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EXPLORATION AND GEOLOGICAL SERVICES DIVISION, YUKON REGION

YUKON

EXPLORATION & GEOLOGY

1998

- Mining & Exploration Overview

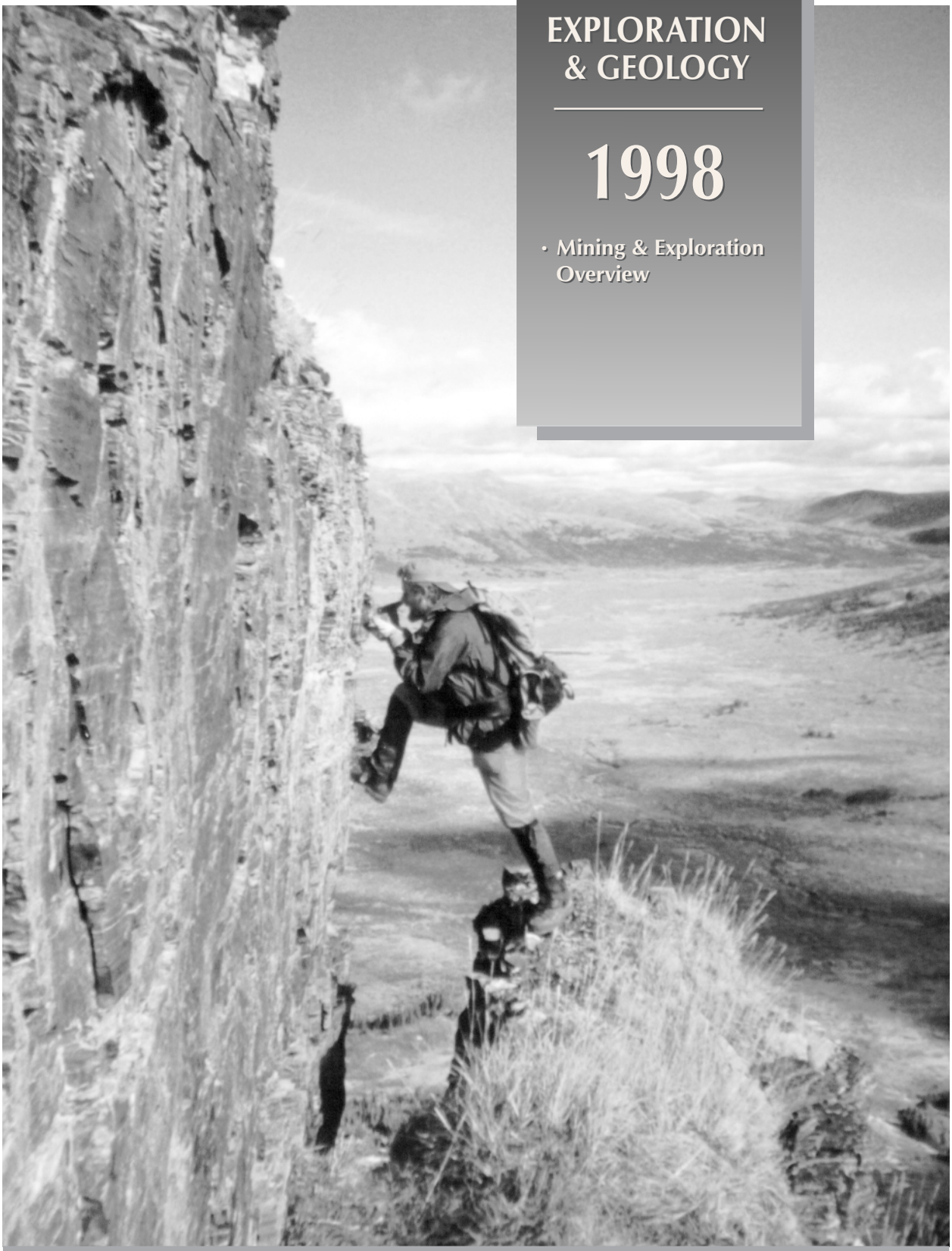

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Photo front cover

Iain Weatherstone of Expatriate Resources, examines a massive rhyolite exposure on the Goal-Net claims, Finlayson Lake massive sulphide district. Photo by Bill Wengzynowski.

Photo back cover

Bernie Kreft, 1998 "Prospector of the Year," on the Drag property, northeast of Ross River.

MINERAL INDUSTRY

Yukon mining and exploration overview — 1998

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Placer mining overview — 1998

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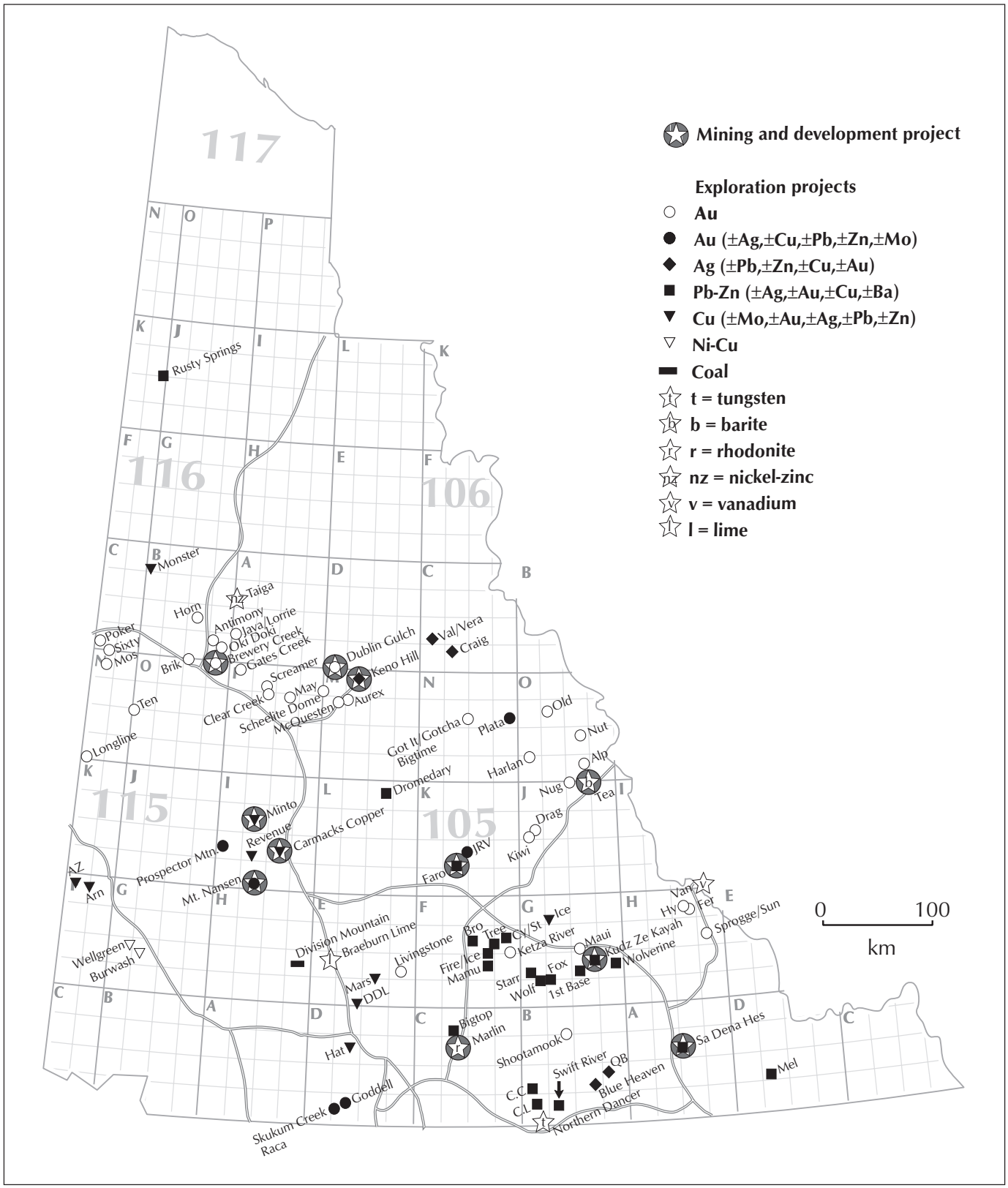


Figure 1. *Location of active Yukon mines and exploration projects in 1998. Not all projects (particularly reconnaissance) are shown on the map. NTS grid in background.*

YUKON MINING AND EXPLORATION OVERVIEW — 1998

Mike Burke
Yukon Geology Program

Burke, M., 1999. Yukon mining and exploration overview — 1998. *In:* Yukon Exploration and Geology 1998, C.F. Roots and D.S. Emond (eds.), Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, p. 2-30.

RÉSUMÉ

En 1998, le Yukon (Fig. 1) a été l'objet de nombreux travaux de reconnaissance axés sur les potentialités aurifères de la suite intrusive de Tombstone du Crétacé moyen et de celles d'autres suites intrusives du Crétacé. Les principaux modèles de gisements recherchés étaient ceux de type Fort Knox, True North, Brewery Creek, Carlin et Pogo. L'exploration aurifère a représentée plus de 60 % des coûts d'exploration, qui se sont chiffrés à quelque 15,4 millions de dollars en 1998 (Fig. 2). La baisse des dépenses d'exploration se reflète dans le nombre de projets d'exploration d'un niveau avancé (ceux impliquant des forages au diamant) qui a chuté de 80 % depuis 1997. En 1998, l'exploration des métaux communs avait pour cible plusieurs styles de gisements. Les amas de sulfures massifs volcanogènes (SMV) ont encore été le point de mire de nombreux programmes d'exploration, notamment du vaste programme de forages au diamant, exécuté par Atna Resources, qui a permis de prolonger le gisement Wolf (découvert en 1997). Les gisements de cuivre et de zinc à haute teneur en argent ont également fait l'objet d'exploration par Manson Creek Resources à l'est de Keno et par Nordac Resources dans le sud du Yukon, à proximité de Rancheria. Bien que l'exploration des SMV dans le district de Finlayson Lake ait subi une forte baisse par rapport aux dernières années, plusieurs programmes y ont été réalisés, dont les forages au diamant effectués par Cominco sur sa propriété de Kudz Ze Kayah.

En tout, 5148 concessions minières ont été jalonnées en 1998 (Fig. 3). Ce chiffre est inférieur à celui des années précédentes. Toutefois, le plus grand nombre de jalonnements (75%) a été réalisé dans les districts miniers de Dawson et de Mayo. Ce pourcentage indique le nombre de nouvelles propriétés jalonnées à la suite de la mise en oeuvre de nombreux programmes de reconnaissance pour l'or dans ces régions. Le nombre de concessions minières en règle a chuté de 66 287, par rapport à l'année précédente; mais il reste plus élevé que la moyenne (Fig. 4).

Les deux mines d'or en exploitation au Yukon, Brewery Creek et Mount Nansen, ont continué leur production; la production du gisement de barytine Tea et du gisement de rhodonite Marlin a été faible. Viceroy Resources ltée prévoit que la production de la mine Brewery Creek atteindra 2572 kg (80 000 onces) d'or en 1998, à un coût au comptant de 180 $US. À la fin du troisième trimestre, la production d'or était de 1637 kg (52 638 onces) à un coût au comptant de 197 $US. Brewery Creek a démontré pendant trois hivers consécutifs que l'on pouvait utiliser la lixiviation en tas, peu coûteuse, avec efficacité au Yukon. La mine Mount Nansen de BYG Resources a produit 472 kg (15 190 onces) d'or et 1208 kg (38 849 onces) d'argent à partir de son exploitation à ciel ouvert Brown-McDade.

Les coûts de mise en valeur concernent principalement le gisement de cuivre-or-argent Minto où on a construit la semelle de fondation de l'usine de traitement, un écran d'injection sur la digue à stériles et un camp permanent ont été terminés en vue de la construction définitive en 1999. Les exploitations minières du Yukon ont engagé également des dépenses de mise en valeur, principalement la mine Brewery Creek où on a exécuté des forages intercalaires et des essais en colonne, agrandi l'aire de lixiviation en tas et ajouté une étape intermédiaire de lixiviation. Au total, les coûts de mise en valeur au Yukon se sont élevés à environ 6,0 millions de dollars.

INTRODUCTION

Yukon (Fig. 1) experienced a large number of reconnaissance-style exploration projects in 1998 directed at the gold potential of the mid-Cretaceous Tombstone suite intrusive belt, as well as that of other Yukon Cretaceous intrusive suites. Fort Knox, True North, Brewery Creek, Carlin and Pogo -style deposits were the main mineral deposit models utilized. Gold exploration accounted for more than 60% of exploration expenditures which totaled approximately $15.4 million (Fig. 2) in 1998. Production in 1998 continued from the Yukon's two operating gold mines, Brewery Creek and Mount Nansen, as well as minor production from the Tea barite deposit and the Marlin rhodonite deposit. Unfortunately, production from the Faro Pb-Zn-Ag mine was suspended in January, 1998 when the Anvil Range Mining Corporation filed for court protection in order to restructure the company. Mine development expenditures of approximately $6.0 million were incurred at the presently operating mines, and in the development of the Yukon's next mine, the Minto Cu-Au-Ag project.

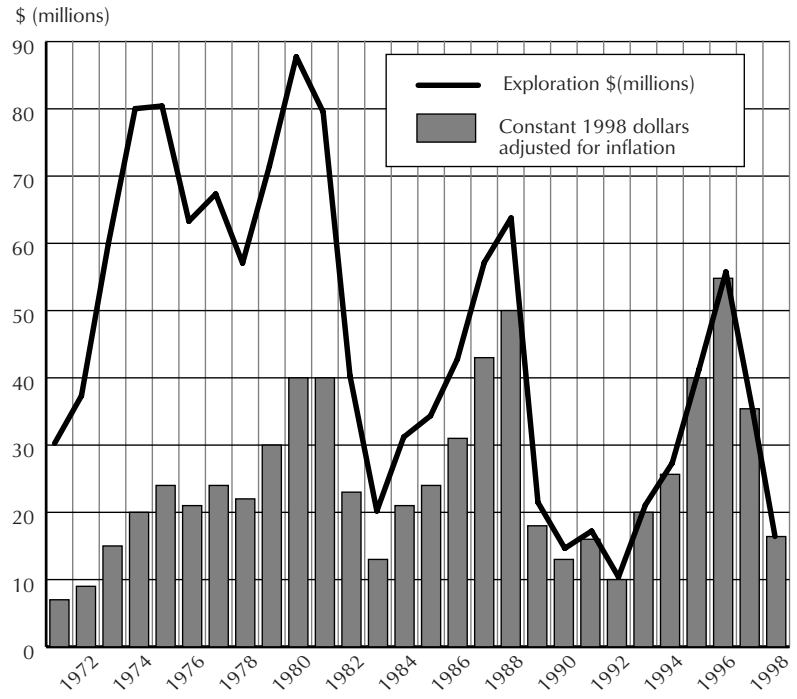


Figure 2. *Exploration expenditures: 1971-1998.*

The decrease in exploration expenditures from 1997 ($35 million) is reflected in the number of advanced exploration projects involving drilling. The approximately 20,000 metres diamond drilled in 1998 was down 80% from 1997 totals. Base metal exploration in 1998 was directed at several styles of deposits. Volcanogenic massive sulphide (VMS) deposits continued to be the focus of numerous programs, including a major diamond drilling program by Atna Resources resulting in the expansion of the Wolf deposit (discovered in 1997). Lead and zinc deposits with high silver contents were also explored east of Keno City in central Yukon by Manson Creek Resources, and in southern Yukon near Rancheria by Nordac Resources. Exploration for VMS deposits in the Finlayson Lake district declined drastically in relation to recent years. Among the few programs conducted in the region was diamond drilling by Cominco on their Kudz Ze Kayah property.

