Energy, Mines and Resources • *Yukon Geological Survey*

YUKON EXPLORATION & GEOLOGY OVERVIEW 2014

YGS Activities

Hardrock Mining, Development & Exploration

Placer Mining, Exploration & Development

Yukon Mineral Exploration Program

Oil & Gas

Yukon Geological Survey

Yukon
Energy, Mines and Resources

YUKON
EXPLORATION & GEOLOGY OVERVIEW 2014

Edited by

K.E. MacFarlane and M.G. Nordling

Yukon Geological Survey

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This overview is available in colour on the Yukon Geological Survey website.

Front cover photograph: Looking south at Profile Mountain and the junction of the Kaskawulsh, Dusty and Alsek rivers. Photo by David Moynihan.

Inside cover photograph: Yukon Geological Survey staff - (*back row, left to right*) Charlie Roots, Matt Hutchison, David Moynihan, Jeff Bond, Johann Slam, Derek Torgerson and Patrick Sack; (*middle row, left to right*) Tiffani Fraser, Monica Nordling, Karen MacFarlane, Olwyn Bruce, Panya Lipovsky, Steve Israel, Kristen Kennedy and Robert Deklerk; (*kneeling*) Rosie Cobbett (and Sawyer) and Midori Kirby. Missing from photo: Carolyn Relf, Don Murphy, Maurice Colpron, Sue Roy, Lara Lewis, Syd Van Loon, Sarah Laxton, Bailey Staffen and Brett Elliot.

PREFACE

Yukon Exploration and Geology (YEG) and the Yukon Exploration and Geology Overview continue to be the main publications of the Yukon Geological Survey (Energy, Mines and Resources, Government of Yukon). Individual YEG papers, with colour images, are available in digital format only and can be downloaded from our website. The YEG Overview is available in a digital format; this year the limited print run is available in colour.

YEG 2014 contains up-to-date information on mining and mineral exploration activity, studies by industry and results of recent geological field studies. Information in this volume comes from prospectors, exploration and government geologists, mining companies and students who are willing to contribute to public geoscience for the benefit of the scientific community, general public and mineral and petroleum industries of Yukon. Their efforts are appreciated.

Monica Nordling has once again joined me in the merriment of YEG season and co-edited this volume. Thank you Monica for trying to keep me sane – and more importantly thank you for the mug with the helpful editing tips. Thanks also to my various Yukon Geological Survey colleagues for submissions and valuable assistance in reviewing manuscripts prior to them being submitted. Your expertise makes my job easier.

Sherry Tyrner and Blayne Epp of the Queen's Printer ensured that the printing process went smoothly.

We welcome any input or suggestions that you may have to improve future YEG publications. Please contact me at (867) 667-8519, or by e-mail at karen.macfarlane@gov.yk.ca.

Karen MacFarlane

IN MEMORIAM

BOB CATHRO

Most of Bob's career was spent in northern Canada. Bob graduated from the UBC Geological Engineering program in 1959, and subsequently worked as a mine geologist at the Eldorado uranium mine (NWT), Verna uranium mine (Sask.), Giant Yellowknife gold mine (NWT), and the United Keno Hill silver mines (Yukon). In 1966, he and fellow geological engineer Al Archer founded the consulting firm Archer, Cathro & Associates Ltd. The firm has specialized in Yukon mining exploration since then and remains as one of the top Yukon explorers after nearly 50 years. During Bob's tenure as partner the firm made several discoveries or significant advancements of important Yukon mineral deposits. These include Casino (copper-gold-molybdenum), Wolverine and Marg (copper-lead-zinc-silver-gold), Mactung (tungsten), Carmacks Copper (copper-gold), Wellgreen (nickel-copper-platinum) and Division Mountain (coal). Bob remained a partner in "AC" until his retirement in 1989.

Bob played a leading role in the 1972 creation and annual updates to Archer Cathro's Northern Cordillera Mineral Inventory. Through the 1970s and 1980s the Inventory was the most comprehensive file on mineral exploration history and property data in Canada. It was sold to the Yukon government in 1990 to become the foundation for the current Yukon MINFILE database.

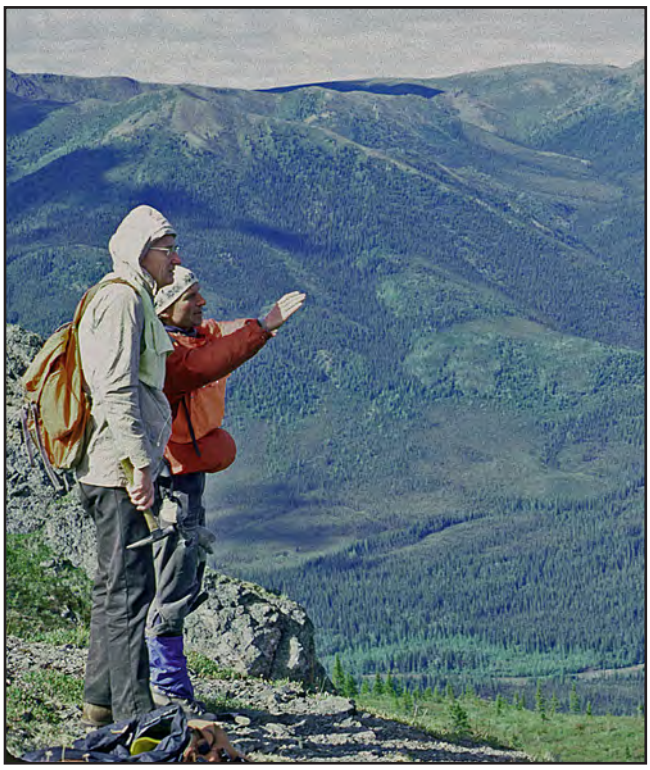
Bob served on the editorial boards of the CIM Special Volumes 15 (1976) and 45 (1995) on Porphyry Deposits of the Canadian Cordillera and GAC Publication #2 (2000) on VMS Deposits of Latin America. His passion for research and science history flourished in retirement when he authored nearly 50 articles on the evolution of economic geology (CIM Magazine) and edited a series on the Great Mining Camps of Canada (Geoscience Canada).

Bob always believed strongly in giving back to his industry. He served as a Director, Vice-President (1978-81), President (1982-1983) and Past-President (1984-1985) of the BC and Yukon Chamber of Mines (now AMEBC). The present Mineral Exploration RoundUp conference had its roots in 1982 as a conversation on a ferry between Chamber Managing Director Jack Patterson, President Bob Cathro and soon-to-become Vice-President Nick Carter.

Over his career, Bob received several awards including the A.O. Dufresne Exploration Achievement Award in 1991 from the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), for "outstanding contribution to mineral exploration in B.C. and Yukon, and for his commitment to the north". In 1999 Bob and Al Archer were co-winners of the H.H. "Spud" Huestis Award for excellence in prospecting and mineral exploration, awarded by (now) AMEBC. In 2002, Archer Cathro was inducted to the Yukon Prospectors' Association Honour Roll, reflecting their exploration successes over the years. The Geological Association of Canada presented Bob with its Distinguished Service Award in 2003.

Bob Cathro, the pioneering western Canadian mineral exploration geologist, mining industry leader, and amateur historian, died at age 79 at his home in Chemainus, BC on August 26, 2014. A friend and mentor to many in the industry, he will be greatly missed.

IN MEMORIAM



Bob Thompson describes to Lew Green (gray jacket) a geological re-interpretation in the Southern Ogilvie Mountains. Photo courtesy of Charlie Roots, 1986.

LEWIS GREEN

Dr. Lewis Green, geologist and writer of mining and surveying history, died November 11, 2014. He was 93. Lew contributed to information about and appreciation of Yukon through his field mapping, geological and mining reports, and with two of his books.

Son of an influential BC and federal politician, Lew began at McGill, but his student life was interrupted by World War II. With the Black Watch (Royal Highland Regiment) he took part in the liberation of Holland. Upon return, he graduated in geology at UBC and, along with three class-mates, proceeded to have a distinguished career with the Geological Survey of Canada. From 1954 through '57 he mapped north and west of Keno Hill, one of the last field parties to use pack-horses. By 1957 the GSC had begun using helicopters to deploy geologists on mountain traverses, and at that point Lew was engaged in reconnaissance in the Nahanni, Pelly and Glenlyon ranges. During the extraordinary summer of 1961, with close cooperation of pilot Pat Callison and Klondike Helicopters of Whitehorse, Lew Green undertook "GSC Operation Ogilvie" to geologically map the mountains from Keno westward to the Alaska border. The late Jim Roddick and Doug Craig were part of that project, which resulted in three maps and a memoir[1], each impressive for its thoroughness, detail and pioneering resolution of stratigraphy.

Lew was appointed Resident Geologist in Whitehorse from 1962 to 1966, where he advised prospectors and companies, and produced both annual and occasional reports on the mineral industry of Yukon. With his wife Kathy and five children, he moved to Vancouver in 1966 to become a consulting geologist and investigate history of the early 20th century.

