentrate on the historic creeks in the camp. On **Wright Creek**, Sisters Resources Ltd. finished mining a channel that was discovered in 1998. The company also continued its exploration efforts by test pitting and rotary drilling between the recent workings and Surprise Lake. No economic leads were discovered and there are no plans to continue mining on this creek. On **Ruby Creek**, Ruby Gold Ltd. continued stripping Quaternary basalt on the east side of the valley and mined underlying Tertiary gravel. Fat Chance Placer Inc. continued to have success mining high-grade, orange colored (Tertiary?) gravel on the west bedrock rim of **Boulder Creek**. On **Wilson Creek** Gary Crawford and Peter Burjoski continued to strip the 30 metres of overburden that overlies a deep channel that was located by drilling. It appears, unfortunately, that the pit was not centered on the channel and therefore no pay dirt was encountered. **Spruce Creek** was only modestly active in 2000. Daniel Johnson designed and built a large "New Zealand" floating plant which he used to mine a section of high-grade paleochannel gravels that is laced with old underground workings. R&L Godkin Contractors Ltd. in conjunction with West Coast Paving Co. Ltd. developed two small truck/excavator pits on the south side of the creek near the confluence with **Little Spruce Creek**. On **Pine Creek**, Sisters Resources Ltd. developed two pits, trying unsuccessfully to extend the south and east margins of the previously mined Gold Run pit. Efforts by Sisters Resources also failed to develop an economic operation on **Snake Creek**. Bruce Wrightson continued to mine high-grade paleochannel gravels along the northern bedrock rim of **McKee Creek**. Among the smaller projects, the most significant were those by Bryan Bjork on two tributaries of **Fox Creek** and the uneconomical attempt by Arrow Minerals Ltd. to reprocess old tailings on **Otter Creek**.

Only one major project in the Atlin district was on a creek without historic production. Turn Creek Resources Ltd. completed an extensive program of test pits on **Turn Creek**, where they explored for

shallow gold bearing gravels. The program failed to identify any areas suitable for immediate development.

Most of the increased activity in the Liard Mining Division was along historic **McDame Creek** and its tributaries, including **3rd North Fork, Troutline** and **Snowy Creeks**. Jerry Unrau, Delbert Batke, and Harvey Friesen all worked parts of the old Centerville leases with varying degrees of success and Scott Jamieson did a limited amount of mining at Hollaway Bar. Raymond Adams continued aggressive exploration of his holdings near the Cassiar Junction. Elsewhere in the mining division, Michael Swenson continued systematic mining on **Dease Creek**; Ed Asp developed a new pit on **Goldpan Creek**; and Renald Bergeron initiated an ambitious mining plan on **Dennis Creek**.

EXPLORATION PROJECTS

Pacific Booker Minerals Inc. drilled 17 holes and deepened 2 of its previous core holes on the **Morrison** porphyry copper prospect (93M 007). The company can earn a 50% interest in the property from Noranda Inc. by advancing the project to a bankable feasibility study within four years with expenditure of \$2.6 million. Chalcopyrite and minor bornite occur as disseminations and fracture fillings in an Eocene biotite-hornblende-plagioclase phyrlic stock. Previous exploration at Morrison determined that the copper grade is strongly zoned around the low grade core of the stock and the deposit is cut by a strike-slip fault. An originally concentric zone containing better than 0.5% Cu is bisected and offset about 300 metres resulting in a sinuous body about 1000 metres long (CIM Special Volume 46). Drilling by Pacific Booker improved definition of this higher grade zone, especially to depth, and tested for extensions to the west and northwest. Morrison has an indicated and inferred resource, calculated prior to drilling by Pacific Booker, of 190 million tonnes of 0.40% Cu and 0.2 g/t Au.