The number of quartz claims staked to the end of October, 1998 was 5148 (Fig. 3). This is lower than in previous years, however the bulk (75%) of

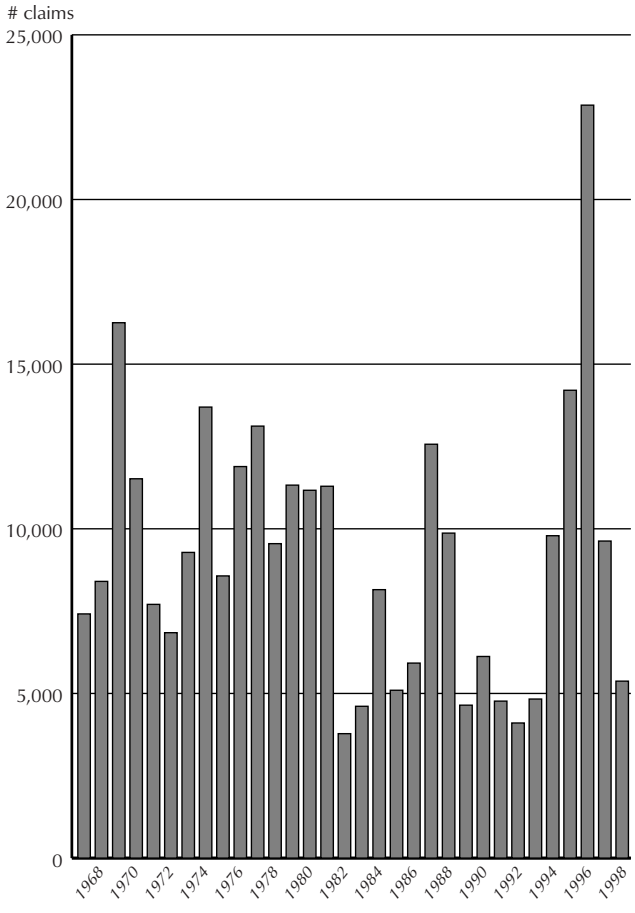


Figure 3. *Quartz claims staked: 1967-1998 (to end of October)*

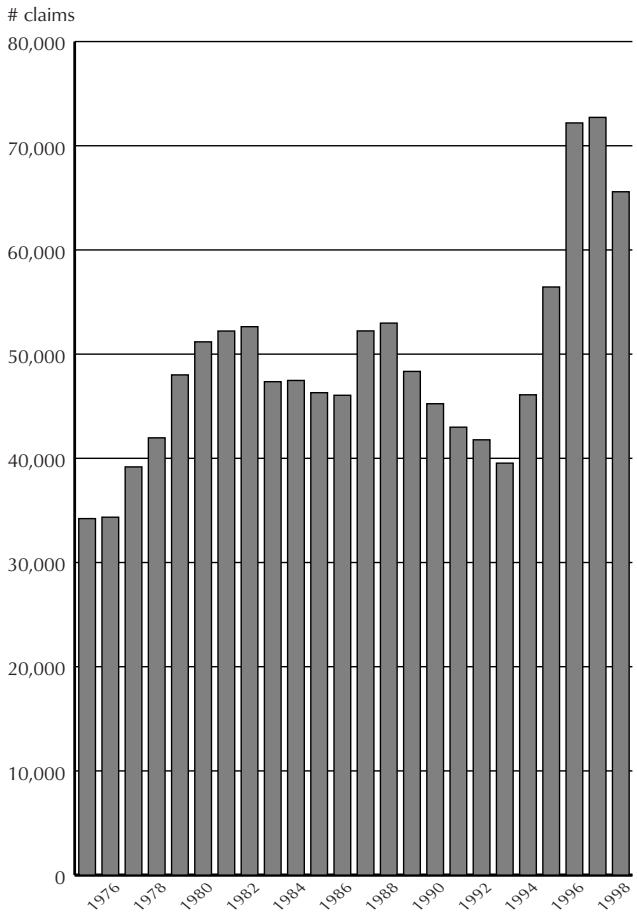


Figure 4. *Quartz claims in good standing: 1975-1998 (to end of October)*

staking was conducted within the Tombstone Intrusive Belt in the Dawson and Mayo mining districts. This reflects a number of new properties staked based on the numerous gold reconnaissance programs conducted in these areas. Claims in good standing have dropped to 66,287 (Fig. 4) which is down from 1997, but remains at levels higher than average.

MINING

Production continued at the Yukon's two operating gold mines, **Brewery Creek** (Yukon Minfile 116B 160) and **Mount Nansen** (Yukon Minfile 115I 064, 065). Minor production of 3000 tonnes was achieved from the **Tea** barite deposit (Yukon Minfile 105O 020) and 35 tonnes from the **Marlin** rhodonite deposit (Yukon Minfile 105C 017).

Viceroy Resources, Ltd., forecast 1998 production of 2572 kilograms (80,000 ounces) of gold from the **Brewery Creek** mine at a cash cost of US$180. Production to the end of the third quarter in 1998 was 1637 kilograms (52,638 ounces) gold at a cash cost of US$197. Proven and probable reserves at Brewery Creek were 13,317,000 tonnes grading 1.44 g/t Au as of December 31, 1997. Ore was mined principally from the Kokanee and Golden zones (Fig. 5) in 1998 with 2.238 million tonnes of ore delivered to the heap leach pad by the end of the third quarter. Waste mined to the end of the third quarter totaled 3.472 million tonnes. Viceroy also conducted extensive infill drilling on several zones within the reserve trend in order to upgrade geological resources to reserves (Diment and Craig, this volume). Significant expenditures were incurred in the expansion of the heap leach pad, column testing and in the addition of an intermediate leaching circuit. The intermediate

Figure 5. *The Golden pit at the Brewery Creek mine.*

leaching circuit effectively doubles the amount of ore under leach, resulting in increased gold production. Continued success at the Brewery Creek mine has proven for the third winter in a row that low-cost heap leaching can be used effectively in the Yukon.

In 1998, BYG Resource's **Mount Nansen** mine processed 136,095 tonnes of ore at an average head grade of 5.03 g/t Au and 43.25 g/t Ag; this production was from the Brown-McDade open pit (Fig. 6), yielding 472 kilograms (15,190 ounces) of gold and 1208 kilograms (38,849 ounces) of silver. A water balance problem in the tailings pond at the beginning of the year resulted in a shutdown and reduced milling rate; consequently, milling for the year has been at 50% capacity. Installation and commissioning of a water treatment plant has rectified the water balance problem and milling has continued at full capacity since June (700 tonnes per day). Mining to the end of September resulted in the removal of 151,763 tonnes of ore from the open pit. During this time, 513,165 tonnes of waste were removed including an 80,000 tonne push-back of the pit wall for the phase III mine design. A preliminary mine design for an open pit on the Flex deposit indicates a resource of approximately 82,000 tonnes grading 7.4 g/t Au and 312.5 g/t Ag. The Flex Zone is slated for production upon completion of permitting, bulk sampling and final feasibility. Production from the Brown-McDade pit is expected to be completed early in 1999. The discovery in the pit of a sulphide-rich breccia pipe, separate from the Main vein, represents a bulk tonnage underground target that may extend the mine life (Stroshein, this volume).

The **Tea barite deposit** is located near MacMillan Pass northeast of Ross River. H. Coyne and Sons of Whitehorse mined approximately 3000 tonnes of barite and processed it in their mill in Ross River. The barite was then shipped to Alaska for use as drilling mud in oil exploration on the North Slope.

Figure 6. *Robert Stroshein with BYG Natural Resources in the Brown-McDade pit.*

Figure 7. *The lighter coloured areas in the photo are deep pink to red, high quality rhodonite at the Marlin deposit. This is unfortunately not as dramatic in black and white.*

Sidrock (officially 12633 Yukon Inc.) produced 35 tonnes of high-quality rhodonite (Fig. 7) from the **Marlin** deposit in south central Yukon. The rhodonite was shipped to Vancouver and is being marketed to carvers in the Orient. Several of the larger pieces are being made into free form sculpture by Sidrock in Whitehorse and are destined for private collections and auction houses in San Francisco and New York. The deposit is believed to have formed as a stratiform synsedimentary manganese deposit hosted by the Big Salmon Metamorphic complex; later metamorphism developed the rhodonite-bearing skarn. Elsewhere on the property, bornite and chalcopyrite in a quartz-carbonate lens 0.3 m thick is exposed for a length of 10 m. The lens follows the foliation in quartz-biotite schist and gneiss of Mississippian(?) age, indicating the potential for other styles of mineralization (VMS) on this property.

MINE DEVELOPMENT

Mine development expenditures were incurred mainly at the **Minto** (Yukon Minfile 115I 021, 022) copper-gold-silver porphyry deposit where mill footings (Fig. 8), tailings dam

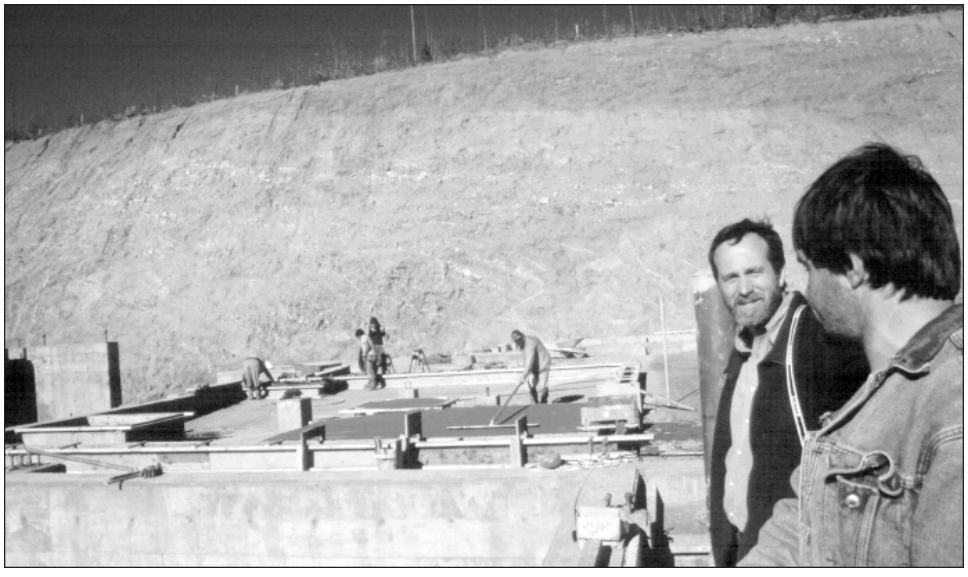


Figure 8. *Jim Prock (foreground) of Minto Explorations explains construction of the mill of the Minto Cu-Au-Ag project to Hugh Copland (facing camera).*

grout curtain and the installation of a permanent camp were completed in preparation for final construction in 1999. The mine is located on the west side of the Yukon River in central Yukon (Fig. 1). The current mine design calls for an open pit containing 6.51 million tonnes grading 2.13% Cu, 0.62 g/t Au and 9.3 g/t Ag at a stripping ratio of 4.9:1.0. The mill is designed for a throughput of 477,000 tonnes of ore per year, resulting in an initial mine life of 13 years. Development at the Minto deposit is being funded by Asarco who may earn a 70% interest in the property by funding the project to production. Minto Explorations retains 30% and is the operator of the project.

Development costs were also incurred at the Yukon's operating mines. At Brewery Creek, infill drilling, column testing, heap leach pad expansion and the addition of an intermediate leaching stage contributed to overall mine development expenditures. Development expenditures in the Yukon totaled approximately $6.0 million, and include the costs incurred in care-and-maintenance of existing mines, as well as the costs associated with permitting.

Cominco's **Sa Dena Hes** Zn-Pb-Ag mine (Yukon Minfile 105A 012, 013) and the **Keno Hill** Ag-Pb-Zn mine (Yukon Minfile 105M 001) of United Keno Hill Mines Limited remained on care- and-maintenance during 1998, awaiting an increase in metal prices which may trigger the resumption of production at these deposits.

Three projects remained in the permitting process in 1998. New Millenium Mining Ltd. continued with the comprehensive review of the **Dublin Gulch** Au deposit (Yukon Minfile 106D 021-029) under the Canadian Environmental Assessment Act. Dublin Gulch, an intrusive-hosted gold deposit, contains open-pit mineable reserves of 50.4 million tonnes grading 0.93 g/t Au. The **Carmacks Copper** deposit (Yukon Minfile 115I 008) is an oxidized Cu-Au porphyry deposit containing 14.1 million tonnes grading 1.01% Cu and 0.51 g/t Au. In 1998, Western Copper Holdings Limited continued their review of the Carmacks Copper project under the Environmental Assessment and Review Process. The **Kudz Ze Kayah** (Yukon Minfile 105G 117) deposit of Cominco awaits final signature on their Class A Yukon Water Licence. No production decision has been made on the VMS deposit which hosts open-pit mineable reserves of 11 million tonnes grading 5.9% Zn, 0.9% Cu, 1.5% Pb, 130 g/t Ag and 1.3 g/t Au.

GOLD EXPLORATION

For the first time in many years, exploration expenditures for gold surpassed expenditures for base metals in the Yukon. Recent exploration successes in Alaska related to mid-Cretaceous intrusive rocks, namely the Fort Knox and more recently the Pogo gold deposit, has boosted exploration in Yukon areas hosting similar geology to the Alaskan discoveries. The potential in the Yukon for similar plutonic-related deposits to these Alaskan discoveries has long been known and was illustrated by the discovery in 1991 of the Dublin Gulch gold deposit near Mayo, the closest known match to the Fort Knox model. The plutonic-related, low-cost, heap-leach Brewery Creek gold mine near Dawson has proven that these types of deposits can be economically exploited in the Yukon. Several senior mining companies conducted reconnaissance exploration programs (Fig. 9) in the mid-Cretaceous Tombstone belt, which resulted in the staking of several new properties. Other properties staked in previous years in this belt had exploration programs ranging from prospecting to diamond drilling.

Figure 9. *Local helicopter companies were pleased with the large amount of reconnaissance programs conducted in 1998.*

Viceroy Resources, Ltd. conducted extensive exploration on several mineralized zones on the **Brewery Creek** mine property (Yukon Minfile 116B 160). Mineralization at Brewery Creek is hosted in oxidized mid-Cretaceous Tombstone Suite quartz-monzonite sills and underlying Devono-Mississippian greywacke of the Earn Group. Exploration at the Brewery Creek mine property in 1998 placed an emphasis on moving ounces of gold from the resource to the reserve category, as well as delineating new oxide resources adjacent to existing reserves (Diment and Craig, this volume). Reverse circulation drilling focused on expanding oxide resources at the Lucky, Bohemian (Fig. 10), East Big Rock, Moosehead, Pacific, Golden and Blue zones. Trenching and road building also started in the South Canadian and Sleemans targets. Exploration at the Bohemian Zone, which had a resource of 364,000 tonnes grading 0.99 g/t Au (as of December 31, 1997), was very successful with drilling intercepts such as 1.2 g/t Au over 40 metres, 2.18 g/t Au over 14 metres, and one of the best holes on the property drilled to date returning 4.42 g/t Au over 46 metres. This resource was upgraded to 1.3 million tonnes grading 1.6 g/t Au as of July, 1998 and the resource will soon be updated based on additional drilling. Preliminary results from other exploration on the property included trenching in the Schooner Zone which returned 1.27 g/t gold over 66 metres, and 0.92 g/t gold over 12 metres from the South Golden Zone. Results from the extensive exploration program of 1998 were still being compiled and interpreted at year-end and announcements relating to the exploration at the mine site should be available in the first quarter of 1999. Viceroy also conducted exploration immediately south of Brewery Creek on the Gates Creek project which is located on Class A lands optioned from the Tr'ondek Hwech'in First Nation.