Two of his books (*The Gold Hustlers* and *The Boundary Hunters*) are significant for their thorough research and insights to events in Yukon. They are based upon records that are now difficult to access and not well covered in other references:

The Gold Hustlers (Alaska Northwest Co., 1977; 3rd printing, 1985) describes the second phase of placer mining in the Klondike district. It details the granting of mining concessions and competition between the companies of ANC Treadgold and those of Joseph Boyle, as well as the financing and construction of dredges, power plants, and the 'Yukon Ditch' (diverting water from the headwaters of the Tombstone and Little Twelvemile rivers). Lew interviewed old-timers, tracked down documents of the protracted court cases and settlements, and worked through records of the companies, to write a lucid account.

[1]*Green, L.H., 1972. Geology of Nash Creek, Larsen Creek, and Dawson map areas, Yukon Territory. Geological Survey of Canada, Memoir 364, 157 p., and 3 maps at 1:250 000 scale.*

The Boundary Hunters (UBC Press, 1982) relates the adventures and methods of marking the Alaskan boundary from Dixon entrance, through the Coast Mountains, the Wrangell-St. Elias ranges, and northward to the Arctic Ocean between 1906 and 1913. It was a joint Canadian-American geodetic survey in exceedingly rough topography, facing river and glacier hazards and rugged weather, with little mechanized equipment and no communication with the outside world. Through good planning, dedication and perhaps smiling fortune, more than 50 field parties sustained few accidents although their many adventures make a good read for those passionate about fieldwork.

His third book, ***The Great Years: Gold Mining in the Bridge River Valley*** (Tricouni Press, 2000) describes the Pioneer-Bralorne mines which were the top producer of lode gold in BC during the 20th century. They are about 180 km northeast of Vancouver. During the depression this valley was one of the few bright spots in the BC economy. Green's book is like having the mine manager show you around: it is replete with assays and stock market fluctuations, but also describes the community life.

Lew had many interests and loved to travel. He was a keen observer: inquisitive and humble, and enthusiastic of the efforts by the next generations of geologists. He was a friend to many within the GSC and exploration community. Kathy, his partner since UBC days, was strong support for his activities and pushed him to finish the books. The couple always spoke wistfully of their years in Yukon. In the 1960s Lew knew the geology of Yukon better than anyone, and remembered it vividly until near the end.

The helicopter at the end of the traverse. Photo by L.H. Green, 1960, from the GSC photo archives.

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Summary of Yukon Geological Survey 2014-15 Activities

Carolyn Relf[1]
Director, Yukon Geological Survey

Relf, C., 2015. Summary of Yukon Geological Survey 2014-15 Activities. *In*: Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 1-16.

INTRODUCTION

The Yukon Geological Survey's field-based projects and desktop geoscience studies support the Department of Energy, Mines and Resources' mandate for stewardship of Yukon's energy and mineral resources and contribute to the sustainability of Yukon's communities. YGS provides information to the public in the form of maps, technical reports, raw data and educational material, all available online at no cost.

This report provides an overview of the survey's 2014-15 activities and highlights some of the results of those activities. More detailed papers on some of the projects discussed here are included in this year's Yukon Exploration and Geology publication; results of other projects will be released separately.

YUKON GEOLOGICAL SURVEY PROGRAM OVERSIGHT AND FUNDING

The Yukon Geological Survey (YGS) develops its annual work plans each winter in consultation with a number of external partners, including two external advisory committees (the Minerals Technical Liaison Committee and the Yukon Oil and Gas Advisory Committee), the Geological Survey of Canada and several university-based research partners. In addition to external advice, Energy, Mines and Resources' corporate priorities and the information needs of other Yukon government departments are factored into annual planning and priority setting.

As part of a longer-term planning cycle, YGS holds multi-party workshops every five years. Last February (2014) the survey held its fifth such workshop involving staff, research partners, industry clients and other government departments. Valuable input was collected on gaps in Yukon's geoscience knowledge base, ideas for new projects were discussed, and emerging issues with potential implications for YGS were identified. The recommendations and priorities discussed at the workshop will be presented elsewhere (Relf, in prep.).

YGS OPERATING BUDGET

Yukon Geological Survey's core geoscience operating budget for fiscal year 2014-15 is $1 265 000, with an additional $1 400 000 allocated for the Yukon Mineral Exploration Program. Coupled with a $950 000 contribution from the Canadian Northern Economic Development Agency (see below), the total 2014-15 budget for YGS, excluding salaries, is $3 615 000.

The Yukon Mineral Exploration Program (YMEP), administered by YGS, provides a portion of the risk capital for exploration projects in Yukon on a competitive, merit basis. The base level of YMEP funding is $770 000 per year, but it fluctuates annually based on market conditions. For fiscal years 2014-15 and 2015-16, Yukon government increased funding to $1 400 000 in recognition of the

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difficulty many prospectors and small companies are having raising capital in the current economic climate. Highlights of this year's YMEP-funded activities are presented elsewhere in this volume (Torgerson, 2015).

STRATEGIC INVESTMENTS IN NORTHERN ECONOMIC DEVELOPMENT (SINED) FUNDING

In March 2014, the Canadian Northern Economic Development Agency renewed its Strategic Investments in Northern Economic Development (SINED) Program for two fiscal years (April 2014 to March 2016). Under the renewed program, $1.9M has been committed to YGS for geoscience projects in Yukon ($950K/year).

SINED Program funding is intended to support economic development in the north. YGS will use this year's SINED funds to deliver a number of projects that will help better understand Yukon's mineral potential, thereby stimulating new exploration and reducing risk. Other projects in this year's SINED work plan involve identifying geologic hazards in order to mitigate risks to infrastructure and communities.

As in previous years, YGS is tracking the impact of its SINED-funded activities to ensure the funds are invested wisely. Readers are encouraged to contact the author if they have comments on the projects being undertaken, or ideas for additional projects.

GEO-MAPPING FOR ENERGY AND MINERALS

In 2013, NRCan's Geo-mapping for Energy and Minerals (GEM) program was renewed for seven years (2013-2020), and this past summer, field work began on a GEM-2 project in southwestern Yukon/northern British Columbia (the GEM-2 Cordilleran Project). Three activities were initiated in Yukon: one involves the delineation of distinct crustal blocks and understanding the role played by their associated bounding faults in mineralization in the region (Ryan *et al.*, 2014). Another aims to develop an updated tectono-stratigraphic framework for the Cache Creek terrane and determine its potential for syn and epigenetic mineralization (Zagorevsky *et al.*, 2014a). A third activity under the GEM-2 Cordilleran project is focused on characterizing Late Triassic-Early Jurassic volcanic and intrusive rocks. The study was initiated in 2014 in northwestern BC (Zagorevsky *et al.*, 2014b) and contributed data and funding to YGS' study of Jurassic plutons in Yukon (described below).

Discussions between GSC and YGS on further collaborative work under GEM-2 are underway.

YUKON GEOLOGICAL SURVEY ORGANIZATIONAL OVERVIEW

Yukon Geological Survey consists of four operational units (Fig. 1): Bedrock Geology (managed by Don Murphy), Mineral Services (until recently, managed by Lee Pigage), Surficial Geology (managed by Jeff Bond) and Technical Services (managed by Karen MacFarlane). These units are coordinated and supported by an Operations & Finance manager (Suzanne Roy) and the survey Director (Carolyn Relf).

STAFF CHANGES

This past June, Lee Pigage retired from YGS, leaving a significant gap in the Mineral Services unit. A competition to back-fill the position was held over the summer, but the position remains open. YGS is continuing to search for a new manager, and in the meantime Lara Lewis is acting manager.

The Surficial Geology unit is fully staffed this year, and employed an additional geologist (Sydney Van Loon) over the summer and fall to assist with collecting and compiling production information from placer operations. Bedrock Geology is now also fully staffed after welcoming Rosie Cobbett back from maternity leave in late December.

Finally, Technical Services lost Aubrey Sicotte in March when he accepted a management position within Energy, Mines and Resources' Lands Branch. Aubrey led the development of YGS' Enterprise database and associated web applications. His position has been back-filled by Brett Elliot, who will join the unit in early January.

The author would like to acknowledge Lee's contributions and leadership and wish him the best in his retirement. Sydney is thanked for her contributions to the placer sector; congratulations are offered to Aubrey on his new challenge. Additionally, a warm welcome is extended to Brett; we look forward to working with him.