Huckleberry Mines Ltd. explored a new target within the large **Whiting Creek** porphyry prospect (93E 050), 7 km north of Huckleberry mine. Mineralization is associated with Late Cretaceous stocks that cut Hazelton Group volcanic strata. Chargeability and magnetic response data were interpreted to indicate a mineralized intrusion between the previously drilled Ridge molybdenum zone and the Creek copper-molybdenum zone. Four holes were drilled through 20 to 30 metres of till into coarse grained quartz monzonite, that is cut by a weak

stockwork of quartz-chalcopyrite-molybdenite veins with epidote-gypsum gangue. Weak propylitic alteration characterizes the intrusion. On the **Lean-To** showing (93E 105) eight kilometres southeast of Huckleberry, Rupert Seel excavated trenches to expose a chalcopyrite-cemented breccia in another Cretaceous stock.

Prospectors Ed and Gerry Westgarde optioned their claims near **Chisholm Lake**, 45 kilometres southwest of Houston, to the Hunter Dickinson Group Inc. which commenced a 60 kilometre grid IP and soil geochemical survey very late in the year. Porphyry copper mineralization occurs in granodiorite outcrop and boulders near a logging road. Imperial Metals Corporation drilled percussion holes along the logging road in 1998 but did not locate significant mineralization and dropped their option of the property in 1999. The prospectors found another bedrock copper occurrence 1.5 kilometres from the area targeted by Imperial Metals that prompted Hunter Dickinson Group to acquire the claims and expand the search area (D. Johnson, pers. comm.).

Two volcanogenic massive sulphide prospects southeast of Smithers received limited exploration. Both are in the Nilkitkwa Formation of the Hazelton Group. The larger program was at the **Del Santo** (93L 025) property, where Telkwa Gold Corp. performed magnetic and gravity surveys, followed by diamond drilling aimed at extending the stratiform chalcopyrite-magnetite-sphalerite showings. Only magnetic basalt was intersected (W. Tompson, pers. comm.). On the **Ascot** property (93L 024), Equity Engineering Ltd. tested the continuity and thickness of sphalerite-barite beds in limy to argillaceous felsic tuff with two short packsack drill holes. The mineralization was discovered by trenching in 1988 but was not drilled before. No results have been disclosed.

Luscar Ltd. announced that the **Telkwa** coal project is on hold, due to the low price of thermal coal on the international market. The Project Report, anticipated for the past year, and required by government's Environmental Assessment process to gain project approval, will not be submitted. The company will retain its coal licenses.

On Princess Royal Island, Kermode Resources Ltd. and Rupert Resources Ltd. drilled two underground holes below the lowest level of the **Surf Inlet** (103H 027) mine, the same area as they tested in 1997. Two quartz veins were intersected but the company did not announce any assay results. Telkwa

Rose Minerals Ltd. canceled the planned mining of a bulk sample from the **Hope** gold-quartz vein near Kalum Lake, north of Terrace. Some specimen material of free gold was extracted.

Feasibility studies stalled on a proposed 450,000 tonne per year marble quarry at the **Laredo** deposit (103A 001) on Aristazabal Island. The proponent, Orinda Investments Limited, was reorganized and re-financed during year 2000. They plan to extract a bulk sample of high purity calcium carbonate filler in 2001 and apply to begin commercial production.

Wheaton River Minerals Ltd. purchased the **Red Mountain** gold project (103P 086) from the receiver of Royal Oak Mines Inc. for \$413 360. Wheaton River re-logged drill core from four sections and confirmed that the gold zone is on the margin of a large raft of turbidite siltstone enclosed by two distinct phases of hornblende-feldspar porphyritic diorite of the Goldslide intrusions (A. Hamilton, pers. comm.). Alteration studies and structural analysis were undertaken to gain a better understanding of ore controls and enable ore reserves to be recalculated. An aerial survey examined the route for an access road up rugged Bitter Creek valley to the portal of the Marc zone. A pre-feasibility study is in progress.

CSS Exploration, a private company, acquired the **Praxis** claims 25 kilometres south of Stewart. The company will explore middle Jurassic rhyolite, correlative with Eskay Creek strata, for a precious metal-enriched massive sulphide deposit. The favourable stratigraphy was recognized during recent mapping by C. A. Evenchick of the Geological Survey of Canada. The company conducted 230 line kilometres of airborne electromagnetic surveying, detailed stream silt geochemistry and geological mapping. In another grassroots program, Teck Explorations Ltd. examined and sampled mineral showings on its newly-acquired **WR** claims 20 kilometres southeast of Stewart.