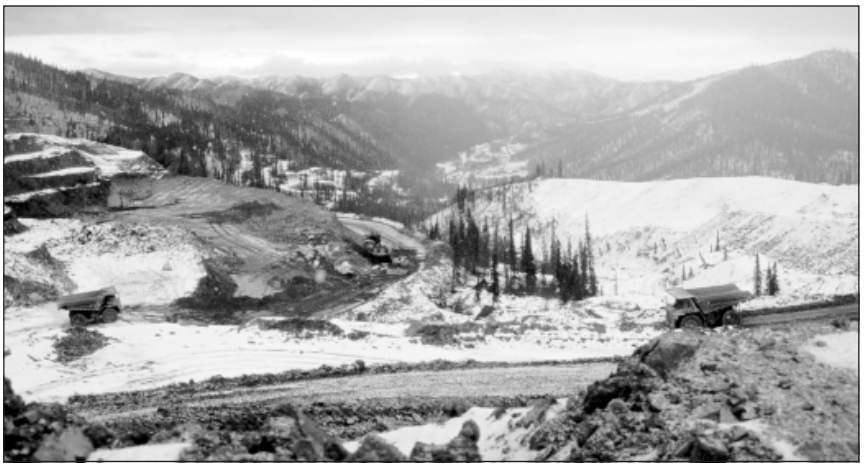


Figure 10. *Two of the main zones of exploration, the Lucky (background left) and Bohemian (background right) at the Brewery Creek mine. The Golden Pit is in the foreground.*

Figure 11. *Portable auger drills were used to collect soil samples on the Oki Doki property near Brewery Creek.*

Viceroy followed up on extensive reconnaissance exploration programs conducted in 1997 and continued with additional reconnaissance programs in 1998. Gold mineralization related to the mid-Cretaceous Tombstone and Tungsten intrusive suites were targeted. In the 1998 season, the company staked several properties and conducted first phase exploration programs involving silt and soil sampling, prospecting and mapping. Follow-up work on a brand new discovery, the **Harlan** property (NTS 105O/4, 5), has defined a breccia zone within a chert pebble conglomerate with anomalous gold values up to 7.4 g/t. The zone is approximately one kilometre wide and five kilometres long. The breccia zone is bounded by a thrust fault which juxtaposes a thick section of fine sediments intruded by limonitic quartz monzonite sills up to 30 metres thick with gold values up to 2 g/t. Results from the numerous projects of Viceroy Resources are being compiled.

International Kodiak Resources Inc. explored the large **Oki Doki** property (NTS 116B/1, A/4) which borders the Brewery Creek mine to the north and east. A program of silt and soil geochemistry (Fig. 11), prospecting, rock sampling and geological mapping followed by Induced Polarization (IP) geophysical surveys was conducted during the 1998 field season. Grid-based soil geochemistry in the area immediately north of the Brewery Creek

mine property identified an anomalous area 1500 metres in length by 100 to 300 metres wide, with up to 646 ppb Au, 392 ppm As, 593 ppm Sb, and 2235 ppm Hg. The anomalous area trends east-west similar to the reserve trend at Brewery Creek. Preliminary IP results from surveys over the anomalous area showed chargeability anomalies with coincident to flanking resistivity features. For 1999, excavator trenching and diamond drilling is planned to test these areas. A similar program to the east identified narrow semi-massive to massive arsenopyrite in fractures within a large, roughly east-northeast trending shear zone near the margin of the Mike Lake intrusive. Select grab sampling of the mineralization yielded values up to 125 g/t Au.

Homestake Canada optioned from Tombstone Explorations the **Lorrie** property (Yukon Minfile 116A 112) located 25 kilometres northeast of the Brewery Creek mine. The claims are contiguous with the Java claims held by Homestake and gives them a large land package in the area. The 1998 program involved geological mapping, sampling, hand and blast trenching. This exploration program was designed to identify and evaluate targets with potential for bulk tonnage gold, contact gold skarn and gold replacements in calcareous Upper Proterozoic-Lower Cambrian Hyland Group sediments adjacent to the mid-Cretaceous Mike Lake intrusive.

Figure 12. *Hand-dug pits (lower left) mark the lower skarn contact of a large pendant of limestone enclosed by granodiorite on the Horn claims.*

Canadian United Minerals evaluated several properties in the Tombstone Mountain area northeast of Dawson. Prospecting, silt and soil sampling and geophysics, followed by hand and helicopter portable Kubota trenching (Fig. 12), was performed on the **Horn** (NTS 116B/7) claims. The Horn claims are located approximately 8 kilometres east of the Marn (Yukon Minfile 116B 147) Cu-Au skarn deposit, which is estimated to contain 275,000 to 330,000 tonnes averaging 8.6 g/t Au, 1% Cu, 0.1% WO_3 and 17 g/t Ag. Mineralization at the Horn consists of high-grade Cu-Au skarn similar to the Marn. Mineralization at the Horn is located at the upper and lower contacts of a large pendant of Permian Takhandit Formation limestone enclosed by granodiorite of the Tombstone Plutonic Suite. Canadian United Minerals intends on continuing to evaluate the occurrence during the winter of 1998/99 with continued trenching and possibly bulk sampling.

In 1998, La Teko Resources Ltd. optioned the **Scheelite Dome** property (Yukon Minfile 115P 033) from Kennecott Canada Exploration. The road-accessible property, 25 kilometres northwest of Mayo, has been explored by Kennecott since 1994. During the 1998 field season, La Teko diamond-

drilled 1268 metres in seven widely-spaced holes (Fig. 13). Drilling by La Teko was conducted on several targets within a 3.5 by 1.4 kilometre gold-in-soil (>40 ppb Au) and bedrock anomaly. These targets included chargeability and resistivity anomalies, as well as favourable geologic and structural domains within Upper Proterozoic to Lower Cambrian Hyland Group metasedimentary rocks adjacent to the mid-Cretaceous Scheelite Dome granite stock (Hulstein et al., this volume). Several styles of mineralization occur on the property with the primary target of the 1998 program being structurally controlled metasediment-hosted quartz-sulphide veins with bulk tonnage gold potential. Mineralization intersected in drilling consisted of silicification and sulphides including arsenopyrite, pyrite, pyrrhotite and stibnite, as well as crosscutting quartz veins. Mineralization was encountered in all drill holes, with the best intersection from hole 98-12, returning 7.7 metres of 3.67 g/t Au. More detailed geophysics in combination with the 1998 drill results will allow La Teko to focus on specific areas within the large gold anomaly, as well as to continue evaluating areas outside of the drill-tested area in 1999.

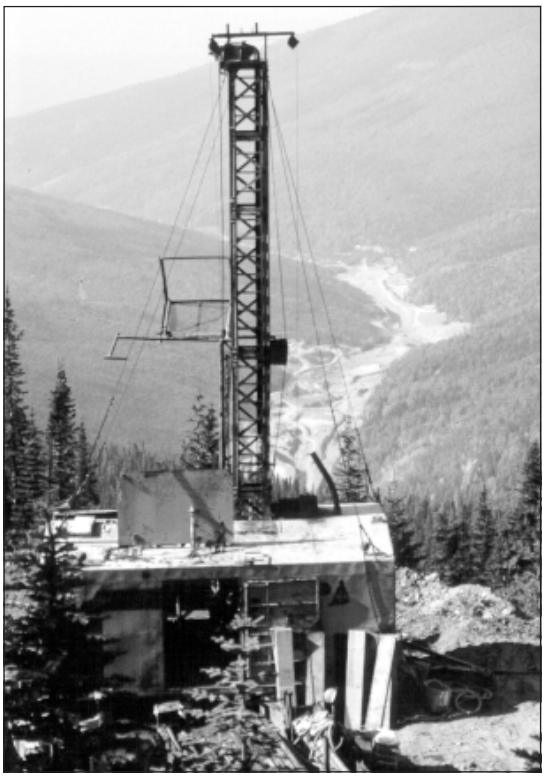


Figure 13. *Extensive placer workings can be seen in Highet Creek which drains the Scheelite Dome property of La Teko Resources.*

Moving further east in the Tombstone Intrusive Belt, Viceroy Resources, Ltd. optioned the **McQuesten** property (formerly the Wayne; Yukon Minfile 105M 029) from Eagle Plains and Miner River Resources. The property is located five kilometres west of Elsa in central Yukon, is accessible by a government-maintained road and is bisected by a power line. Viceroy conducted extensive excavator trenching (Fig. 14) totaling 3.3 kilometres, and a five-line kilometre Induced Polarization survey in the 1998 work program. Skarn and replacement styles of mineralization (semi-massive pyrrhotite) are hosted by calcareous metaclastic rocks and limestone of the Upper Proterozoic to Lower Cambrian Hyland Group. Variably mineralized (up to 2% pyrrhotite) and strongly sericitized quartz monzonite dykes of Cretaceous age cut stratigraphy on the western end of the property. Trenching in 1998 defined a 10-120 m wide zone of > 0.25 g/t Au over an east-west strike length of 2.5 kilometres. Arithmetic averages of vertical channel samples in trenching within the zone returned values up to 2.48 g/t Au over an 18 metre length in trench 98-11. Trench 98-14 returned a 40 metre length grading 1.24 g/t Au within

Figure 14. *Time Termuende of Miner River Resources (right) and Rick Diment of Viceroy Resources examining trenches on the McQuesten property.*

a wider zone of 80 metres grading 0.94 g/t Au. Previous wide-spaced reverse circulation drilling within the mineralized corridor returned values up to 3.2 g/t Au over 23 metres, 1.10 g/t Au over 33.5 metres and 2.1 g/t Au over 27 metres. Systematic drilling of the property is expected to begin in 1999 with the aim of defining a resource within the mineralized corridor.

YKR International Resources Ltd. conducted a small program consisting of a 15-line kilometre IP survey on the **Aurex** property (Yukon Minfile 105M 060) which is contiguous with the McQuesten property.

Teck Exploration explored the **Kiwi** property (NTS 105J/12) northeast of Ross River with a small program of trenching using a helicopter-portable Kubota backhoe. Epithermal gold mineralization is associated with quartz-feldspar porphyry dykes of probable Cretaceous age, intruding black graphitic shales of the Ordovician to Devonian Road River Group (Fig. 15). Silicification with minor pyrite and rare visible gold occurs in both the shales and intrusive rocks. Alteration consisting of silicification and sericitization also occurs over a widespread area.

Eagle Plains and Miner River Resources conducted several prospecting programs, as well as rock, silt and soil sampling on seven properties within the Tombstone Plutonic Suite. All the properties host gold mineralization either within or peripheral to plutonic rocks. The partners plan on drill-testing several targets in 1999, and are seeking joint venture partners on these properties.

Alliance Pacific Gold Corp. conducted a winter program of rotary drilling on the **Plata** mine property (Yukon Minfile 105N 003) in east-central Yukon. Sixteen vertical holes totaling 200 metres were drilled within the Thrust Zone, formerly known as the "P4 Zone." The Thrust Zone occupies a major gently southwest-dipping thrust fault that is associated with a 1 to 3 m wide quartz feldspar porphyry dyke of probable mid-Cretaceous age. Mineralization

Figure 15. *Jean Pautler of Teck Exploration in a trench at the Kiwi property. Light-coloured quartz feldspar porphyry can be seen intruding black shales.*

consists of disseminated pyrite, arsenopyrite, tetrahedrite and other sulphosalts in a massive white quartz gangue. Lenses of massive pyrite-pyrrhotite-galena-sulphosalts are also present. Previous drilling has indicated a resource of 206,000 tonnes with an average grade of 267.5 g/t Ag and 3.3 g/t Au. Eleven holes intersected the zone in this year's drill program and returned an average grade of 653.4 g/t Ag and 3.3 g/t Au. The average width of the zone is 1.8 metres and it remains open in all directions.

The **Hy** gold prospect (NTS 105H/15) is 185 kilometres north of Watson Lake between the Hyland and Little Hyland rivers. The claims were originally staked by Phelps Dodge in 1996 after reconnaissance sampling yielded anomalous gold concentrations in silt and float samples in nearby creeks and outcrops. The claims are underlain by Upper Proterozoic to Lower Cambrian Hyland Group sedimentary rocks consisting of phyllite, quartzite and shale with lesser pebble conglomerate, limestone and grit. Mineralization consists of disseminations and clots of arsenopyrite, pyrite and galena in quartz veins and breccias exposed in isolated outcrops. Follow-up exploration this year consisted of prospecting, geological mapping, and extensions of the 1997 grid to the east and southeast, and collection of 266 soil samples and 27 rock samples. Geological mapping delineated two fault structures coincident with, and possibly related to, the East and West gold zones. Several of the rock samples returned highly anomalous gold concentrations accompanied by significant amounts of silver and arsenic. Samples from the West Zone returned up to 144.2 g/t gold from arsenopyrite-bearing quartzite and quartz vein material. Rock samples from the East Zone returned up to 9.9 g/t gold from arsenopyrite-bearing quartz vein material, quartz breccia and phyllite.

Barramundi Gold Ltd. conducted a program of soil sampling, induced polarization and electromagnetics and a small program of diamond drilling on the **Longline** project (Yukon Minfile 115N 024). The Longline project is located approximately 80 kilometres north of Beaver Creek straddling the Yukon-Alaska border. Barramundi has been exploring the property for the bulk tonnage gold potential of mineralization in the Moosehorn granodiorite, however in 1998, the company completed detailed work on a high-grade vein system (Fig. 16) exposed within the granodiorite. Mining of the vein in 1996 by a previous operator produced 1800 tonnes of material with a recovered grade of 19.0 g/t Au. Barramundi has applied for a Type B water licence in order to bulk-sample the vein system in 1999, while continuing with its evaluation of the bulk tonnage potential of the property.

Figure 16. *High-grade quartz-sulphide mineralization from the Longline property.*

Figure 17. *Stringers of pyrite in a clay-altered plutonic breccia from the Porphyry Breccia zone at Mount Nansen.*

Figure 18. *Quartz-sulphide mineralization typical of veins from the Flex zone at the Mount Nansen mine.*

Columbia Gold Mines Ltd. conducted preliminary exploration work on the **JRV** property (Yukon Minfile 105K 051, 052, 053) located approximately 20 kilometres north of the town of Faro. The property covers the southeastern margin of the Cretaceous Anvil Batholith which intrudes Paleozoic metasediments. Three zones containing potential for open-pit bulk tonnage precious metal mineralization are targeted. Mineralization consists of broad zones of silicification and chalcedonic veining associated with argillic and phyllic alteration. Sulphide minerals include pyragyrite and tetrahedrite, galena, arsenopyrite and sphalerite. The Arseno Zone contains an area measuring 600 by 700 metres in which twelve samples of mineralization averaged 1.65 g/t Au and 138.2 g/t Ag. Follow-up work, including drilling, is planned for 1999.

BYG Natural Resources conducted a large exploration program on their properties in the **Mount Nansen** (Yukon Minfile 115I 064, 065) area. Sixty diamond drill holes totaling 4844 metres were drilled on the Flex, Porphyry breccia, Tawa, Orloff-King and Brown McDade zones. Mining of the Brown-McDade Main vein, an oxidized quartz-sulphide epithermal vein, encountered a previously undiscovered carbonate-hosted gold-silver bearing, silicified sulphide rich breccia pipe separate from the Main vein (Stroshein, this volume). The irregular pipe-like body has a high-grade core with dimensions of approximately 15 by 20 metres enveloped by decreasingly mineralized and silicified brecciated carbonate rocks. Assays from the core within the open pit typically assay greater than 30 grams per tonne gold. Brecciated metamorphosed clastic rocks in the pipe have been intersected by drilling 60 metres down-plunge returning 23.8 metres of 11.7 g/t Au and 24 g/t Ag. A winter drilling program will continue testing the pipe as it presents an easily accessible, bulk tonnage underground mining target. Drilling of a high gold-in-soil geochemical anomaly, approximately 800 metres north of the Brown McDade open pit encountered a clay-altered plutonic breccia, with mineralization consisting of disseminated and stringer pyrite +/- galena-sphalerite (Fig. 17). Hole 98-198 ended within this zone and averaged 1.4 g/t Au and 11.1 g/t Ag over 23.8 metres. Other holes in the area encountered lower grade mineralization. The bulk of the 1998 drilling was conducted in the Flex Zone, which consists of a swarm of epithermal quartz-sulphide veins (Fig. 18) within a 425 by 55 metre area with a north-northwesterly trend. Infill drilling was conducted to upgrade confidence in the preliminary open pit design for the Flex Zone (81,700 tonnes grading 7.37 g/t Au and 312.5 g/t Ag). The drilling program successfully extended the vein system 75 metres to the north and 100 metres south along strike beyond the pit design. A 1997 stripping program within the Flex Zone helped define the geometry and structure within the zone. New veins discovered during the stripping

program were intersected by the 1998 drilling, returning intersections up to 7.68 g/t Au and 107.6 g/t Au over 6.1 metres in hole 98-231. Further work, including bulk sampling and final feasibility studies, is planned for the Flex Zone in 1999.