OVERVIEW OF 2014 FIELD STUDIES

BEDROCK MAPPING PROJECTS

Bear Creek project

One of the highlights of the 2014 field season was a mapping project in the Mount Decoeli area (Figs. 2 and 3) that involved nearly all YGS staff. The project, conceived by Steve Israel, was designed to resolve

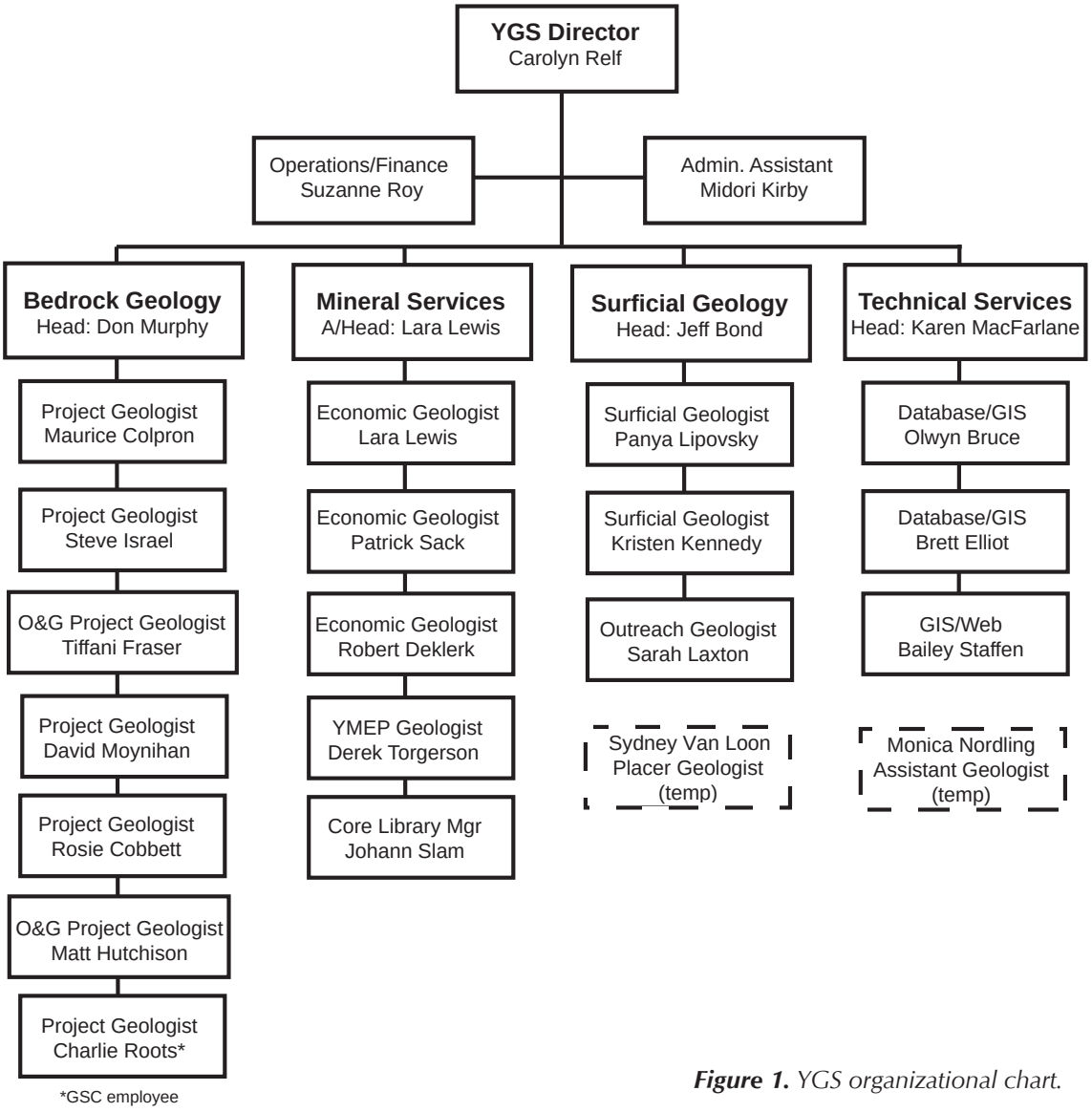

Figure 1. *YGS organizational chart.*

internal stratigraphic and structural relationships within the mixed metavolcanic and metasedimentary Bear Creek assemblage, and constrain the regional tectonic framework of the assemblage. Recent 1:50 000 scale mapping in adjacent areas (Israel *et al.*, 2011; Israel and Kim, 2013) provided a good contextual foundation for the project and allowed staff to effectively "blitz" the area in ten days. A colleague from the U.S. Geological Survey (Jonathon Caine) joined the team and carried out detailed kinematic studies of the Denali Fault, as part of a regional study of major crustal faults in the northern Cordillera.

A preliminary geology map of the study area was released in December 2014 (Israel *et al.*, 2014). In addition to mapping the bedrock geology, staff from the Surficial Geology unit examined glacial deposits in several drainages to better understand the local ice movement history and assess placer potential. A number of interesting questions arose from the surficial reconnaissance, generating ideas for future graduate thesis projects in the area.

The Bear Creek project was both fun and intense. It not only allowed mapping to be completed at an accelerated rate, but it gave YGS staff a rare opportunity to work together in the field and share their different areas of expertise.

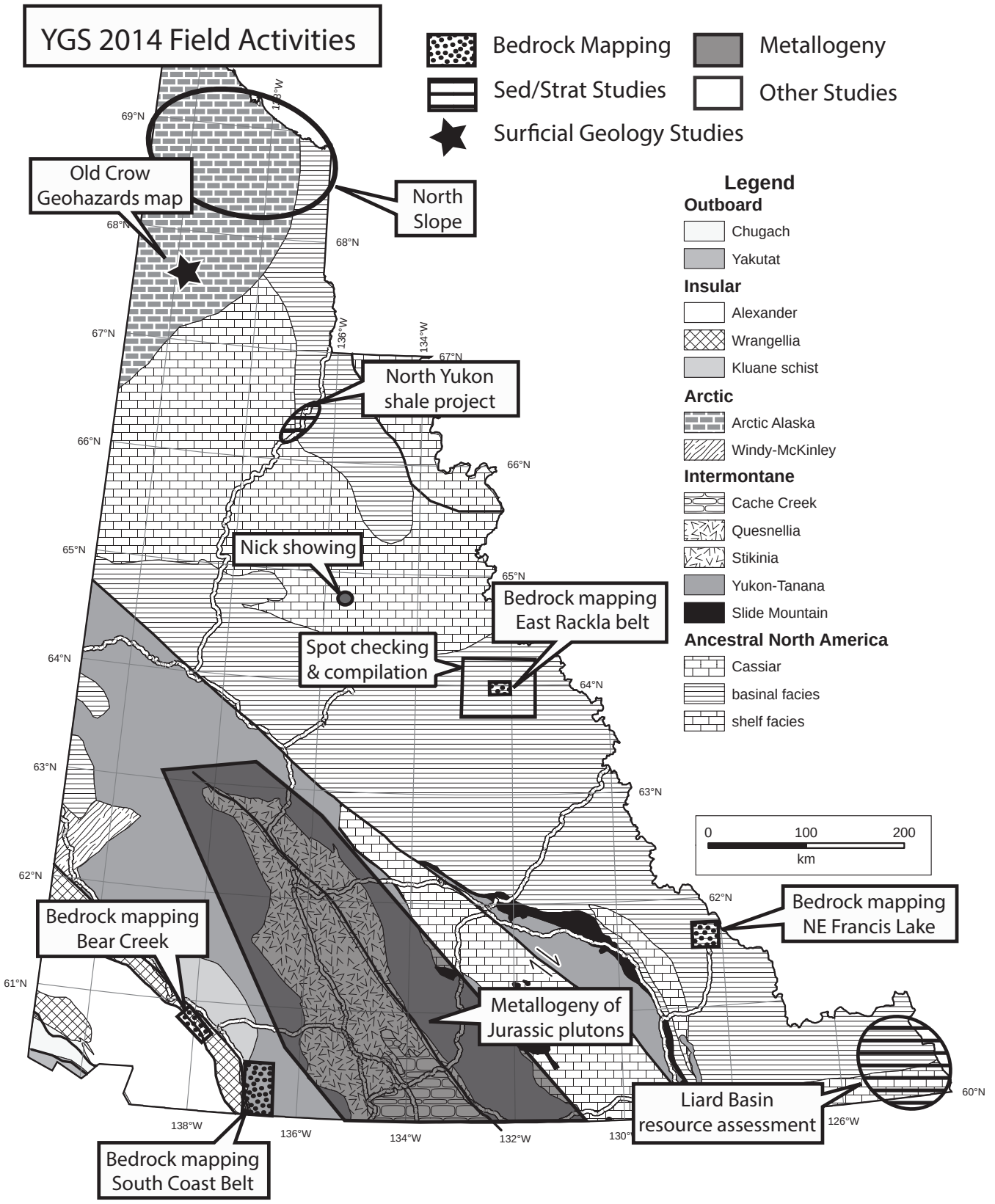

Figure 2. *Simplified map of Yukon showing locations of 2014 field projects.*

Figure 3. *YGS field geologists Steve Israel (foreground) and Don Murphy mapping in the Bear Creek area.*

South Coast Belt project

Following the mapping campaign at Bear Creek, Israel resumed 1:50 000 scale mapping in the Coast plutonic complex between Haines Junction and the British Columbia border (Fig. 2). Rocks in the area are interpreted to be the faulted extension of the Juneau gold belt of southeastern Alaska.

Mapping identified a package of metasedimentary rocks that may help to corroborate broad tectonic and stratigraphic correlations in this part of the Cordillera. Project highlights are presented in the 2015 Yukon Exploration and Geology volume (Bordet *et al.*, 2015). Two new maps (Bordet and Israel, 2014; Israel and Bordet, 2014) were released in December 2014.