Mountain Boy Minerals Ltd. shipped 34.5 tonnes of silver ore to the Trail smelter from the High Grade vein on the **Mountain Boy** property (104A 011), 22 kilometres north of Stewart. A shipment in 1999 contained 18 800 g/t silver. Sphalerite, galena, argentite, native silver, stromeyerite and pyrargyrite occur in a gangue of quartz, jasper and barite. A proposed drilling program was deferred until 2001.

Rimfire Minerals Corp. optioned the **RDN** property (104G 144) to Newmont Exploration of Canada

Limited. RDN is underlain by Jurassic stratigraphy that is correlative with Eskay Creek strata. The property is located 40 kilometres south of the Eskay mine. An interpreted sea-floor hydrothermal vent and a gold-lead-arsenic-silver soil anomaly, are both associated with argillite that is underlain by felsic volcanic rocks and overlain by pillow basalt. A UTEM geophysical survey located six significant conductors over a 6.7 kilometre strike length. Drilling is anticipated in 2001.

Underground drilling was conducted at the **Silvertip** limestone-hosted silver-lead-zinc prospect (104O 038) by Peruvian Gold Ltd. and Imperial Metals Corp. The program tested the continuity and orientation of a 31.4 metre massive sulphide zone intersected in a surface drill hole, reported in *Exploration and Mining in British Columbia - 1999*. Drilling delineated a 5 to 20 metre thick massive sulphide zone with grades that are typical of the deposit (*i.e.* 325 g/t silver, 6.4% lead, 8.8% zinc). The massive sulphide body is roughly stratabound. It is interpreted by the company to be an important mineralizing conduit, but not a chimney deposit.

Rimfire Minerals Corp. began exploration of the **Thorn** epithermal copper-gold-silver property, 125 kilometres northwest of Telegraph Creek, with an airborne geophysical survey. This was followed by soil geochemistry, geological mapping and prospecting. The property has been known since 1963 as one of few occurrences of enargite in British Columbia, but exploration has been sporadic due to its remote and rugged location. Pyrite-tetrahedrite-enargite veins and strong clay-sericite alteration are developed in a late Cretaceous quartz-feldspar-biotite stock (see Figure 6). The company reported assays from five veins, two of which were discovered in year 2000, that range widely in grade from 0.3 to 8.7% copper, 1.1 to 57.4 g/t gold and 90 to 760 g/t silver over 0.5 to 2.3 metres. Rimfire plans to test some of these veins by drilling in its next exploration program.

The **Mansfield** property (114P 031) of Santoy Resources Ltd., which is located at the south end of the Kluane mafic-ultramafic belt, 110 kilometres south of Haines Junction, was explored for platinum group metals. In the Kluane belt, ultramafic sills typically consist of clinopyroxenite, peridotite and marginal gabbro with, on the Wellgreen and Canalask properties in nearby Yukon, deposits of nickel and copper sulphides with significant platinum and palladium. The ultramafic sill on the Mansfield property is 50 metres wide and, as interpreted from



Figure 6. David Caulfield, president of Rimfire Minerals Corp. (right) and Tom Schroeter, British Columbia Geological Survey, examine intensely altered quartz-biotite-feldspar porphyry, the host to enargite-tetrahedrite veins on the Thorn property.

an airborne magnetic and electromagnetic survey flown in 1987, extends more than 13 kilometres beneath a thin blanket of glacial till. Secondary nickel-copper mineralization occurs in an iron carbonate altered basalt. Previous explorers trenched copper-nickel soil anomalies but did not investigate areas where soil samples contain up to 910 ppb palladium and 260 ppb platinum. Santoy prospected bedrock canyons and dug soil pits through glacial till in search of platinum group metals.

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