An exploration program, consisting of geological mapping, rock sampling and ground geophysical surveys, was completed in the eastern part of the **Prospector Mountain** property (Yukon Minfile 115I 034, 036) of Troymin and Almaden Resources. The road-accessible property is located 50 kilometres northwest of the Mount Nansen mine. Previous work identified epithermal gold-silver mineralization on the property, while current work is directed toward the alkalic Cu-Au porphyry potential.

Partners Omni Resources and Arkona Resources and Trumpeter Yukon Gold conducted a program of geochemistry, geophysics and diamond drilling (Fig. 19) on the **Skukum Creek** (Yukon Minfile 105D 022) and **Goddell/Carbon Hill** projects (Yukon Minfile 105D 025) in 1998. The properties are located in the Wheaton river area 85 kilometres south of Whitehorse. Mesothermal quartz-sulphide deposits host drill-indicated resources of 825,000 tonnes grading 7.15 g/t Au in the Goddell deposit and 800,000 tonnes grading 7.6 g/t Au and 275 g/t Ag at the Skukum Creek deposit. Diamond drilling of five holes totaling 1322 metres was conducted to test previously identified high-grade gold vein targets in the Skukum Creek area. Unfortunately, mineralization of the same tenor as that identified on surface was not encountered in drilling. Two new areas of mineralization with many of the characteristics of the Goddell-style deposit were discovered in the Goddell/Carbon Hill area and exposed by hand trenching. Further work on these and several other untested targets is planned for 1999.

President Mines Ltd. conducted a program of geological mapping, prospecting and geochemistry on the **Gold Reef** property (Yukon Minfile 105D 037) in the Wheaton River area south of Whitehorse. Previous work identified high-grade epithermal mineralization on the property. The vein on the Gold Reef claim is 1.2 to 1.5 m wide and locally swells to 4.6 m of solid quartz, concordant with foliation in greenstone and schist of the Triassic Lewes River Group. Small lenses of arsenopyrite, galena, argentite, chalcopyrite and pyrite were found and one small pocket contained coarse, free gold, sylvanite and hessite. Work in 1998 has identified four main geochemical and geological targets within a 6 kilometre zone. Several gold bearing quartz-carbonate vein float trains were also identified within the zone.

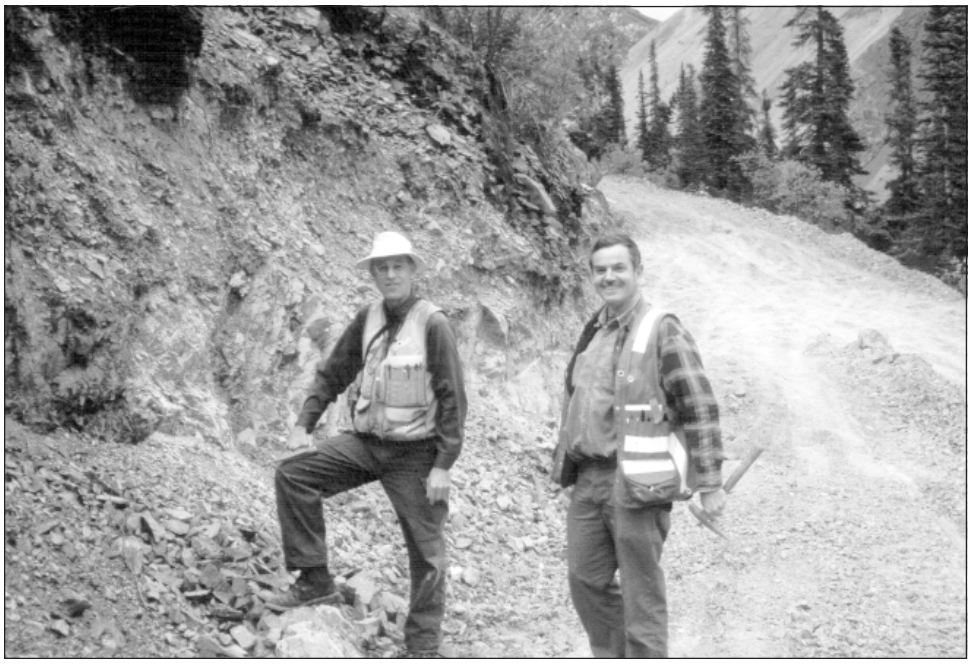


Figure 19. *Gary Wesa (left) and Terry Elliot at the Polaris zone on the Skukum Creek property in the Wheaton River area.*

Figure 20. *Limonitic-altered quartz sericite schist outcrop on Lake Creek at the Livingstone Creek property northeast of Whitehorse.*

Placer miner Max Fuerstner and Whitehorse geologist Larry Carlyle staked a large block of quartz claims over the productive creeks in the **Livingstone** (Yukon Minfile 105E 001, 042, 049, 054) camp, 90 kilometres northeast of Whitehorse. The area has never been systematically explored for hard rock mineralization despite a 100-year history of placer mining. Mineralization previously identified in the area consists of a 1-2 metre-wide quartz-sulphide vein with minor visible gold which returns assays up to 30 grams gold per tonne. Work in 1998 identified another style of mineralization exposed in an outcrop of limonitic and argillically-altered, sheared quartz-sericite schist (Fig. 20) on Lake Creek. A composite grab sample of this outcrop assayed 3110 ppb Au. Gold from the Livingstone camp is typically large (Fig. 21; nuggets up to 36 ounces, 1100 grams) and several nuggets containing octehedral impressions of magnetite crystals were observed. Magnetite is commonly observed in Paleozoic metamorphic units underlying the property and suggest that another undiscovered source of gold exists on the property.

Figure 21. *Two 5-ounce gold nuggets from Livingstone Creek.*

Yukon Yellow Metal conducted a small program of A-size core drilling (Fig. 22) on the Shootamook Creek property (Yukon Minfile 105B 045). Three holes, totalling 101 metres, were collared from one setup on the Winnie showing. A granitic intrusive plug intense argillic alteration was encountered in all holes, with variable silicification and minor sulphide mineralization. Hole Mel-X2 encountered a zone at 28 metres depth with very fine-grained acicular arsenopyrite which assayed 1.9 g/t Au over 0.7 metres.

Brett Resources Inc. conducted a short program of geological mapping on the **Maui** property (NTS 105G/11), 80 kilometres southeast of Ross River. The program followed up on soil geochemical anomalies and gold bearing quartz-sulphide mineralization discovered during a grassroots program in 1997 by

Whitehorse geologist Jim Dodge. The program was funded by the Yukon Mining Incentive Program. The property lies within Yukon-Tanana Terrane and contains a metasedimentary package of quartz-sericite to quartz-biotite garnet schists overlying a thin metavolcanic muscovite-quartz-feldspar schist which unconformably overlie megacrystic quartz monzonite (Tulk and Tucker, 1998). This package can be tenatively correlated with Unit 1, Unit 3 and the Mississippian Houle augen orthogneiss described in the adjoining mapsheet by Murphy (1997). A high-level quartz monzonite plug intrudes the orthogneiss (Dodge, 1997). Mineralization on the property includes a swarm of intrusive-related arsenopyrite-pyrite-quartz veins hosted in metasedimentary rocks. The widest of four veins was exposed over 0.4 metres by hand-trenching, and select samples assayed up to 5.8 g/t Au, 2500 ppm Bi, 17% As. A small massive sulphide body, conformable to foliation in the metavolcanic schist, returned values up to 3.0 g/t Au, 128 ppm Bi, 10% As and 6.3% Zn. The sulphides could not be traced along foliation for any significant distance. Brett returned the claims to Dodgex Ltd. of Whitehorse after completing the 1998 program.

Figure 22. *AX drilling rig at the Shootamook Creek property of Yukon Yellow Metal.*

Radius Exploration conducted a small diamond drilling program on the **Brik** (Yukon Minfile 116B 004) property (Fig. 23) near Dawson. Exploration targeted low-sulphide, structurally controlled, precious metal mineralization adjacent to an Eocene felsic volcanic centre and the Tintina Fault. Seven holes were completed to test IP and geochemical anomalies

Figure 23. *Harmen Keyser (left) of Radius Exploration and Al Doherty of Aurum Consultants examine core from the Brik property.*

coinciding with a poorly exposed zone of epithermal-style alteration and mineralization in ultramafic rocks. Results of the drilling show that the zone of interest is a thin veneer of ultramafic rocks bounded by a sub-horizontal thrust fault within 25 metres of surface, underlain by graphitic schist. Anomalous gold grades were encountered in drilling, but no grades of economic significance were intersected.

BASE METAL EXPLORATION

Figure 24. *Helicopter-supported drilling was performed on the Wolf property.*

Since 1994, base metal exploration has been dominated by the search for volcanogenic massive sulphide deposits in the Finlayson Lake district. In 1998, exploration for base metals covered most areas of the Yukon; companies were seeking a wide range of commodities and deposit types. Although there were several active exploration projects in the Finlayson district, the level of exploration has declined dramatically from previous years. Exploration in the district is expected to increase with the acquisition by Expatriate Resources of Boliden Westmin's 60% share of the Wolverine deposit (6.2 million tonnes grading 12.7% zinc, 1.3% copper, 1.5% lead, 371 g/t silver and 1.76 g/t gold). Expatriate has stated its intention to move the project forward through resumed exploration and increased efforts in finding a metallurgical solution to the high selenium content of the Wolverine property; the property was idle in 1998. Exploration for VMS deposits continued in other areas of Yukon-Tanana Terrane apart from the Finlayson Lake district.

Atna Resources continued to expand the **Wolf** Pb-Zn-Ag volcanogenic massive sulfide deposit (Yukon Minfile 105G 008) optioned from YGC Resources in 1998, drilling 6625 metres in 30 holes, the Yukon's largest diamond drilling program (Fig. 24). Atna announced a drill-indicated resource for the deposit of 4.1 million tonnes grading 6.2% Zn, 1.8% Pb and 84 g/t Ag for the main Wolf deposit after the 1998 drilling. The Wolf is located 45 kilometres west of Cominco's Kudz Ze Kayah deposit in a belt of Mississippian volcanic rocks southwest of the Tintina Fault in Pelly-Cassiar terrane (Gibson et al.; and Hunt, this volume). Drilling was successful in expanding the deposit which now has a strike length of 600 metres and has been traced for a down dip length of 450 metres (Fig. 25). Two additional zones of massive sulphide mineralization have been found in the footwall of the main Wolf stratigraphic horizon. A new zone, the East Slope, was discovered 1200 metres along strike to the east of the Wolf deposit. Drilling in the East Slope Zone intersected three massive sulphide horizons within a 140 metre-thick sequence of mineralized felsic pyroclastic rocks. Drill hole WF98-33 intersected 4.0 metres of 4.63% Zn, 2.12% Pb and 30.0 g/t Ag in the uppermost sulphide horizon which is correlated with the main Wolf horizon. One other hole was drilled in the East Slope Zone approximately 60 metres downdip from hole WF98-33 and intersected two narrow mineralized horizons. The main Wolf horizon which

Figure 25. *High-grade massive sulphide core from the Wolf property.*

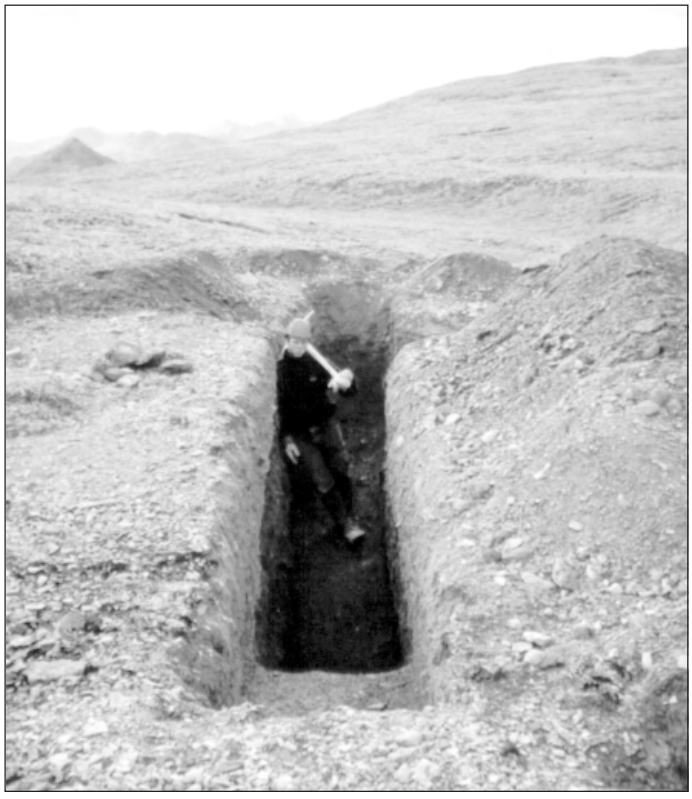
Figure 26. *Willow Creek zone at the Starr property of Pathfinder and Petra Resources.*

remains open, and the additional zones discovered by the 1998 program will be further tested in 1999. Atna also drilled on the Fox property, optioned from Cominco, which adjoins the Wolf property. They also conducted prospecting, mapping and sampling programs on the Fire and Ice claims optioned from Eagle Plains/Miner River Resources. The Mamu property was also optioned from Oro Bravo Resources and received limited work. Atna also worked on their 100% owned Tree property hosted in the same belt of rocks.

Pathfinder Resouces and partner Petra Resources conducted their first full season of exploration on their extensive block of claims that extends to the northwest from the Wolf claims. The **Starr** property (Yukon Minfile 105G 090, etc.) covers 25 kilometres of the same volcanic stratigraphy that hosts the Wolf deposit. A program of silt and soil sampling, prospecting and geological mapping was conducted in late 1997 on numerous zones identified by prominent gossans, an airborne geophysical survey and a preliminary geological program. The program conducted by Equity Engineering successfully located massive sulphide mineralization consisting mainly of massive pyrite with trace galena and sphalerite (Fig. 26). This zone and several other promising areas will be explored in 1999.

In the Finlayson VMS district, exploration has declined, however several companies remained active in the emerging camp. Expatriate Resources has large land holdings in the Finlayson district and they continued to advance the potential of several properties with programs of geological mapping, sampling and hand trenching (Fig. 27). Several targets consisting of massive sulphide mineralization have been identified and remain to be tested by diamond drilling. In 1998, Expatriate announced a resource calculation for the **Ice** (NTS 105G/13, 14) deposit in the Finlayson district. The deposit contains 4,561,863 tonnes grading 1.48% Cu with minor gold, silver and cobalt. Approximately 3.4 million tonnes of the resource can be exploited by open-pit mining. Arcturus Resources also

Figure 27. *A tidy hand trench excavated by Expatriate Resources personnel in the Finlayson Lake area.*



continued working on their **First Base** property (Yukon Minfile 105G 031), 17 kilometres west of Cominco's **Kudz Ze Kayah** deposit, with a small program of ground geophysics. Elsewhere in the Finlayson district, Cominco Exploration conducted the only drill program in the area on their Kudz Ze Kayah (Yukon Minfile 105G 117) property. Kudz Ze Kayah was the original discovery in the Finlayson district and contains open-pit mineable reserves of 11 million tonnes grading 5.9% Zn, 0.9% Cu, 1.5% Pb, 130 g/t Ag, and 1.3 g/t Au. Exploration on the **Wolverine** deposit (Yukon Minfile 105G 072) of Expatriate/Atna Resources was idle in 1998. Exploration is expected to resume in 1999 with legal issues surrounding ownership of the property resolved and metallurgical solutions to the high selenium content of the deposit being investigated.