Rackla Belt East project

This past summer, David Moynihan completed 1:50 000-scale mapping in the eastern part of the Rackla belt in east-central Yukon (Fig. 2). The project wraps up five years of mapping in this belt (Chakungal and Bennett, 2011; Colpron, 2012a,b; Colpron *et al.*, 2013; Moynihan, 2014a,b). The main objective of the project was to establish the stratigraphic and structural framework of the region and particularly of sediment-hosted (Carlin-type) gold occurrences in the Rackla belt.

This summer, mapping concentrated on firming up the stratigraphic correlations between Neoproterozoic rocks of the Hyland Group and Windermere Supergroup and extending these relationships to the east and south of areas mapped in 2012-2013. Moynihan undertook systematic mapping mainly in NTS 105N/15 & 16, then spot checked outcrops across adjacent map sheets (105O/13, 106B/4 and 106C/1 & 2) to correlate units over a broad region. Moynihan and Colpron continue to collaborate with Jim Crowley (Boise State University) and Justin Strauss (Harvard University) to build geochronologic and chemostratigraphic datasets that support correlations established by mapping. A new map covering the six map sheets studied by Moynihan this summer will be released early in 2015.

Frances Lake area

Following completion of his work in the Rackla belt, David Moynihan initiated mapping in eastern Frances Lake area, following up on reconnaissance work he did there in 2012. Mapping focused in NTS map sheet 105H/09, which straddles the Nahanni Range Road and includes the Justin and 3Ace gold prospects, as well as the trace of the March fault, a regional structure that has been proposed to control gold mineralization along the Hyland valley (Hart and Lewis, 2006). This summer's mapping led to the recognition of two limestone/marble marker horizons in the upper part of the Hyland Group, the younger of which is stratigraphically equivalent to the Algae Formation elsewhere in Selwyn basin. Contrasting structural styles were noted on either side of the Hyland River and future work will assess the significance of postulated structures that may occupy the river valley in this area.

North Slope project

In 2013, Maurice Colpron (YGS) and Karsten Piepjohn (German Federal Institute for Geosciences and Natural Resources, or BGR) co-led the field component of a multi-partnered, multi-year study in the circumpolar Arctic. The 2013 expedition on the Yukon's North Slope (Fig. 2) involved a number of thematic studies that were briefly described in Relf (2014).

One of the studies focused on an occurrence of naturally-burning shale discovered near the confluence of Boundary Creek and Big Fish River. The organic-rich shale, which is part of the Upper Cretaceous Boundary Creek Formation, and the potential ignition mechanism, are described in the 2015 Yukon Exploration and Geology volume (Fraser and Reinhart, 2015).

Preliminary results of two other North Slope studies are presented in the same volume. McClelland *et al.* (2015) reports on detrital zircon geochronology of lower Paleozoic sandstones in the Barn Mountains and discusses their significance for paleogeographic reconstruction of northern Laurentia. In another paper, von Gosen *et al.* (2015) discuss their preliminary analysis of Tertiary brittle faults in the eastern part of the Yukon North Slope (the Rapid depression) and conclude that these results are inconsistent with propagation of a large-scale strike-slip fault zone, such as the Kaltag fault, through this region as previously inferred, but rather may indicate reactivation of older structural heterogeneity in the subsurface.

Further analyses of samples collected along the Yukon North Slope in 2013 is ongoing and will be subject of further publications in coming years.

PETROLEUM STUDIES

North Yukon upper Paleozoic shale project

Work continued this year on the North Yukon upper Paleozoic shale project (Fig. 2). The project, initiated in 2013, aims to better understand the petroleum potential of upper Paleozoic strata across northern Yukon, in particular, the Devonian-Carboniferous fine-grained clastic sequences. Stratigraphic units of interest are the upper Road River Group, Canol Formation, Ford Lake Shale and Blackie Formation. The project is being led by Tiffani Fraser and Matt Hutchison.

The Canol Formation was targeted as the first priority for the characterization of lithology, refinement of age and stratigraphic relationships, and assessment of hydrocarbon potential (as both a source rock and reservoir). Sedimentary logging and high-resolution sampling undertaken this past summer on outcrops at Trail River and on core from the Rich property have yielded a detailed sedimentological, lithogeochemical and petroleum potential data set with which to characterize this formation.

A detailed paleoenvironmental assessment of Canol shales is presented in the 2015 Yukon Exploration and Geology volume (Hutchison and Fraser, 2015).

Liard Basin resource assessment

As a result of current interest in shale gas in Liard basin, the BC Ministry of Natural Gas Development is partnering with the National Energy Board (NEB) to conduct an unconventional resource assessment of the basin, specifically targeting the Devonian Horn River Group and Besa River Formation. While most of Liard basin is in northeastern British Columbia, its northern limit extends into southeastern Yukon and southwestern Northwest Territories. YGS and the NWT Geoscience Office are therefore collaborating with BC and NEB to include the portion of the basin north of 60° in the resource model.

Geological data for the Yukon portion of Liard basin are very limited. YGS collected surface data from a few sections in 2012, and drill core and cuttings from the few Yukon wells were collected this fall. As a result,

the assessment will be based heavily on data from BC. Nevertheless, the study will provide a broad indication of the source rock and reservoir potential of shale on the Yukon side of the border.

MINERAL OCCURRENCE STUDIES

Jurassic Plutons

In response to input at YGS' February 2014 planning workshop, a new metallogenic study of Jurassic plutons in south-central Yukon was initiated this year by Patrick Sack and Maurice Colpron (Fig. 2). These plutons are the northern continuation of paired plutonic belts that host significant porphyry Cu-Au and Cu-Mo deposits in British Columbia, and Cu-Au-Ag mineralization at the Minto and Carmacks Copper deposits in Yukon. The goals of this study are to characterize the Jurassic plutonic suites in Yukon and evaluate their potential to host porphyry-style or Minto-type mineralization.

During the 2014 field season, samples were collected from nearly all Jurassic plutons south of Minto Mine (Fig. 4). Petrographic, physical rock property, whole-rock geochemical, isotopic and geochronological analyses are currently underway. These data will be reported in a separate publication.

An anticipated outcome of this project will be the compilation of an atlas of Jurassic plutonic rocks in Yukon. This study benefits from collaboration with the Mineral Deposit Research Unit (MDRU) of the University of British Columbia, and from coordination and funding from the GEM-2 Cordilleran project of the Geological Survey of Canada. A complementary thermobarometric study of the Jurassic plutons is being conducted as a BSc Honours project at MDRU and aims at estimating the depth of emplacement of the various intrusive phases in Yukon.

Nick Showing

The Nick showing, located in the Wernecke Mountains about 130 km north of Mayo (Fig. 2), is characterized by anomalous Ni-Zn-PGE mineralization (Hulbert *et al.*, 1992) hosted in a massive sulphide layer up to 10 cm thick within a thick section of black shale in Selwyn basin. The mineralized layer is regionally extensive and corresponds to a Devonian disconformity between the Road River Group and overlying Canol Formation.

In 2014, Patrick Sack, Tiffani Fraser, Matt Hutchison and Don Murphy visited the property with Luke Beranek from Memorial University to examine the nature of this contact. Specifically, YGS is interested in its potential use as a regional stratigraphic marker to correlate shale from northern Yukon across Selwyn basin and into the western Canada sedimentary basin, as well as its metallogenic and tectonic significance.

Fieldwork consisted of mapping, diamond drill core logging, detailed section logging and sampling across the mineralized horizon. Follow-up analytical work currently underway includes microfossil identification, thermal maturity, XRD mineralogy and Re-Os whole-rock dating. Analytical results are expected by spring 2015.

Figure 4. *Jurassic granodiorite tors in the northern part of Aishihik batholith.*

Pyrite chemistry

Patrick Sack continued work on a regional study of pyrite chemistry in Selwyn basin, sampling early diagenetic and framboidal pyrite from fine-grained clastic rocks of the Hyland, Road River and Earn groups in 2014. The project is being carried out in collaboration with the Centre of Excellence in Ore Deposits at the University of Tasmania, as part of a global study of regional gold fertility of carbonaceous shale-rich basins. The study is also evaluating diagenetic pyrite as an exploration vector for gold. Variations in pyrite chemistry may also be useful as regional chemostratigraphic markers. Results of this project will be published in 2015.

COMMUNITY MAPPING

In 2014, YGS released new 1:25 000 surficial geology maps for the Faro (Turner *et al.*, 2014), Ross River (Turner, 2014) and Dawson City (McKenna and Lipovsky, 2014) areas. The maps support a series of community-based landscape hazard mapping projects being coordinated by Yukon College's Northern Climate Exchange (NCE). Final hazard maps and accompanying reports will be released by spring 2015.

As part of the community mapping program, Kristen Kennedy and Panya Lipovsky began a new surficial mapping project around Old Crow this summer (Fig. 2). They completed preliminary mapping in and around the community, and plan to acquire LiDAR imagery to assist with the evaluation of geologic hazards. Final maps and reports will be released by April 2016.

UPGRADES TO YUKON REGIONAL GEOCHEMICAL SURVEY DATA

For the past eight years, YGS has been working to systematically upgrade Regional Geochemical Survey (RGS) data from historic stream sediment surveys completed by the Geological Survey of Canada. The bulk of the work has been, and continues to be, funded by CanNor through their SINED program.

This fiscal year, YGS is continuing the re-analysis of stream sediment samples archived in Ottawa. Wayne Jackaman has been contracted to access archived pulps and generate new, 53-element ICP-MS analyses following GSC's QA/QC standards. A total of roughly 8100 samples from nine 1:250 000 map sheets (105B, C, D, E, F and 115 F, G, H and I) are scheduled to be re-analyzed and new maps released (Fig. 5) over the coming spring/summer.

A second phase of the RGS upgrade work, initiated last fiscal year, involves digitizing the catchment areas for each stream sediment sample and undertaking weighted sums modeling for the various types of mineral occurrences known, or inferred, to exist in the area. Last year, Heberlein Geoconsulting was contracted to undertake a test study on two map sheets (Heberlein, 2013), and feedback from clients indicated the project added considerable value to the original single-element dataset. Specifically, the digitized polygons revealed a wide range in catchment area size, suggesting that some anomalies may be significantly diluted. The polygons also identified a number of catchments that were not sampled by the original surveys.

With respect to the weighted sums analysis, the two test maps showed a strong correlation between documented mineral occurrences and high modeled values. In areas that have seen little or no mineral exploration, the maps may serve to identify areas with previously unrecognized mineral potential. In December, YGS awarded a contract to CSA Global to continue the value-added modeling of Yukon RGS data. This work, funded with SINED grant money, will continue to March 2016. Map sheets identified for analysis are illustrated in Figure 5. The work will be staged such that those map sheets for which modern, ICP-MS data exist will be modeled first. Map sheets which currently lack ICP-MS data will await the completion of Jackaman's re-analysis before modeling begins.

At the February 2014 planning workshop, participants re-iterated the Technical Liaison Committee's advice that YGS should undertake in-fill stream sediment sampling between existing RGS data points. While such a project at a Yukon-scale would be prohibitively expensive without new, dedicated resources, YGS is considering ways to undertake targeted stream sediment sampling focused on gaps in existing RGS coverage.

A plan is in place for summer 2015 to evaluate Aurora Geoscience Ltd.'s Aerochem sampling unit (Fig. 6) as a potential tool for collecting additional stream sediment samples. The SINED-funded case study will assess the cost of sample collection (relative to on-the-ground sampling using field crews with shovels) and compare the analytical

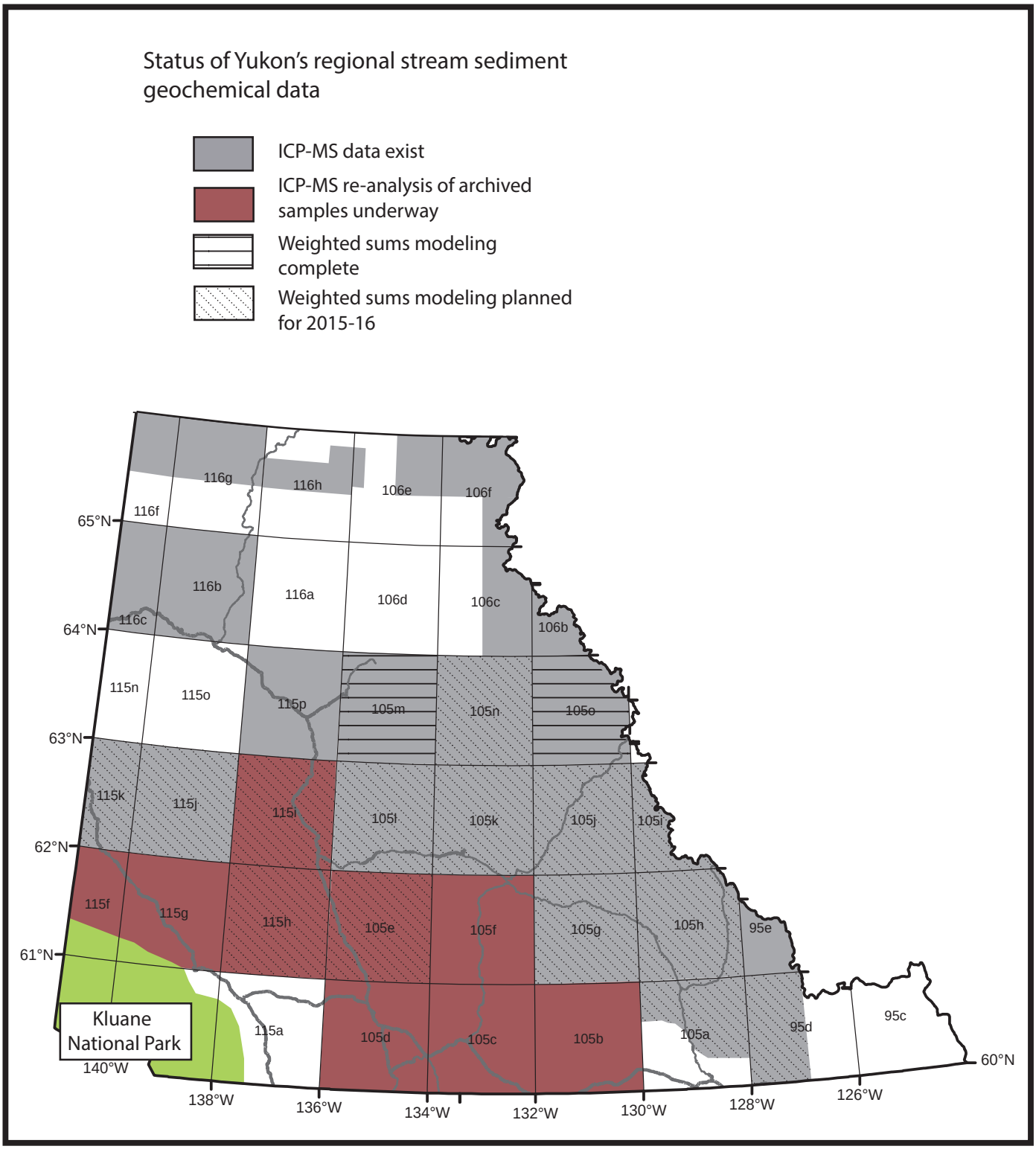

Figure 5. *Status of Yukon stream sediment geochemistry projects. Map sheets for which modern, 53-element ICP-MS analyses exist are shaded grey; samples from pink-shaded areas are scheduled to be re-analyzed by spring, 2015. Map sheets prioritized for weighted sums modeling are indicated with diagonal cross-hatching. Modeling has been completed to date for two map sheets (horizontal hatching).*

Figure 6. *Photograph of Aurora Geoscience's "Aerochem" unit.*

results derived from Aerochem *vs.* manually-collected samples. If sample quality matches that of the manual samples (*i.e.*, if it matches that of the original RGS data) and sample collection proves to be more cost effective, the Aerochem tool may be a means to generate new RGS data in areas of low sample density.

GEOPHYSICS PROJECTS

This winter, YGS is planning an airborne geophysical survey in the vicinity of the Wellgreen Ni-Cu-PGM deposit (Fig. 7). The survey, to be flown in partnership with Kluane Corporation, Wellgreen Platinum Ltd. and Victoria Gold Corp., will collect regional magnetic and EM data over a portion of Wrangellia terrane for which no publicly-available regional geophysical data exist. YGS' financial contribution will be supported by SINED funds.

The Geological Survey of Canada has provided YGS with specifics for their national aeromagnetic survey program to help ensure the seamless integration of this survey with the national data set. The survey is expected to be completed by spring, with release of the maps and data over the summer.

In addition to the above-planned airborne survey, Sarah Laxton contributed ground-penetrating radar (GPR) surveys to a number of collaborative studies. These included ongoing collection of GPR data over Llewellyn glacier (Fig. 8) to assess the contribution of glacier melt water to the Whitehorse Hydro facility in partnership with Yukon College (NCE) and the Yukon Energy Corporation, and surveys of archeological sites in collaboration with Yukon's Heritage Branch.