Several properties continued to be evaluated in the Wolf Lake, Teslin and Quiet Lake areas for their VMS potential. Birch Mountain Resources conducted a small program of prospecting, geological sampling and mapping on the **Swift River** property (Yukon Minfile 105B 027) located 130 kilometres west of Watson Lake. Numerous Pb-Zn-Ag-Cu-Au showings occur on the property which is underlain by interbedded clastic and volcanic rocks of the Yukon-Tanana Terrane. Previous work has classified the mineralization as skarn based on the calc-silicate host rocks and mineralogy of most of the known showings. Birch Mountain has re-interpreted the geology and is exploring the property as a series of syn-sedimentary exhalative deposits with a significant regional and contact metamorphic overprint. Work in 1998 discovered a new showing consisting of medium-grained quartz-pyrrhotite-actinolite-sphalerite-calcite-galena mineralization approximately one metre thick, hosted in an argillaceous quartz-muscovite schist. The showing is poorly exposed on a steep talus slope and grab samples returned values up to 9.3% Zn, 2090 ppm Pb, 1716 ppm Cu and 30.8 ppm Ag (De Paoli, 1998). Further work, including drilling, is planned for 1999.

Fairfield Minerals Ltd. conducted programs including IP surveys, soil geochemistry, prospecting and hand and blast trenching on the **Cabin Lake** (NTS 105B/4) and **Caribou Creek** (NTS 105C/8) properties in southern Yukon. The properties are underlain by Paleozoic metavolcanic and metasedimentary rocks of the Yukon-Tanana Terrane. The main target on the properties is polymetallic massive sulphides. Work to date has outlined several copper and copper-zinc soil anomalies. Trenching in the areas of soil anomalies has uncovered disseminated pyrite-chalcopyrite mineralization in sheared quartz mica schists on the Cabin Lake property. Porphyry-style mineralization, consisting of quartz stringers with chalcopyrite and molybdenite within a granitic intrusive, has also been discovered there. Values up to 606 ppb Au and 56.6 ppm Ag with anomalous bismuth, lead, molybdenum and tungsten were obtained from larger angular quartz float in the area of the porphyry mineralization. At Caribou Creek, disseminated and stringer-type sulphide mineralization in quartz sericite schist and quartz-carbonate altered intermediate to mafic volcanic rocks were discovered.

Figure 28. *Helicopter-supported drill at the Dromedary property of Blackstone and Geologix Explorations.*

Tanana Exploration conducted a program of geological mapping, geochemical and lithogeochemical sampling, and prospecting, following up on multi-element soil geochemical anomalies coincident with airborne EM conductors delineated in 1997 on the **Bigtop** property (Yukon Minfile 105C 021). The property is underlain by interlayered carbonaceous shales, pyritic felsic volcanics and tuffaceous units of Yukon-Tanana Terrane. A number of discordant zones of silicified, sericitized and

lesser chloritized rocks with quartz veining and disseminated sulphides were identified in the 1998 program. The best developed zone showed a strong depletion of Ca, Na and K, with the Na depletion being laterally extensive. Petrographic analysis of felsic volcanics has shown them to be primarily dacitic in composition with some porphyritic textures. Many samples were tuffaceous and contained carbonaceous matter, suggesting formation in a relatively shallow submarine environment. A compilation of all data collected during the past two seasons will assist in the delineation of a number of stratigraphic drill targets which are proposed to test the mineral potential of the property (S. Traynor, pers. comm., 1998).

Blackstone Resources and Geologix Explorations conducted a 3-hole, 535-metre drill program (Fig. 28) on the **Dromedary** Pb-Zn-Ag property in central Yukon. Sedimentary-exhalative style mineralization is hosted in Devono-Mississippian Earn Group sediments. Drilling was targeted at extending two mineralized horizons intersected by drilling in 1997. Pyrrhotite-siderite mineralization, with minor base metals, was encountered by the drilling. The best intersection was 2.0 metres of 3.66% Zn, 0.02% Pb and 2.3 g/t Ag in hole FRN98-05. The drilling indicated a thickening of the sulphide horizon to the west where gravity and magnetic anomalies remain open. Several other geophysical anomalies on the property remain to be tested.

After a long lapse, exploration for Pb-Zn-Ag deposits northeast of Mayo in the Kathleen Lakes area was resumed by Manson Creek and Prism Resources. The partners explored several silver-lead-zinc properties hosted in Proterozoic dolomite in the southern Wernecke Mountains. Work was directed at sampling and re-evaluating many of the known showings and deposits in the area, and included detailed silt sampling, detailed mapping, rock sampling, line-cutting and several small gradient IP surveys. Several styles of mineral occurrence exist on the properties including replacement, veins and possibly Mississippi Valley-type mineralization. The main areas explored were deposits and occurrences in the **Val/Vera** (Yukon Minfile 106C 083, 085) area, and the Craig deposit optioned from Falconbridge. The Vera deposit contains a resource calculated at the end of 1981 of 850,000 tonnes averaging 306 g/t Ag and 3.7% combined Pb-Zn. Previous work on the Vera included extensive diamond drilling and 720 metres of underground development. The Val trend contains nine silver-lead occurrences (Fig. 29) located within Middle Proterozoic Gillespie Group dolomite that is unconformably overlain by carbonate rocks of the Late Proterozoic Pinguicula Group. The vein-like South Hill (South) Zone has an average width of 4.5 m and has been explored by drilling for about 300 m along strike and 250 m below surface. Drill-

Figure 29. *George Sivertz of Manson Creek Resources extols the virtues of the Val/Vera trend in the southern Wernecke Mountains.*

Figure 30. *Ariel view of the kill zone associated with the Craig deposit in the Kathleen Lakes area. Manson Creek Resources re-evaluated the deposit in 1998.*

indicated reserves are 272,000 tonnes grading 137 g/t Ag. The Big Red Zone also in this trend appears to be an irregular replacement style of deposit and has a drill-indicated potential of 60,000 tonnes grading 1030 g/t Ag. Manson Creek also optioned the **Craig** (Yukon Minfile 106C 073) deposit (Fig. 30) from Falconbridge and included it in the 1998 exploration program. Previous diamond drilling on the Craig Main Zone has outlined a mineral resource of 964,000 tonnes grading 112 g/t Ag, 13.5% Zn and 8.5% Pb. In 1998, work included exploration of several showings hosted within a 6.5 kilometre trend of the "Craig dolomite" on claims owned 100% by Manson Creek. Further work, including diamond drilling, is planned for 1999.

Figure 31. *Tom Becker of Nordac Resources at the H zone on the Blue Heaven property in southern Yukon.*

Nordac Resources Ltd. explored the **Blue Heaven** property (Yukon Minfile 105B 020) for both its high-grade small tonnage and lower grade bulk tonnage silver potential. Blue Heaven is located 38 kilometres by gravel road north of the Alaska Highway near Rancheria in south central Yukon. Exploration in the area has increased with recent activity at the Silvertip deposit (2.57 million tonnes of 325 g/t Ag, 6.4% Pb, 8.8% Zn) of Imperial Metals Corporation located approximately 60 kilometres to the southeast in British Columbia. The H Zone (Fig. 31) at Blue Heaven consists of high-grade silver veins hosted in a quartz sericite schist. The H-1 vein contains massive galena with varying amounts of banded sphalerite, arsenopyrite and tetrahedrite. Trenching on the H-1 returned a high-grade assay of 12,376 g/t Ag over 94 centimetres. The Blue Zone consists of galena

and sphalerite in siderite replacement bodies at the base of a limestone-skarn unit. Chip sampling from a trench in the Blue Zone returned a weighted average of 61.1 g/t Ag, 4.0% Pb and 3.8% Zn over 29.6 metres. Trenching, bulk sampling and diamond drilling is planned for 1999.

Figure 32. *Blackstone and Glenhaven Resources conducted helicopter-supported drilling on the Taiga Ni-Zn-PGE property.*

Nordac also explored the **Quarterback** property located 18 kilometres east of Blue Heaven. The QB#1 Zone was drilled in 1997 with the best result from drilling returning 1.75 metres of 107.5 g/t Ag, 8.4% Pb and 13.5% Zn. Exploration in 1998 resulted in the discovery of the QB#2 Zone located 3 kilometres to the west of the 1997 drilling. Hand trenching downslope from the discovery outcrop, a jasperoid-altered limestone, exposed mineralization which assayed 151.1 g/t Ag, 2.52% Pb, 0.91% Zn and 0.34% Cu over 15 metres. An extensive silver-lead-zinc-copper soil anomaly was also defined in the discovery outcrop area.

Nordac also acquired, by staking, the Northern Dancer property, which contains the **Logtung** deposit (Yukon Minfile 105B 039), straddling the B.C.-Yukon border. The tungsten-molybdenum porphyry deposit contains a geological resource of 229 million tonnes grading 0.14% WO_3 and 0.05% MoS_2. Nordac conducted exploration immediately south of the deposit, where a quartz vein swarm contains beryl, wolframite and scheelite.

Blackstone and Glenhaven Resources conducted a helicopter-supported diamond drill program (Fig. 32) totaling 832 metres in 14 holes on the **Taiga** Ni-Zn-PGE property 100 kilometres northeast of Dawson. Stratabound pyrite-vaesite containing nickel-zinc mineralization with elevated Mo, Au and PGEs, is hosted in baritic and carbonaceous shales of the middle member of the lower Middle Devonian Earn Group. Drilling was conducted in the MM grid area where a 1997 drill program encountered significant mineralization (5.3 metres of 1.42% Ni and 0.70% Zn) in the stratabound horizon. Drilling was also conducted in the MM grid extension area where mapping, prospecting and soil sampling identified the favourable horizon (Fig. 33). Drilling was successful in extending the horizon, however no intersections of the same tenor as that in 1997 were encountered. Drilling in the MM grid in 1998 encountered anomalous values for Ni-Zn when intersecting the favourable horizon. The

Figure 33. *Limestone balls mark the immediate footwall to the Ni-Zn-PGE horizon in the MM grid extension area on the Taiga property.*

best result was 1265 ppm Ni and 8320 ppm Zn over 0.9 metres in hole REN98-13. Hole REN98-25 in the MM grid extension intersected 2490 ppm Ni, 1640 ppm Zn over 1.41 metres. Three unexpected gold intersections associated with late-stage calcite and gypsum veinlets were also reported including 9.64 g/t Au over 1.61 metres and 1436 ppb Au over 0.75 metres in hole REN98-15.

Blackstone and Glenhaven also explored several properties to the east and north of the Taiga, targeting additional areas anomalous in Ni-Zn, identified from a large silt and soil sampling program conducted by UMEX in 1976-77. Ni-Zn soil anomalies were further defined with grid-based soil sampling; prospecting located additional Ni-Zn mineralization within the favourable horizon. The partners are evaluating how to further assess this enigmatic but highly prospective belt of rocks.

Blackstone conducted a program of grid establishment, geologic/structural mapping and soil and rock chip sampling on the **Monster** property (Yukon Minfile 116B 084), northeast of Dawson. The Monster property is located within the Coal Creek Inlier, an oval-shaped and east-trending window of Middle and Late Proterozoic clastic rocks that have been penetrated by mineralized breccias and cut by mafic sills and dykes. This belt of rocks shows distinct similarities in age, tectonic setting, alteration, and mineralization to Proterozoic iron-oxide deposits such as Olympic Dam (2 billion tonnes grading 1.6% copper, 0.6 g/t gold, 0.06% uranium oxide and 3.5 g/t silver) in Australia. Blackstone is actively seeking a joint venture partner for this property.

Eagle Plains Resources and CanAustra Resources carried out a small seismic and gravity geophysical survey followed by prospecting and geochemical sampling on the **Rusty Springs** property (Yukon Minfile 116K 003) in northern Yukon. The seismic work indicated that the siliceous limonitic stratabound horizon which hosts Cu-Pb-Zn-Ag mineralization on the property, extends to the east under a wide tussock-covered valley. The gravity survey identified two gravity highs underlying the valley. These targets are planned to be tested with further geophysics and drilling in 1999.

Liberty Minerals Exploration Inc. conducted a program of hand- and blast-trenching, followed by 339 metres of helicopter-supported diamond drilling in four holes on the **AZ** (Yukon Minfile 115F 051) property. The property is located approximately 40 kilometres south of Beaver Creek in western Yukon. Copper-gold mineralization on the property is hosted in pyroxene-magnetite and garnet-quartz-epidote skarn developed within basalts of the Middle Triassic Nikolai Group in Wrangellia terrane (Fig. 34). Surface sampling by Noranda in 1992 in the discovery outcrop area of garnet-magnetite-epidote skarn with disseminated to semi-massive chalcopyrite, returned values up to 8 g/t Au, 171.4 g/t Ag and 10.1% Cu. Trenching in 1998 away from the discovery outcrop failed to expose mineralization of the same tenor, and suggested that the pyroxene-magnetite skarn was the more favourable host to copper-gold mineralization. Drilling targeted magnetic anomalies, defined by a detailed magnetic survey conducted in 1997, and intersected a large (89 metre thick) section of mixed garnet-silicate and magnetite-pyroxene skarn in DDH 98-5. Sulphide minerals were rare in the garnet-silicate skarn while the pyroxene-magnetite skarn was mineralized with disseminated pyrite and chalcopyrite (< 1%). The best result was 2184 ppm Cu, 0.24 g/t Au and 1.6 g/t Ag from pyroxene-magnetite skarn from DDH 98-5. DDH 98-6 also intersected skarn lithologies before intersecting a coarse-grained hornblende-quartz diorite and alaskite (Doherty and Clarke, 1998).

Figure 34. *Pyroxene-magnetite skarn with minor chalcopyrite from the AZ property.*

Rob Hamel and partner H. Coyne and Sons continued excavator trenching on the Hat claims (Yukon Minfile 105D 053), which are along strike with the mined-out War Eagle deposit (Fig. 35) in the Whitehorse Copper Belt. Calc-silicate skarn consisting of garnet, diopside and wollastonite, with chalcopyrite and bornite is exposed over a 200 metre strike length and up to 25 metres width. High-grade skarn in trenches approximately 400 metres north of the War Eagle yielded chip samples up to 9.58% Cu and 1.0 g/t Au over 1.5 metres.

GEMSTONES

Late in the 1998 season, Expatriate Resources reported a discovery of emeralds in the Yukon. The location and mode of occurrence remains confidential. The emeralds have been examined by J.H. Montgomery, Ph.D., P.Eng., who has stated that "some near gem-quality stones are present." The occurrence will be further evaluated for its gemstone potential in 1999.

COAL AND INDUSTRIAL MINERALS

Cash Resources Ltd. conducted a program of excavator trenching at the **Division Mountain Coal** (Yukon Minfile 115H 013) project. Trenching was conducted at Cub Mountain northeast of the Division Mountain coal resource. The property is located 90 kilometres northwest of Whitehorse near Braeburn and is 18 kilometres southwest of the main power transmission line to Carmacks and Faro. Cash Resources estimates drill-indicated raw coal reserves at 54.7 million tonnes. Usibelli Coal mine, Inc. (UCM) of Healy, Alaska entered into an agreement with Cash Resources to acquire 50%, or alternatively all of Cash's coal properties in the Yukon. UCM is a privately owned corporation which has been involved in the coal mining industry including mining, exportation and power plant operation in Alaska since 1943.