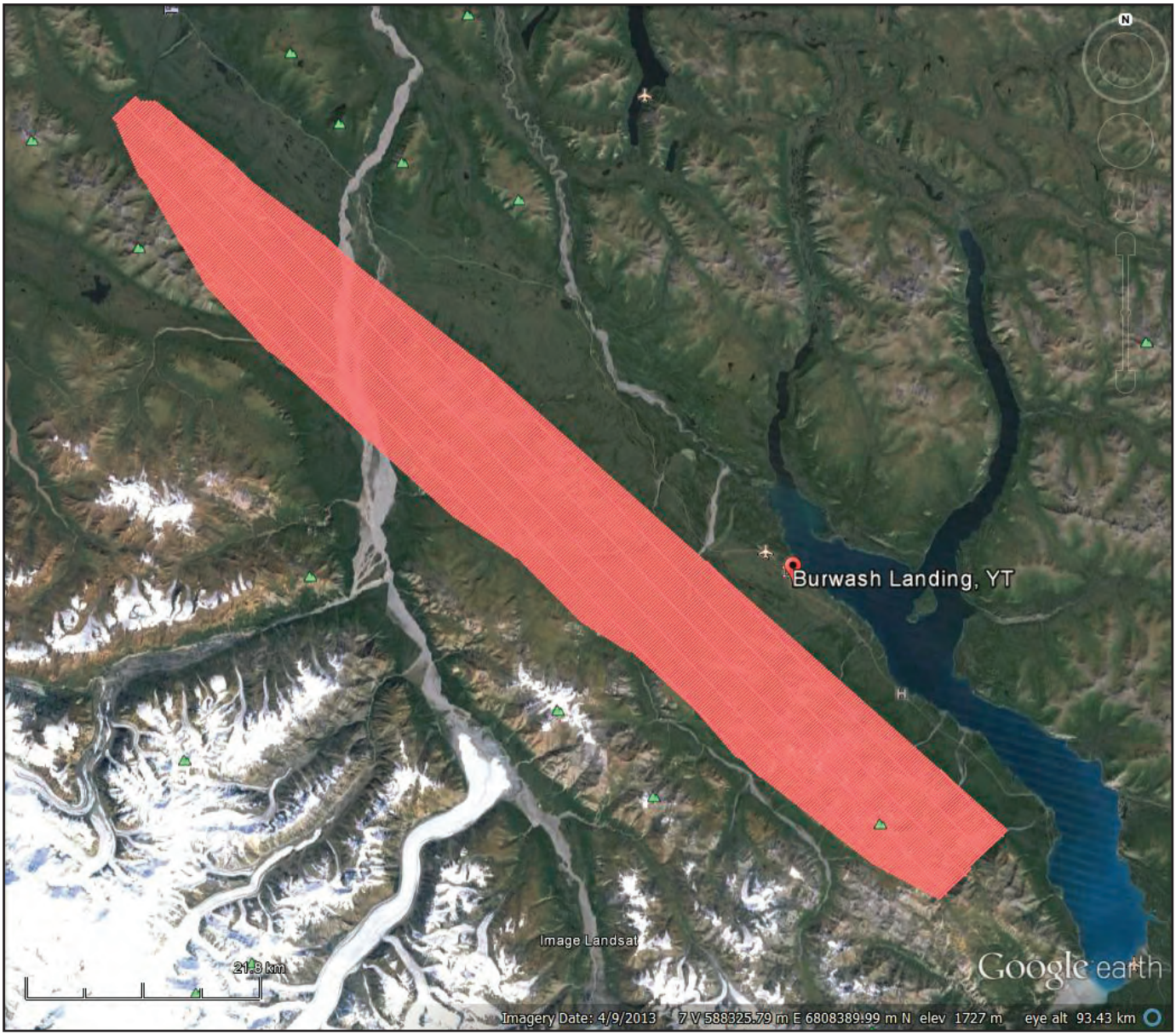

Figure 7. *Google Map image of planned footprint for magnetic/EM survey in the Wellgreen area.*

GEOSCIENCE OUTREACH

YGS enhanced its program of geological outreach and education this year. Under Sarah Laxton's leadership, several public "rock walks" were held over the summer around Whitehorse and in Tombstone Park, and geo-education events were held in conjunction with Canada Water Week in Faro, Ross River, Carcross, Haines Junction and Whitehorse. YGS hosted its annual Earth science workshop for Yukon teachers and worked with the Emergency Services office to run the first ever earthquake awareness "Great Shake-out" event. Several of these events were highlighted in the media.

A number of schools were targeted for "Geo-Ed" events, including visits to Kluane and Robert Service schools, and Mining Matters activities were organized for Whitehorse schools during the annual Geoscience Forum. Classroom visits during the year included thematic presentations linked to school curricula, hikes and youth-focused activities at the Whitehorse Copper Belt railway.

YGS also worked with EMR's Oil and Gas Branch to develop information on Yukon's oil and gas resources.

Figure 8. *Photo of field crew working near the Llewellyn glacier.*

UNIVERSITY COLLABORATIONS

YGS provided support for three university projects this year through its SINED funding.

Brent Ward at Simon Fraser University is supervising two MSc thesis projects in Yukon. The first study, currently in its final year, is examining the timing and extent of the pre-Reid ice limit in the Ogilvie Mountains. Results of the project are presented in the 2015 Yukon Exploration and Geology volume (Brown *et al.*, 2015). The second study, initiated this year, will involve sampling of basal tills in the region underlain by the Jurassic pluton study described above. Surficial mapping and heavy mineral analysis will be used to assess till sampling as an exploration tool for unexposed Jurassic plutons in south-central Yukon.

In August, MDRU initiated the Yukon-Alaska Metallogeny project. This project will build on the emerging metallogenic models developed under their recently-completed Yukon Gold Project. One of the key objectives of the study is to improve our understanding of the regional and local structural and magmatic controls on gold mineralization in the Intermontane terranes between Whitehorse and Fairbanks. The Yukon-Alaska Metallogeny project is being led by Murray Allan, Craig Hart and Jim Mortensen (MDRU). YGS is one of a number of partners participating in the project.

ONGOING YGS ACTIVITIES

INDUSTRY LIAISON

In 2014, YGS Mineral Services staff visited eighteen mineral exploration properties and participated in the annual media tour organized by the Mineral Resources Branch. In addition to field visits, staff tracked 2014 mineral exploration results and expenditures and liaised with industry to provide access to YGS' diamond drill core collection. Highlights of the 2014 field season are presented elsewhere in this volume (Lewis *et al.*, 2015).

Staff in the Bedrock Geology unit collaborated with the Oil and Gas Branch to monitor petroleum exploration activity and review/approve requests to sample oil and gas drill core and cuttings (housed at the Geological Survey of Canada's facilities in Calgary). Murphy (2015) presents an overview of oil and gas exploration activities elsewhere in this volume.

Surficial Geology staff visited placer mining operations in the Klondike, Kluane and Mayo districts this year. The Yukon Placer Industry report, a compilation of production highlights and industry activity derived from site visits and data provided by miners, was released in the fall (Van Loon and Bond, 2014). The volume covers five years' of placer mining activity (2010-2014). An overview of Placer exploration and mining highlights for 2014 is presented elsewhere in this volume (Bond and Van Loon, 2015).

PERMAFROST MONITORING

Surficial Geology staff continued to maintain a network of permafrost monitoring stations in six Yukon communities (Whitehorse, Beaver Creek, Dawson, Faro, Ross River and Watson Lake). Results from the past six years of monitoring are discussed in the 2015 Yukon Exploration and Geology volume (Lipovsky, 2015). Information on Yukon permafrost can be viewed on the Yukon Permafrost Data network at http://permafrost.gov.yk.ca.

PUBLICATIONS

In 2014, YGS released eighteen Open Files, two Miscellaneous Reports, and four external publications in refereed journals, as well as its annual Yukon Exploration and Geology overviews and project update reports (see publication list at the end of this volume).

In addition to new publications, YGS is working this year with the National Archives in Ottawa to scan Yukon Consolidated Gold Corporation's files, based on interest expressed by members of Yukon's placer community. A total of 546 maps and 400 documents have been identified for scanning. Once completed, they will be indexed and made available online. The project is supported by SINED funds.

UPDATING OF YGS DATASETS

In addition to online access to YGS publications and industry files, the survey manages a number of dynamic datasets in a corporate Enterprise database. Some have been accessible via YGS' website for a number of years (*e.g.*, MINFILE and references), and others datasets, such as the drill core data and lithogeochemistry, are in the process of being imported into the Enterprise database. Once imported, cleaned and tested, these data will be accessible online.

In November, YGS released preliminary shape files of the updated Yukon digital bedrock geology compilation, produced by Maurice Colpron with contributions by Steve Israel, Don Murphy and Murray Allan (MDRU). By that time, the map had been updated to include all new bedrock geology data between 60°N and 65°N, including recent maps by YGS and GSC, and industry contributions for part of Dawson Range and White Gold areas (through MDRU's Yukon Gold project). The objective is to complete the update of the entire Yukon by January 2015 and produce a revised bedrock legend to be released later in 2015. Files can be downloaded from http://www.geology.gov.yk.ca/update_yukon_bedrock_geology_map.html.

Robert Deklerk continues to manage MINFILE data and liaise with Technical Services staff to upgrade the database's web interface. Within the database itself, data entry and updates focused on east-central Yukon within the traditional territory of the Ross River Dena Council. Twelve new occurrences were added, and several more were updated. In addition, all resource/reserve data in the database were reviewed last year, and where publicly reported, resource/reserve data were updated.

Regarding the MINFILE web interface, modifications were made to enable easier access to the resource/reserve section, and work was initiated to link mineral occurrences to YGS references and assessment reports. Plans were announced last year to develop an online public comment form; however, staff turnover within Technical Services has delayed this project. YGS anticipates completing the form in 2015-16.

Last year, YGS developed an in-house application for collecting geo-referenced bedrock map data in the field

using Cartopac software on a hand-held Trimble Juno unit. The tool replaced the older GeoField application developed by the survey ten years earlier (Lipovsky *et al.*, 2003), and features customized pick lists, an integrated GPS and a number of other features. A number of adjustments to address technical issues and streamline data entry were made for the 2014 field season. In addition, the tool was tested for three other applications in 2014 with limited success: stratigraphic section logging, collection of placer data and drill core logging.

The system works very well for collecting point data in the field and has a number of functions, such as a built-in camera, that have yet to be fully used. The next phase of development for the bedrock mapping application is to write scripts to automate data uploading to the Enterprise database. Modifications to the other applications will require user feedback to fully address issues encountered in the field.

H.S. BOSTOCK CORE LIBRARY

Work continued in 2014 on the YGS drill core collection. Over the summer, over 6800 boxes of diamond drill core were moved to the new core library, catalogued and photographed. All core that was originally identified for relocation to the new core library has now been moved. Cleaning of drill core data is scheduled to be completed by spring 2015, and data will be migrated into a drill core module of the Enterprise database over the summer/fall.

As the core move and cataloguing phase of the drill core project approaches completion, YGS is turning its attention to expanding the core collection to include representative suites from all significant mineral occurrences in the territory. Over the next few years, YGS will pro-actively seek donations of core samples from deposits and occurrences of interest that are not currently represented in the collection. Acquisition was initiated this year with the donation of core from the Tom and Jason occurrences. Core from four holes, totalling 325 m, was donated by Hudson Bay Mining.

The H.S. Bostock Core Library continued to see an increase in use by clients since the drill program project was initiated. Mineral Services provided access to core from thirteen drillholes (representing eight properties), and approved requests to cut, photograph and/or undertake analyses of core from three of the holes. In addition to diamond drill core, cored sediment from Riverdale, drilled for geotechnical purposes, was accessed by a client. The rock saw facilities saw thirty person-days of use in 2014.

SUMMARY

YGS had another busy year in 2014. Regional bedrock mapping in the Rackla belt was wrapped up, and the long-awaited Placer Industry Report was released. Major progress was made on the update of the bedrock geology compilation, and a record number of education and outreach activities were held.

The planned geophysical survey in the Kluane Lake area represents a new type of research partnership for YGS. The survey will extend publicly-available data beyond that currently covered by the Geological Survey of Canada's regional magnetic surveys, and provide Kluane First Nation with information on a portion of their traditional territory adjacent to the Wellgreen deposit, enabling informed land use planning.

Information on YGS activities, publications, and staff contacts can be accessed on our website (www.geology.gov.yk.ca). As always, YGS welcomes information requests and feedback on our program.

ACKNOWLEDGEMENTS

The author would like to acknowledge YGS staff for providing updates on the status of their projects to include in this overview. Maurice Colpron is thanked for reviewing the paper and enhancing a number of project descriptions, and Karen MacFarlane is thanked for editing it and catching a number of errors and typos.

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Yukon Hardrock Mining, Development and Exploration Overview 2014

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Lewis, L.L., Deklerk, R., Sack, P.J. and Torgerson, D., 2015. Yukon Hardrock Mining, Development and Exploration Overview 2014. *In:* Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 17-42.

ABSTRACT

In 2014, exploration and mining companies in Yukon faced major financial challenges. Of the three mines in Yukon, two were in production but produced less metal than in 2013, the third was not in operation having temporarily suspended production. On the exploration side, there were fewer projects, and with a few notable exceptions, most of these projects had smaller expenditures. Exploration spending in 2014 is estimated at approximately $80 million, an increase of $35 million over 2013 spending. However, this increase is almost entirely due to a large lead-zinc exploration program at the Selwyn project which was dormant last year. In total, there were 64 exploration projects ranging from small grassroots projects to large projects advancing toward mine development. The division of exploration expenditures by commodity is as follows: gold – 42%, zinc-lead – 40%, nickel-PGEs – 7%, silver – 6%, copper – 4% and other – 1%. The number of exploration projects by commodity is quite different: gold – 61% of exploration projects, copper – 15%, nickel-PGEs – 5%, zinc-lead – 5%, silver – 5% and other commodities – 9%. Similar to 2013, claim staking was low in 2014. Only 2100 quartz claims were staked though the number of claims in good standing remains high at 207 000 claims, representing approximately 11% of the total Yukon land base. Despite the financial adversity, significant grassroots and advanced exploration discoveries were made this season and four companies released updated or initial NI 43-101 compliant resources. Several projects also increased exploration activity mid-season due to early-season success.

INTRODUCTION

In 2014, low metal prices and depressed equity markets were major challenges for exploration and mining companies in Yukon. With one less producing mine in 2014, due to the temporary closure of the Bellekeno Mine in September 2013, metal production was down for the Territory. Exploration programs were also smaller in 2014; fewer projects were drilled than in previous years or were drilled using low-cost, shallow RAB drilling. In total, there were 64 exploration projects ranging from small grassroots projects in greenfields areas to large projects advancing toward mine development (Fig. 1). Of the 14 projects with expenditures of over $200 000, 10 had expenditures greater than $1 million.

The activities and results presented in this report are a summary rather than a comprehensive list of Yukon exploration, development and mining projects. Some results are still pending at the publication deadline of this volume. Summary statistics and analytical results are based on news releases by companies and personal communication with company representatives.

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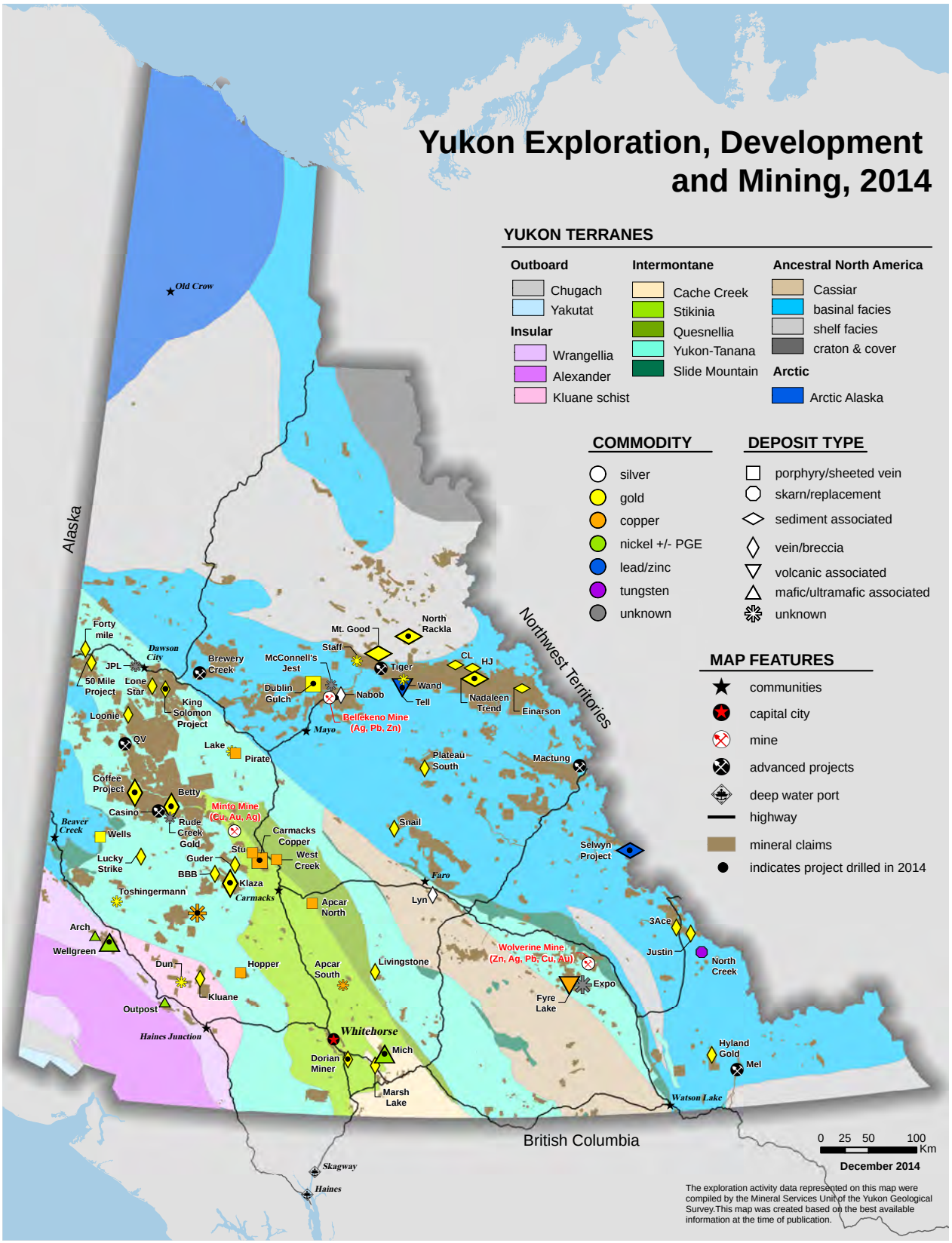

Figure 1. *Yukon exploration, development and mining projects, 2014. Large symbols represent projects with estimated expenditures ≥$100 000, small symbols with <$100 000. Black dot in the centre of a symbol indicates that drilling constituted part of the exploration activities.*

MINING AND MINE DEVELOPMENT

Yukon is home to three hard rock mines. Capstone Mining Corp.'s (www.capstonemining.com) **Minto** copper-gold-silver mine (Yukon MINFILE 115I021) continued operating at capacity in 2014. Open pit mining at Area 118 was completed in September. Further surface mining was planned for the Minto North deposit, but the company experienced delays in receiving the Water Use License Amendment required for pre-stripping. As a result, Capstone continued underground mining, and began processing stockpiled ore to maintain mill throughput. Although this resulted in slightly lower grades being milled, Capstone maintained full mill production in 2014, producing 15 112 tonnes of copper in concentrate, 147,319 oz of silver and 16,512 oz of gold during the first nine months of 2014.