A private Yukon exploration company continued evaluating the **Braeburn Lime** (NTS 105E/ 5) project. Seven reverse circulation drill holes totaling approximately 200

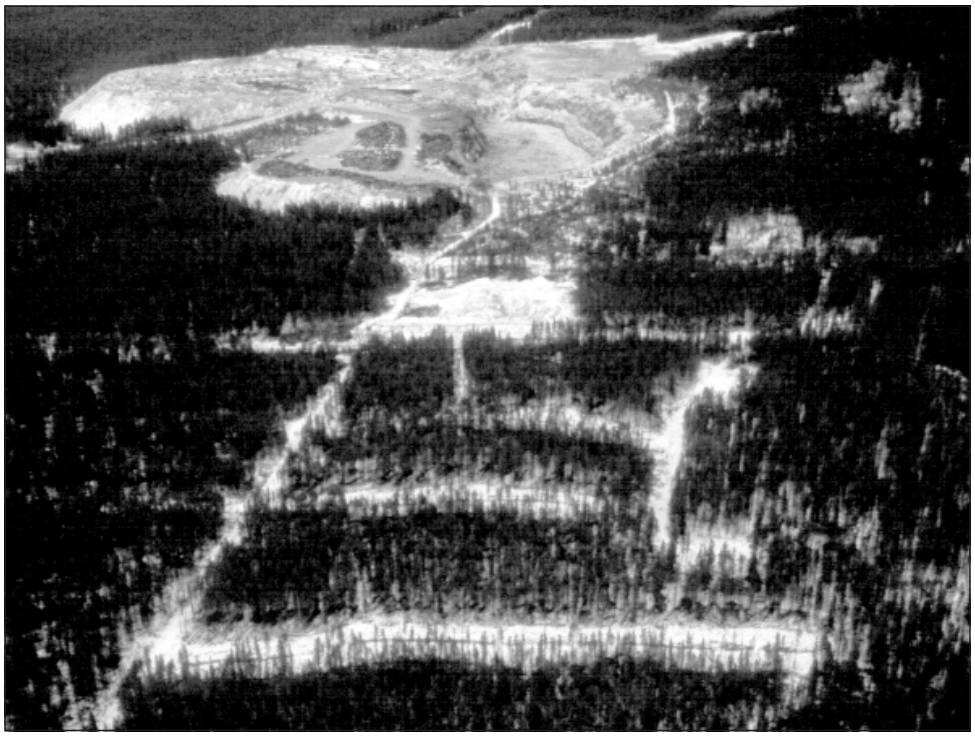


Figure 35. *Trenching along strike from the mined-out War Eagle Pit in the Whitehorse Copper Belt has exposed calc-silicate skarn containing chalcopyrite and bornite.*

metres were drilled testing near-surface high purity Triassic Lewes River Group limestone. The property is road-accessible midway between Whitehorse and Carmacks.

ACKNOWLEDGMENTS

This report is based on public information gathered from many sources. It includes information provided by companies through press releases, property summaries provided to the department and from property visits conducted in the 1998 field season. The cooperation of companies and individuals providing information and their hospitality during field visits are gratefully acknowledged. Editing by Diane Emond, Charlie Roots and Leyla Weston greatly improved this report.

Companies and individuals exploring in the Yukon and wishing to be included in future reports are encouraged to contact the author.

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APPENDIX 1: 1998 EXPLORATION PROJECTS

BS – Bulk Sample
D – Development
DD – Diamond Drilling
ES – Environmental Studies
F – Feasibility
G – Geology
GC – Geochemistry
GP – Geophysics
M – Mining
PD – Percussion Drilling
PF – Pre-feasibility
R – Reconnaissance
T – Trenching
U/GD – Underground Development

PROPERTY	COMPANY	MINING DISTRICT	MINFILE # (1:50 000 NTS)	WORK TYPE	COMMODITY
Alp, Nug, Old, Nut, Drag, May	Eagle Plains/ Miner River Resources	Mayo	105O 004, 048, 039, 044 105J 007, 115P 056	G,GC	Au
Arn	Nordac Resources	Whitehorse	115F 048	G,GC	Cu-Au
Aurex	YKR International	Mayo	105M 060	G,GP	Au
AZ	Liberty Mineral	Whitehorse	115F 051	G,GC,DD	Cu-Au
Bigtop	15053 Yukon Inc.	Whitehorse	105C 021	G,GC,T	Pb-Zn-Cu-Ag-Au
Blue Heaven	Nordac Resources	Watson Lake	105B 020	G,GC,T	Ag-Pb-Zn-Cu
Braeburn Lime	Liberty Minerals	Whitehorse	(105E/5)	G,GC,RC	$CaCO_3$
Brewery Creek	Viceroy Resources	Dawson	116B 160	M,G,GC,RC	Au
Brik	Radius Exploration	Dawson	116B 004	G,DD	Au
Cabin Lake, Caribou Creek	Fairfield Minerals	Watson Lake	(105B/4 105C/8)	G,GC,T	Pb-Zn-Cu-Ag
Clear Creek	Newmont/New Millenium	Mayo	115P 012, 013	GP	Au
Cy/St	Eagle Plains/ Miner River Resources	Watson Lake	105F 102	G,GC	Pb-Zn-Ag
DDL	Nordac Resources	Whitehorse	105E 006	GC,T	Cu-Au
Division Mountain	Cash Resources	Whitehorse	115H 013	G,T	Coal
Dromedary	Blackstone Resources Geologix Explorations	Whitehorse	105L 031, 051	G,DD	Pb-Zn-Ag-Au
FER	Rimfire Minerals	Watson Lake	(105H/15)	G,GC	Au
Fire/Ice	Atna Resources/ Eagle Plains-Miner River	Whitehorse	105F 071, 073	G,GC,GP	Pb-Zn-Ag
First Base	Arcturus Resources	Watson Lake	105G 031	GP	Pb-Zn-Cu-Au-Ag
For Sure/Big Time/ Got It/Gotcha	Prospector International	Mayo	105O 024	G,GC	Au
Fox	Atna Resources/Cominco	Whitehorse	105G 008	G,GC,GP	Pb-Zn-Ag
Gates Creek	Viceroy/Tr'on dek Hwech'in First Nation	Dawson	(116A/4, 115P/13)	G,GC	Au
Goddell, Skukum	Omni/Arkona/Trumpeter	Whitehorse	105D 025, 022	G,DD	Au-Ag
Harlan	Viceroy Resource Corp.	Mayo	(105O/4/5)	G,GC	Au
Hat	Coyne & Sons	Whitehorse	105D 053	G,GC,T	Cu-Au-Ag
Horn	Canadian United Minerals	Dawson	(116B/7)	G,GC,GP	Au

PROPERTY	COMPANY	MINING DISTRICT	YUKON MINFILE (prefix is NTS map #)	WORK TYPE	COMMODITY
Hy	Paramount Ventures/ Phelps Dodge	Watson Lake	(105H/15)	G,GC	Au
Java/Lorrie	Homestake Canada	Dawson	116A 012, 021	G,GC,T	Au
JRV	Columbia Gold Mines	Watson Lake	105K 051, 052, 053	G,GC	Au-Ag
Kathleen Lakes	Manson Creek Resources	Mayo	106C 065, 083, 085, 073	G,GC,GP	Ag-Pb-Zn
Keno Hill	United Keno Hill	Mayo	105M 001	D	Ag-Pb-Zn
Kiwi	Teck Exploration	Whitehorse	(105J/12)	G,GC,T	Au
Kudz Ze Kayah	Cominco	Watson Lake	105G 117	G,DD	Pb-Zn-Cu-Ag-Au
Livingstone	Larry Carlyle/ Max Fuestner	Whitehorse	105E 1, 042, 049, 054	G,GC,T	Au-Ag
Longline	Barramundi Gold Ltd.	Whitehorse	115N 024	G,GC,DD	Au
McQuesten	Viceroy/Miner River/ Eagle Plains Resources	Mayo	105M 029	G,GC,T	Au
Mamu	Atna Resources/ Oro Bravo	Whitehorse	105F 013	G,GC,GP	Pb-Zn-Ag
Marlin	Northern Rhodonite	Whitehorse	105C 017	M	Rhodonite
Maui	Brett Resources	Watson Lake	(105G/11)	G,GC	Au
Mel	International Barytex	Watson Lake	95D 005	G	Pb-Zn-Ag
Minto	Minto Resources	Whitehorse	115I 021, 022	D	Cu-Ag-Au
Monster	Blackstone Resources	Dawson	116B 084, 102, 103	G,GC	Cu-U-Au-Ag
Mos	Barker/Risbey	Dawson	115N 039, 040	G,GC	Au-Ag
Mount Nansen	BYG Natural Resources	Whitehorse	115I 064, 065	M,G,GC,T,DD	Au-Ag
Northern Dancer	Nordac Resources	Watson Lake	105B 039	G,GC	WO_3, MoS_2
Oki-Doki	International Kodiak	Dawson	(116B/1, A/4)	G,GC,T,GP	Au
Pigskin, QB	Nordac Resources	Watson Lake	105B 107, 098	G,GC,T	Ag, Pb, Zn
Plata	Alliance Pacific Gold	Mayo	105N 003	PD	Au-Ag
Prospector Mountain	Troymin/Almaden Res.	Whitehorse	115I 034, 036	G,GC	Au-Ag
Revenue	YKR International	Whitehorse	115I 042	G,GP	Cu-Au-Ag-WO_3-MoS_2
Rusty Springs	Eagle Plains Resources CanAustra Resources	Dawson	116K 003	G,GP	Ag-Cu-Pb-Zn
Scheelite Dome	La Teko/Kennecott	Mayo	115P 033	G,GC,GP,DD	Au
Screamer	Prospector International	Mayo	115P 040	G	Au
Shootamook	Yukon Yellow Metal	Watson Lake	105B 045	DD	Au
Starr	Pathfinder/ Petra Resources	Watson Lake	105G 090, etc	G,GC	Pb-Zn-Ag
Sun/Sprogge	Viceroy/Battle Mountain	Watson Lake	105H 034	G,GC	Au
Swift River	Birch Mountain Resources	Watson Lake	105B 027	G	Pb-Zn–Cu-Ag
Taiga	Blackstone Resources Glenhaven Resources	Dawson	116B 128	G,GC,DD	Ni-Zn-Mo-Au-PGE

PROPERTY	COMPANY	MINING DISTRICT	YUKON MINFILE (prefix is NTS map #)	WORK TYPE	COMMODITY
Tea	Coyne & Sons	Watson Lake	105O 020	M	Barite
Tree	Atna Resources	Whitehorse	105F 095	G,GC,GP	Pb-Zn-Ag
Wash	Nordac Resources	Whitehorse	115G 100	G,GC,T	Ni-Cu-Au-PGE
Wellgreen	Northern Platinum	Whitehorse	115G 024	G,GC	Ni-Cu-PGE
Wolf	Atna Resources	Whitehorse	105G 008	DD,G,GC	Pb-Zn-Ag
Yukon Regional	Kennecott Canada	Various		R,G,GC	Au
Yukon Regional	Hudson Bay	Various		R,G,GC	Au
Yukon Regional	Homestake	Various		R,G,GC	Au
Yukon Regional	Viceroy Resources	Various		R,G,GC	Au
Yukon Regional	Phelps Dodge	Various		R,G,GC	Au
Yukon Regional	Teck Exploration	Various		R,G,GC	Au
Yukon Regional	Eagle Plains/Miner River	Various		R,G,GC	Au
Yukon Regional	Barrick	Various		R,G	Au
Yukon Regional	Placer Dome	Various		R,G	Au

APPENDIX 2: 1998 DRILLING STATISTICS

PROPERTY	COMPANY	DIAMOND DRILL		RC/PERCUSSION DRILL	
		METRES	# HOLES	METRES	# HOLES
AZ	Liberty Minerals	339	4		
Brik	Radius Exploration	375	7		
Brewery Creek – exploration	Viceroy Resources			6009	82
Brewery Creek – minesite infill	Viceroy Resources			7961	137
Dromedary	Blackstone/Geologix	534.6	3		
Fox	Atna/Cominco	945			
Kudz Ze Kayah	Cominco	1750	11		
Longline	Barramundi Gold	214	4		
Mount Nansen	BYG Resources	4844	60		
Plata	Alliance Pacific Gold			200	16
Scheelite Dome	La Teko/Kennecott	1250	7		
Shootamook	Yukon Yellow Metal	101	3		
Skookum Creek area	Omni/Arkona/Trumpeter	1350	5		
Strike	Cominco	200	2		
Taiga	Blackstone/Glenhaven	832.2	14		
Wolf	Atna/YGC Resources	6625	30		
TOTAL		**19,360**		**14,170**	

PLACER MINING OVERVIEW — 1998

William LeBarge
Yukon Geology Program

Low gold prices continued to daunt the Yukon's placer mining industry in 1998, resulting in a decrease in both production and employment. Many operations were forced to downsize by reducing personnel, operating one shift instead of two. Other operations had water licenses but did not mine, choosing instead to explore for better ground or maintain equipment. Several operations selectively mined only high-grade areas, preferring to leave the less economic ground for times when the gold price has improved.

A total of 161 mines operated, with approximately 600 people directly employed in the industry. This represents a 6% drop in the number of mines and a 20% drop in employment from 1997. Over 80% of the placer gold was produced from unglaciated regions of the Yukon including Klondike, Indian River, west Yukon (Fortymile, Sixtymile, Moosehorn) and lower Stewart River. The remaining gold came from glaciated regions including Clear Creek, Mayo, Dawson Range, Kluane and Livingstone.

Gold production in 1998 totalled 90,288 crude ounces (2,808,273 g), compared to 116,383 crude ounces (3,619,919 g) for 1997 (Fig. 1). This represents an approximate 22% drop in production. This gold is worth approximately CDN$31.4 million which is CDN$12 million lower than the value of gold produced in 1997.

Mining Land Use regulations are scheduled to take effect on placer claims in 1999 and the current standards of effluent discharge set out in the Yukon Placer Authorization will be reviewed in 2001. These are some of the issues that face the industry, along with the lowest placer gold production in 16 years. However, the number of active mining operations has dropped only 6%, which is evidence that these mainly family-run businesses are committed to remaining in the Yukon, and they continue to significantly contribute to the Yukon economy as they have for last 100 years.

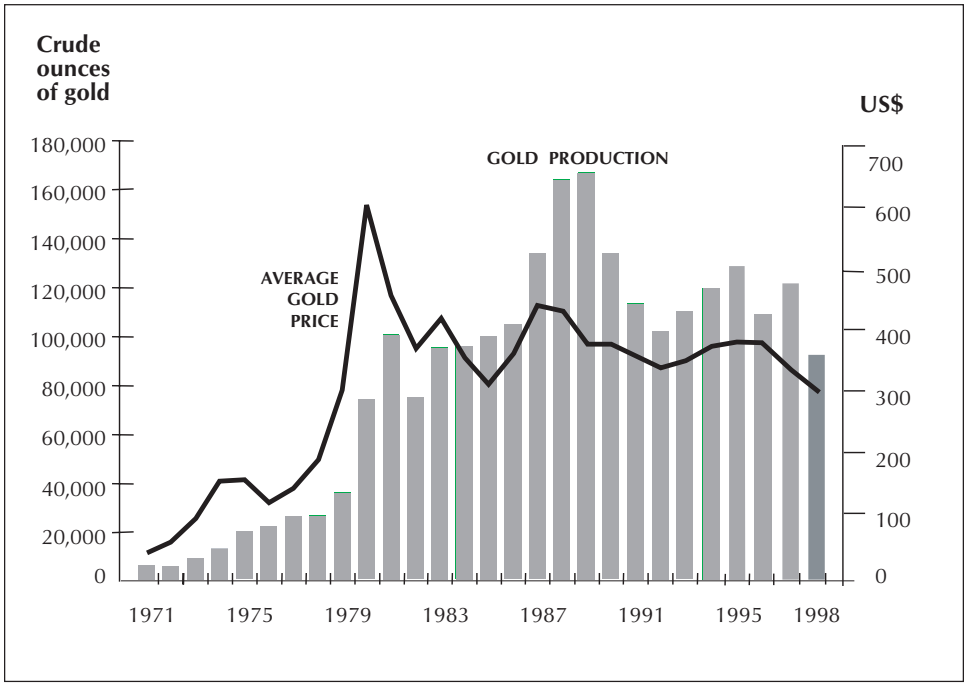

Figure 1. *Yearly gold production figures for the Yukon.*

RÉSUMÉ

Les faibles prix de l'or ont continué à décourager l'industrie de l'exploitation minière des placers au Yukon en 1998 pour entraîner des diminutions de la production ainsi que de l'emploi dans ce secteur. De nombreuses exploitations on a été contraintes à réduire leurs activités, résultant en coupures de personnel et entraînant un régime à un quart de travail plutôt que deux. Dans d'autres exploitations disposant de permis d'exploitation hydraulique il n'y a eu aucune extraction et on s'est contenté d'exécuter des travaux d'exploration ou d'entretien d'équipement. Dans plusieurs exploitations on a exploité de manière sélective uniquement les zones à forte teneur, préférant laisser de côté les zones moins rentables pour des jours où le cours de l'or se sera amélioré.

Il y avait au total 161 mines en exploitation et l'industrie assurait des emplois directs à environ 600 personnes, ce qui représente une diminution de 20 % au niveau de l'emploi et de 6 % en termes du nombre d'exploitations par rapport à 1997. Plus de 80 % de l'or placérien a été tiré des régions non glaciaires du Yukon, notamment les régions du Klondike, d'Indian River, de l'ouest du Yukon (Fortymile, Sixtymile, Moosehorn) et de la basse rivière Stewart. Le reste de l'or provenait des régions glaciaires dont celles du Clear Creek, de Mayo, de la chaîne Dawson, de Kluane et du ruisseau Livingstone.

À la fin de septembre, la production d'or pour 1998 totalisait 71 718 onces (2 230 681 g) d'or brut comparativement à 96 735 onces (3 008 797 g) pour la même période en 1997. Cela représente une diminution de la production d'environ 27 % et correspondrait à une production estimée d'environ 85 000 onces (2 643 798 g) à la fin de 1998. Cet or vaut approximativement 30 millions de dollars canadiens, soit 12 millions de moins que la valeur de la production d'or en 1997.

Le règlement sur l'utilisation des terres pour l'exploitation de placers au Yukon doit entrer en vigueur en 1999 et les normes en matière de déversement d'effluents actuellement établies dans le Yukon Placer Authorization seront réexaminées en 2001. Ce sont quelques-uns des problèmes avec lesquels doit composer l'industrie qui a fourni la plus faible production d'or placérien en 16 ans. Le nombre des exploitations en activité n'a toutefois diminué que de 6 %, ce qui constitue une indication du fait que ces entreprises principalement familiales sont engagées à rester au Yukon et elles continuent à contribuer de manière importante à l'économie du territoire comme elle l'ont fait au cours des 100 dernières années.

L'histoire quaternaire et la géochimie du till du district d'Anvil de la partie centrale est du Yukon

GOVERNMENT

Yukon Geology Program

Grant Abbott
Yukon Geology Program

Yukon Geology Program

Grant Abbott
Yukon Geology Program

Abbott, J.G. 1999. Yukon Geology Program. *In:* Yukon Exploration and Geology 1998, C.F. Roots and D.S. Emond (eds.); Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, p. 35-44.

OVERVIEW

Now in its third year, the Yukon Geology Program (Fig. 1) is a *de facto* Yukon Geological Survey consisting of two integrated and jointly managed offices with different administrative structures (Fig. 2). Federal funding is provided through the Exploration and Geological Services Division of the Department of Indian Affairs and Northern Development (DIAND), and territorial and cost-shared (YTG/DIAND) funding comes through the Mineral Resources Branch of the Department of Economic Development (Yukon Government, YTG). The Geological Survey of Canada (GSC) also maintains an office with the Program.

Figure 1. *Top row, from left: Jason Adams, Charlie Roots, Tammy Allen, Will van Randen. Bottom; standing, from left: Gord Nevin,Diane Emond, Grant Lowey, Jo-Anne van Randen, Lee Pigage, Maurice Colpron, Shirley Abercrombie, Danièle Héon, Ali Wagner (front), Panya Lipovsky (back), Kaori Torigai, Jeff Bond, Grant Abbott, Julie Hunt (back), Lisabeth Bryan (front), Robert Deklerk (back), Bill LeBarge (front), Mike Burke, Don Murphy, Craig Hart.*

The past year saw some stability and growth after the uncertainty and change of the previous year. Five managers completed their first full year in new jobs. In DIAND, they were: Terry Sewell, Regional Director General; Bob Holmes, Director, Mineral Resources Directorate; and Grant Abbott, Acting Chief Geologist, Exploration and Geological Services Division. In YTG they were: Jesse Duke, Acting Director, Mineral Resources Branch and Shirley Abercrombie, Acting Manager, Mineral Resources Branch. Five geological positions were filled. Lee Pigage and Maurice Colpron will undertake regional mapping, Jeff Bond is in a term position to undertake till geochemical surveys, Jo-Anne van Randen is also in a term position as a resource assessment geologist, and Gord Nevin is our GIS technician. The Program is now operating at full strength for the first time in three years.

Negotiations to devolve the responsibilities of the Northern Affairs Program to YTG are ongoing. Conclusion of negotiations on outstanding issues is expected before release of this publication. If they are successful, transfer could be completed as early as the end of 1999, a year later than originally planned.

PROGRAM HIGHLIGHTS FOR 1998

The Yukon Geology Program (YGP) in 1998 supported three regional bedrock mapping projects, two mineral deposit studies, two placer deposit studies, a till geochemistry study, two staff geologists, one Yukon Minfile geologist, two resource assessment geologists, and one GSC mapper. Several other projects were also funded through contributions to the Geological Survey of Canada and to university researchers. Figure 3 is a summary of available geological maps and regional geochemical and geophysical maps from the Yukon Geology Program.

FIELDWORK

Recent massive sulphide discoveries in the Finlayson Lake District have helped to stimulate research interest in the Yukon-Tanana Terrane and other pericratonic terranes in the northern Cordillera. The Yukon Geology Program is playing a significant role in the Ancient Pacific Margin NATMAP proposal. This

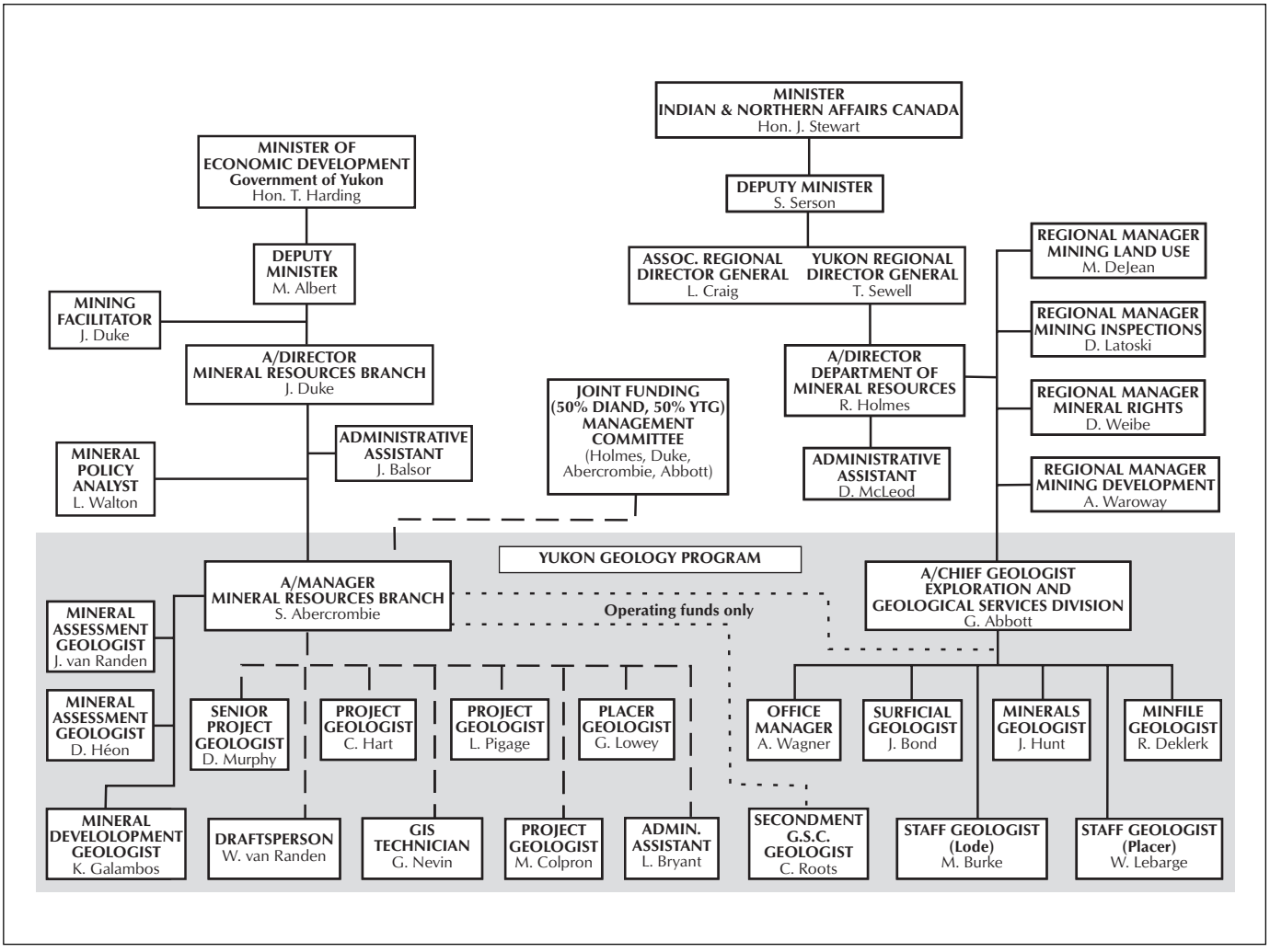

Figure 2. *Yukon Mineral Resources organization chart.*

cooperative effort involves the Geological Survey of Canada, the British Columbia Geological Survey (BCGS) and the universities of Alberta, British Columbia and Victoria. The project, if approved, will examine critical localities in British Columbia, Yukon and possibly Alaska. The Yukon Geology Program will continue mapping by Don Murphy in the Finlayson Lake area, and by Maurice Colpron in the Glenlyon area. In the Stewart River area, where most of the Yukon's placer gold deposits are located, placer deposit studies by Grant Lowey will accompany surficial mapping by Lionel Jackson of the GSC. The Geological Survey of Canada contribution will include Steve Gordey in the Stewart River map area, Charlie Roots in the western half of Wolf Lake map area, and in the northern half of Jennings River map area with Joanne Nelson and Mitch Mihalynuk of the BCGS.

The closure of the Faro mine at the beginning of the year was a major blow to the Yukon economy. Remaining reserves in the Anvil District are uneconomic at present, but significant exploration potential remains. The YGP has embarked on several projects to capture, synthesize, and enhance the geological database that owners of the mine have accumulated over the last 30 years. Lee Pigage who has 20 years of mapping and exploration experience in the district is overseeing the project, and has begun compilation and bedrock mapping at 1:25 000 scale. Lithogeochemical studies by Cliff Stanley of Acadia University will test reports by exploration geologists of visual alteration of host rocks above the Grizzly (formerly Dy) deposit. The study could define a new exploration tool for the district. Jeff Bond is mapping the surficial geology of the district and has completed a case study of till geochemistry down-ice from the Faro deposit.

Placer deposit studies were also a main focus. After completing a compilation map of the geology of the White Channel gravels in the Klondike district, Grant Lowey began studies of placer deposits in the Stewart River map area. This project will be part of the proposed Ancient Pacific Margin NATMAP project. In partnership with the Mining Inspections Division of the Northern Affairs Program, Bill LeBarge and Mark Nowosad from Okanagan College began a new project to study the relationship between sedimentology, grain size distribution, and water quality of effluent from placer deposits. Data gathered from this study should assist with the review of the Yukon Placer Authorization, scheduled for 2001.

Julie Hunt is in the final year of her study of volcanogenic massive sulphide deposits (VMS). Her focus was the geological setting of the Wolf deposit, in Devono-Mississipian volcanic rocks on the Pelly Cassiar Platform. The Wolf deposit is a new discovery which has re-ignited exploration interest in the rocks of Ancient North America after so much recent attention was paid to VMS deposits of similar age in adjacent Yukon–Tanana terrane.

Craig Hart postponed a good part of the third year of his metallogenic study of the Dawson Range. Forest fires and a shortage of helicopters forced him to change course and focus on precious metal occurrences related to the Tombstone suite of Cretaceous intrusions. These include the Brewery Creek gold deposit and in Alaska, the Fort Knox and True North gold deposits. In the Dawson Range, Craig has not only the task of putting the wide variety of intrusion-related precious and base-metal deposits into their regional context, but is also compiling new 1:50 000 scale geology maps based on interpretation of geophysical surveys that were funded by the 1990-1996 Canada-Yukon Economic Development Agreement. Interest in the Dawson Range may be spurred next year by the recent realization that several of the gold occurrences and deposits in it are the same age as the exciting new Pogo gold discovery on trend to the west in Alaska.

OTHER PROJECTS

The Yukon Geology Program supported the work of several scientists of the Geological Survey of Canada. Charlie Roots is nearing completion of a final report for Lansing map area. This will be the completion of a seven-year-long project to map Mayo and Lansing map areas. Steve Gordey is completing the compilation of a digital geological map of the Yukon. The map is expected to be released on CD-ROM in March, 1999 and will be a significant step forward in our efforts to produce digital products and to manage the large amount of geological information now available in the Yukon. Alejandra Duk-Rodkin received support to produce a glacial limits map of the Yukon to mark the centennial of the Klondike Gold Rush in 1998. Part of this project has resulted in a significant reinterpretation of the early glacial history of Stewart River map area which will lead to a much better understanding of the remaining placer potential there. The glacial limits map will be integrated with the digital bedrock compilation.

INDUSTRY LIAISON AND SUPPORT

Mike Burke and Bill LeBarge, our main links to the exploration industry, continued to monitor Yukon hard rock and placer mining and mineral exploration activity, visit active properties, review reports for assessment credit, and maintain the assessment report library.

YUKON MINFILE

Yukon MINFILE, the Yukon's inventory of mineral occurrences, and another mainstay of the Yukon Geology Program, is maintained by Robert Deklerk. We have completed an upgrade from Foxbase to Microsoft Access Version 2 and are now proceeding with an upgrade to Access 97 with major revision and simplification of the database structure. Paper copies of the text version are available through Exploration and Geological Services Division, and the updated digital version will be released on CD-ROM this spring and sold by Hyperborean Productions in Whitehorse.

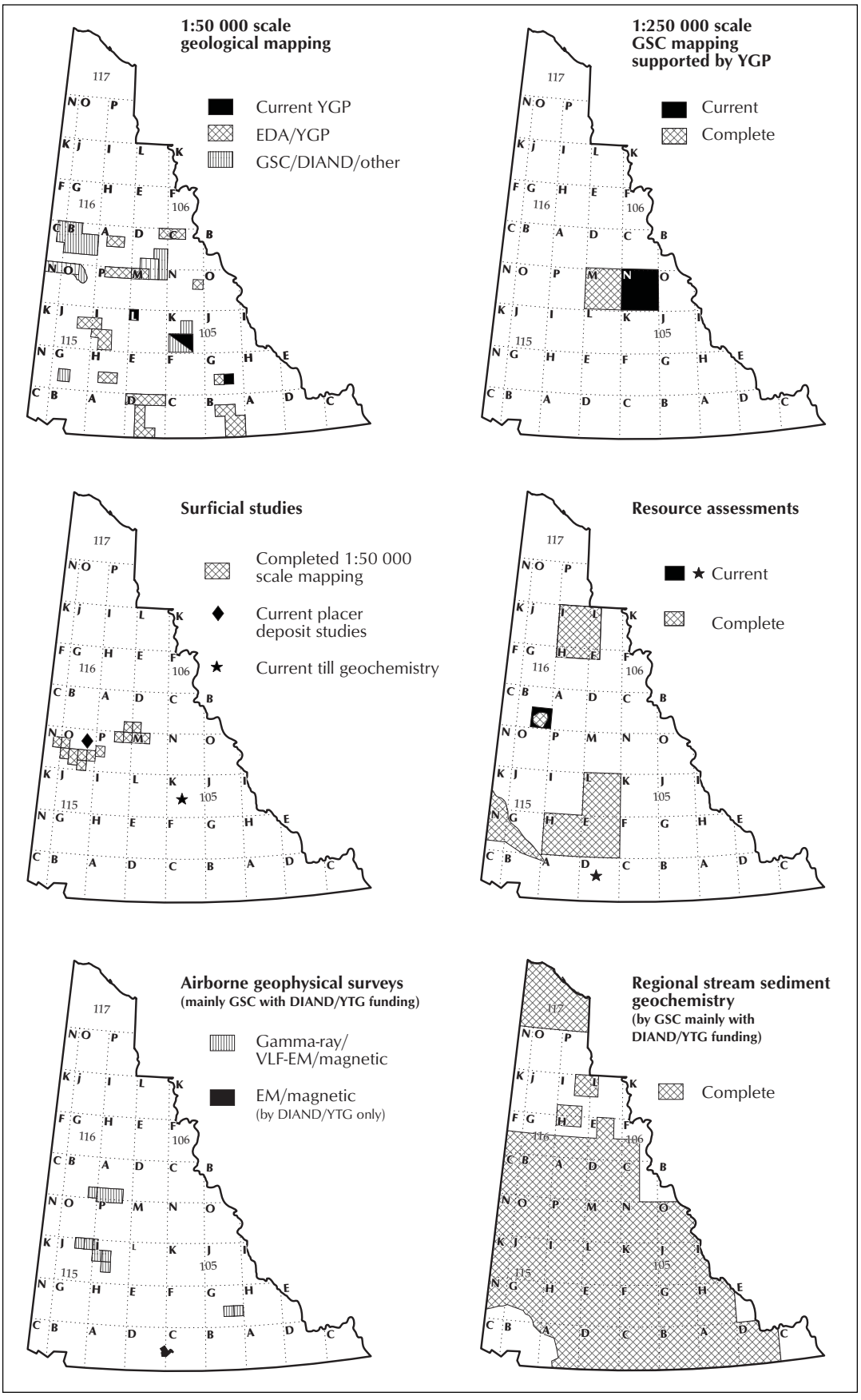

Figure 3. *Summary of available geological maps and regional geochemical surveys in the Yukon. Not shown are 1:250 000 scale geological maps and regional aeromagnetic maps which cover most of the Territory, and are published by the Geological Survey of Canada.*

YUKON GEOPROCESS FILE

The Yukon Geoprocess File, under the direction of Diane Emond, is an inventory of information on geological process and terrain hazards, and also includes references and summaries of bedrock and surficial geology. The Geoprocess File is intended as a planning aid for development activities and is available for most areas south of 66° latitude.

H.S. BOSTOCK CORE LIBRARY

The H.S. Bostock Core library is maintained by Robert Deklerk. The facility contains about 128,000 m of diamond drill core from about 200 Yukon mineral occurrences. Confidentiality of material is determined on the same basis as mineral assessment reports. Confidential core can be viewed with a letter of release from the owner. Rocks saws and other rock preparation equipment are available to the public.

MINERAL RESOURCE ASSESSMENTS

The Yukon Geology Program is responding to an increasing need for geological and metallogical information to assist resolution of land use issues and conflicts. Some of the pressures have come from native land claims negotiations, and localized land use conflicts such as one within the city limits of Whitehorse, but most important is the priority of the Yukon government to implement a Protected Areas Strategy by the year 2000. The Yukon Protected Area Strategy will result in protection and withdrawal of land in all 23 ecoregions in the Yukon. YTG plans to provide efficient and cost-effective input into the selection process by undertaking a Yukon-wide mineral potential study under the direction of Danièle Héon in the spring of 1999.

YUKON MINING INCENTIVE PROGRAM

The Yukon Government provides grants for grassroots exploration and initial development of properties. This year, under the supervision of Ken Galambos, $378,000 was distributed to 27 prospectors.

PUBLICATIONS

The Yukon Geology Program is now converted to fully digital publishing. All geological maps are now printed, and new publications are being produced, from a digital format, on-demand. This advance will greatly reduce our printing and storage costs. We expect to eventually sell digital files through our website.

Appendix 1 is a summary of recent references including Yukon Geology Program publications and maps, articles in outside journals, theses and other Yukon publications of interest.

Yukon Geology Program publications are published by Exploration and Geological Services Division, DIAND and are available through:

Geoscience Information and Sales
c/o Whitehorse Mining Recorder
102-300 Main Street
Whitehorse, Yukon Y1A 2B5
Phone (867) 667-3266, Fax. (867) 667-3267

To learn more about the Yukon Geology Program, visit our homepage at
http://www.yukonweb.com/government/geoscience/
or contact us directly:

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RÉSUMÉ

Le Programme d'études géologiques du Yukon est un programme intégré réalisé à frais partagés par la Division de l'exploration et des services géologiques des Affaires indiennes et du Nord Canada (MAINC), la Division des ressources minérales du gouvernement du Yukon et la Commission géologique du Canada de Ressources naturelles Canada. Nous recueillons, compilons et communiquons des informations sur la géologie et les gisements de minéraux au Yukon.

Notre principale activité est de dresser des cartes géologiques, qui sont essentielles à la prospection, aux recherches géologiques et à la planification de l'utilisation des terres. Depuis 1991, nous avons produit vingt cartes sur le substratum rocheux à l'échelle de 1/50 000. Plus tard au cours de l'année, les données cartographiques numeriques que compile actuellement à l'échelle de 1/250 000 la Commission géologique du Canada, seront diffusées.

La cartographie des dépôts superficiels en appui à l'exploitation des placers est également une priorité. Pendant l'année, des projets de cartographie, de compilation et d'évaluation de placers ont continuée, soit :

1) le projet de recherche sur le placer Mayo; et

2) les études sur le placer de la région Rivière Stewart. Une nouvelle carte des limites glaciaires est en outre en cours de production en collaboration avec la Commission géologique pour commémorer le centenaire de la ruée vers l'or.

Deux études gîtologiques spécifiques ont été amorcées :

1) une sur les gisements de sulfures massifs volcanogènes dans le terrane Yukon-Tanana, la plate-forme de Pelly-Cassiar et le bassin de Selwyn; et

2) une autre sur les gisements de métaux précieux et communs dans le chaînon Dawson.

Des études sur le potentiel minéral sont entreprises au besoin (p. ex. associées aux revendications territoriales des Premières Nations, aux parcs, etc.). Elles permettent de donner aux décideurs une évaluation actuelle du potentiel minéral de façon à ce que le retrait des terres soit fondé sur des informations les plus exhaustives possibles.

Les données géochimiques et géophysiques recueillies au Yukon peuvent être obtenues en s'adressant à la Commission géologique du Canada. Des données géochimiques sur les sédiments fluviatiles et l'eau à l'échelle régionale ont été recueillies dans presque tout le territoire. Des levés géophysiques multiparamétriques aériens ont été réalisés dans les régions du chaînon Dawson, des monts Tombstone et du lac Finlayson.

Le Programme d'études géologiques du Yukon consiste à diriger des activités d'exploration minérale et entretient des rapports étroits avec l'industrie minérale. Nous gérons la base de données Minfile sur le Yukon ainsi que la compilation de données géologiques et historiques sur toutes les occurrences minérales connues du Yukon, qui s'élèvent à plus de 2 500. Le fichier de Minfile sur les placers est en cours d'élaboration et sera diffusé plus tard au cours de l'année. Le fichier GEOPROCESS du Yukon est un résumé de la géologie, des processus géologiques et des dangers liés au terrain. Nous produisons également deux publications annuelles: Yukon Exploration and Geology et Yukon Placer Activity. La carothèque H.S. Bostock contient quelque 128 000 m de carottes extraites à la foreuse au diamant dans 200 propriétés minières au Yukon.

Le Programme d'incitatifs à l'exploitation minière du Yukon, mis sur pied par le gouvernement du Yukon, appuie financièrement les prospecteurs (< 10 000 $ par année) et les sociétés d'exploration (< 20 000 $ par année) dans le but de promouvoir la prospection, l'exploration minérale et la mise en valeur minière au Yukon.

Pour en savoir plus long sur le Programme d'études géologiques du Yukon, visitez notre page d'accueil à *http://www.yukonweb.com/government/geoscience/* ou communiquez directement avec :

Grant Abbott, Géologue principal intérimaire
Division de l'exploration et des services géologiques
Affaires indiennes et du Nord canadien
300 rue Main-bur.345
Whitehorse (Yukon) Y1A 2B5
Téléphone : (867) 667-3200, Courriel : abbottg@inac.gc.ca

Shirley Abercrombie, Gestionnaire intérimaire
Division des ressources minérales
Ministère de l'expansion économique
C.P. 2703
Whitehorse (Yukon) Y1A 2C6
Téléphone : (867) 667-3438, Courriel : sabercro@gov.yk.ca

On peut obtenir des exemplaires des publications du Programme d'études géologiques du Yukon en s'adressant à :

Bureau d'information et des ventes en géosciences
a/s Conservateur des registres miniers
Affaires indiennes et du Nord canadien
300 rue Main-bur.102
Whitehorse (Yukon) Y1A 2B5
Téléphone : (867) 667-3266

APPENDIX 1: RECENT PUBLICATIONS

GEOSCIENCE MAPS

Geoscience Map 1998-1: Surficial geology of Sprague Creek map area, central Yukon (115P/15; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-2: Surficial geology of Seattle Creek map area, central Yukon (115P/16; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-3: Surficial geology of Mount Haldane map area, central Yukon (105M/13; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-4: Surficial geology of Keno Hill map area, central Yukon (105M/14; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-5: Surficial geology of North McQuesten River map area, central Yukon (115A/1; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-6: Surficial Geology of Dublin Gulch map area, central Yukon (106D/4; 1:50 000 scale), by Jeffrey Bond.

Geoscience Map 1998-7: Surficial Geology of Matson Creek and Ogilvie (115N/9 and 115O/12; 1:50 000 scale to accompany O.F. 1998-1), by C. Mougeot and L. Walton.

Geoscience Map 1998-8: Surficial Geology of Garner Creek (115O/13; 1:50 000 scale to accompany O.F. 1998-1) by C. Mougeot and S. Morison.

Geoscience Map 1998-9: Geological map of Slats Creek area, Wernecke Mountains, Yukon (106D/16; 1:50 000 scale), by Derek J. Thorkelson.

Geoscience Map 1998-10: Geological map of Fairchild Lake area, Wernecke Mountains, Yukon (106C/13; 1:50 000 scale), by Derek J. Thorkelson.

Geoscience Map 1998-11: Geological map of Dolores Creek area, Wernecke Mountains, Yukon (106C/14; 1:50 000 scale), by Derek J. Thorkelson.

OPEN FILES

Open File 1998-1: Surficial geology and sedimentology of Garner Creek, Ogilvie, and Matson Creek map areas (115O/13, 115O/12 and 115N/9, east half), by Stephen Morison with contributions from Lori Walton and Charlotte Mougeot (includes Geoscience Maps 1998-7,8).

Open File 1998-2. White Channel Gravel, Klondike Gold Fields, Yukon, Canada, by G.W. Lowey (Poster available in French and English).

Open File 1998-3. Preliminary geological map, Little Kalzas Lake, central Yukon (105L/13; 1:50 000 scale), by Maurice Colpron.

Open File 1998-4. Preliminary geological map of Wolverine Lake area, Pelly Mountains, southeastern Yukon (105G/8, north half; 1:50 000 scale), by Donald C. Murphy and Steve Piercey.

Open File 1998-5: Preliminary geological map of the Mount Vermilion area, southern Yukon (parts of 105G/5 and 105G/6; 1:25 000 scale), by J.A. Hunt.

OUTSIDE ARTICLES

Hunt, J.A., 1998. Recent discoveries of volcanic-associated massive sulphide deposits in the Yukon. CIM Bulletin, vol. 91, No. 1017.

Lowey, G. W., 1998. A new estimate of the amount of displacement on the Denali Fault system based on the occurrence of carbonate megaboulders in the Dezadeash Formation (Jura-Cretaceous), Yukon, and the Nutzotin Mountains sequence (Jura-Cretaceous), Alaska. Bulletin of Canadian Petroleum Geology, vol. 46, no. 3, p. 379-386.

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Wynne, P.J., Enkin. R.J., Baker, J., Johnston, S.T. and Hart, C.J.R., 1998. The Big Flush — Paleomagnetic signature of a 70 Ma regional hydrothermal event in displaced rocks of the northern Canadian Cordillera. Canadian Journal of Earth Sciences, vol. 35, p. 657-671.

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Harris, M.J., Symons, D.T.A., Blackburn, W.H. and Hart, C.J.R., 1998. Jurassic motions of the Canadian Cordillera: Paleomagnetic evidence from the Guichon Batholith, B.C. and the Teslin Stock, Y.T. GAC/MAC Program and Abstracts, vol. 23, Quebec City, p. A73.

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Harris, M.J., Symons, D.T.A., Blackburn, W.H. and Hart, C.J.R., 1997. Tectonic motion of the Jurassic Fourth of July Batholith, northern British Columbia, from paleomagnetism. EOS, vol. 78, AGU Fall meeting, Abstracts and Program, San Francisco, p. F188.

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Hart, C.J.R., Harris, M.J., Blackburn, W.H. and Symons, D.T.A., 1998. Depth of skarn formation as determined by Al-in-amphibole geobarometry, Whitehorse Copper Belt. Geological Association of Canada/MAC Program and Abstracts, vol. 23, Quebec City, p. A74.

Hart, C.J.R., Johnston, S.T., Francis, D., Smuk, K., Wynne, P.J. and Enkin. R.J., 1998. Yellowstone in Yukon: a hotspot link to Late Cretaceous alkalic-associated Cu-Au mineralization. *In:* Cordillera Revisited: Recent Developments in Cordilleran Geology, Tectonics and Mineral Deposits, Short Course Extended Abstracts, Exploration Methods '98-Pathways to Discovery, Geological Association of Canada, Cordilleran Section, p. 110-117.

Hart, C.J.R., Villeneuve, M. and Thorkelson, D.J., 1998. Geochronology and tectonic origin of Neogene alkalic volcanic rocks in the northern Canadian Cordillera. Geological Society of America Programs with Abstract, vol. 30, No. 7, p. A242.

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McCausland P.J.A., Symons, D.T.A. and Hart, C.J.R., 1998. Post-Cretaceous geotectonic motion of the Yukon-Tanana Terrane from paleomagnetism of the Seymour Creek stock, Yukon Territory. EOS, vol. 79, AGU Fall meeting, San Francisco. F219-F220.

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Thorkelson, D., J.G. Abbott, J. Mortenson, R. Creaser and M. Villeneuve, 1998. Proterozoic sedimentation, magmatism, metasomatism and deformation in the Wernecke and Ogilvie Mountains, Yukon. Lithoprobe Report No. 64, p. 110-119.

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Open File 3607. Airborne geophysical survey, Brewery Creek area, Yukon Territory (NTS 116B/1 and parts of 116A/4, 115P/13), by R.B.K. Shives, J.M. Carson and P.B. Holman, 218 p.

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Harris, M., 1998 Geotectonic motions of northern Canadian Cordillera terranes from paleomagnetic measurements with geobarometric corrections. University of Western Ontario, London, Ontario, 206 p.

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Burn, C.R., 1998. The response (1958-1997) of permafrost and near-surface ground temperatures to forest fire, Takhini River valley, southern Yukon Territory. Canadian Journal of Earth Sciences, vol. 35, p. 184-199.

Cecile, M.P., 1998. Geology and structure cross-section, Marmot Creek, Yukon Territory. Scale 1:50 000, latitude 63°45'-64°00', longitude 131°00'-131°30'. Geological Survey of Canada, Map 1923A.

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Forbes, D.L., 1997. Coastal erosion and nearshore profile variability in the southern Beaufort Sea, Ivvavik National Park, Yukon Territory. Geological Survey of Canada, Open File 3531; 100 p.

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White, J.M., Ager, T.A., Adam, D.P., Leopold, E.B., Liu, G., Jetté, H. and Schweger, C.E., 1998. Neogene and Quaternary selected palynological data from Yukon and adjacent Northwest Territories and Alaska. Geological Survey of Canada, Open File 3557, 43 p.

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