Alexco Resource Corp. (www.alexcoresource.com) temporarily suspended its mining operation at the **Bellekeno** (Yukon MINFILE 105M 082) silver-lead-zinc mine in September, 2013, due to low silver prices and high operating costs. Alexco filed a Preliminary Economic Assessment (PEA) technical report for operations at the Bellekeno, Lucky Queen and Flame & Moth deposits (December 5, 2013 News Release; Fig. 2). The PEA stated the company's intention of resuming site production activities in 2015. The plan is for initial production at the Flame & Moth deposit (Yukon MINFILE 105M 087) to be supplemented by ore from the Bellekeno deposit. Bellekeno ore would eventually be replaced by ore from the Lucky Queen deposit (Yukon MINFILE 105M 085). Permitting for development and production from the Flame & Moth deposit is underway. Subsequent to a positive environmental assessment, the Government of Yukon issued a decision document outlining terms to be met for an amended Quartz Mining License. Amendments to the current Water Use Licence are also required.

Figure 2. *Geologists David Moynihan (YGS) and Al McOnie, Vice President of Exploration (Alexco) at the future location of the Flame & Moth portal.*

The **Wolverine** Mine (Yukon MINFILE 105G 072) is owned by Yukon Zinc Corp. (www.yukonzinc.com), a private company, and produces zinc, copper and lead concentrates that are trucked to the port of Stewart, British Columbia. The mine has been operating at a planned 75% production capacity. In the first six months of 2014, approximately 215 000 tonnes of ore were milled, producing concentrates of copper (~8200 tonnes), lead (~5900 tonnes) and zinc (~41 800 tonnes), with silver and gold credits.

In 2014, overall development expenditures in Yukon totaled $47.5 million. Capstone spent $12.5 million on underground development, mining improvement projects and permitting and environmental activities at the **Minto** mine. Yukon Zinc spent $2 million, primarily on underground drilling. Selwyn Chihong Mining Ltd. (www.selwynchihong.com) spent $33 million on its large lead-zinc **Selwyn** property (Yukon MINFILE 105I 012, 032, 036, 037, 042, 045, 053, 066, 067, 068, 069) near the Yukon-Northwest Territories border. The program included environmental studies, an internal scoping survey and major refurbishment of the 79-km-long Howards Pass access road which connects the property to the government-maintained Nahanni Range Road near the Cantung mine. As part of the road refurbishment, eight new permanent bridges were installed. The $13.5 million road was completed under budget and on time. A Prefeasibility Study for the Selwyn project is scheduled for completion in the first quarter of 2015.

ADVANCED PROJECTS

Several projects have defined deposits and are in advanced stages of development. Victoria Gold Corp. (www.vitgoldcorp.com) received its permit to begin construction to develop the Eagle gold deposit (Dublin Gulch; Yukon MINFILE 106D 025) on its **Dublin Gulch** property, but has deferred a production decision until equity markets recover. Golden Predator Mining Corp. (www.goldenpredator.com) released a positive PEA in November, 2014, for its **Brewery Creek** gold deposits (Yukon MINFILE 116B 160). The PEA assessed a heap leach operation whereby several of the shallow oxide deposits on the property would be mined as open pits. ATAC Resources Ltd. (www.atacresources.com) filed a NI 43-101 PEA for the Tiger deposit (Yukon MINFILE 106D 098) on the western end of its large **Rackla Gold** Project. The PEA was based on conventional open pit mining of 2 million tonnes of oxide ore at an average grade of 3.7 g/t Au; the operation would run seasonally over four years and produce 220,000 oz of gold over its mine life (July 23, 2014 News Release).

Early in the summer of 2014, Kaminak Gold Corp. (www.kaminak.com) announced the results of a NI 43-101 PEA for the **Coffee Gold** Project (Yukon MINFILE 115J 110, 111). The study indicates that Coffee represents a robust, high margin, rapid pay-back, 11-year open pit mining project at current gold prices. The deposit could become a significant Yukon producer, yielding close to 450,000 oz in the first two years and producing an average of 167,000 oz annually over the life of mine at an all-in sustaining cash cost of US$688 per ounce of gold. Subsequent to filing the PEA, Kaminak started a feasibility study for the Coffee Gold Project with a 2014 budget of $12 million. Work in 2014 to be incorporated into the study includes infill drilling, additional metallurgical test-work, continued environmental baseline activities and a condemnation drilling program (June 10 and July 28, 2014 News Releases).

Copper North Mining Corp. (www.coppernorthmining.com) revived the **Carmacks Copper** project (Yukon MINFILE 115I 008) located in west-central Yukon with the release of a new PEA that included the recovery of gold and silver along with copper. Re-engineering and optimization of the mine and processing plan was done with the aim of reducing capital expenses for the project. The main aspect of this optimization is looking at various leaching processes whereby crushed ore is submerged in weak sulphuric acid. In mid-October Copper North Mining announced the commencement of a joint Canada-China Feasibility Study, a key component of which is the use of Chinese equipment to reduce capital costs.

After a brief hiatus, to allow further consultations with the Little Salmon/Carmacks First Nation, Western Copper and Gold Corp. (www.westerncopperandgold.com) has restarted the Yukon Environmental and Socioeconomic Assessment Board (YESAB) process for its large **Casino** copper-gold porphyry deposit (Yukon MINFILE 115J 028) in western Yukon. Concurrent with the permitting process, Western Copper recently signed a number of contracts with project management firms and equipment providers. North American Tungsten (www.natungsten.com) received YESAB approval for its **Mactung** tungsten deposit (Yukon MINFILE 105O 002) near the NWT border at MacMillan Pass; specific conditions must be met by the company before a Quartz Mining License can be issued. The underground mining operation will process 2000 tonnes of ore per day and is expected to be in operation for 11 years.

EXPLORATION

Exploration spending in 2014 is estimated at approximately $80 million (Fig. 3), an increase of $35 million over 2013 spending. This increased amount is almost entirely attributable to Selwyn Chihong Mining Ltd. which spent $32 million on exploration at the Selwyn lead-zinc project in west-central Yukon. The large expenditures at the Selwyn project skew the exploration spending toward base metals. Exploration expenditures, and the exploration section of this report, are easily subdivided by commodity. The breakdown of exploration spending by commodity is as follows: gold – 42%, zinc-lead – 40%, nickel-PGEs – 7%, silver – 6%, copper – 4% and other – 1% (Fig. 4). The breakdown changes dramatically when calculated based on the number of exploration projects: 61% of exploration projects were gold-focused, 15% were for copper, 5% were for nickel-PGEs, 5% were for zinc-lead, 5% were for silver and 9% were for other commodities (Fig. 5).

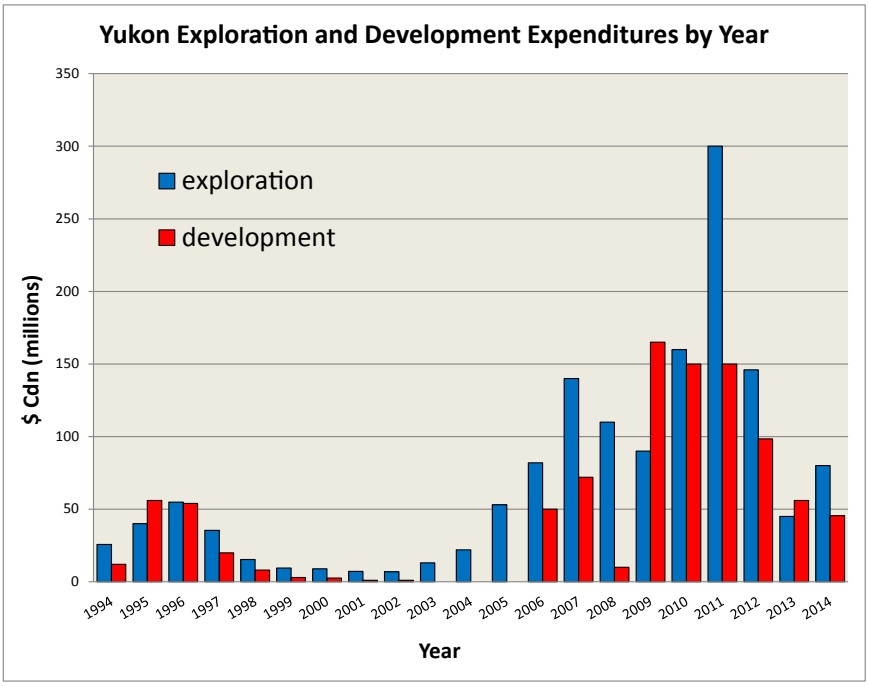

Figure 3. *Estimated exploration and development expenditures on Yukon projects, 1994-2014.*

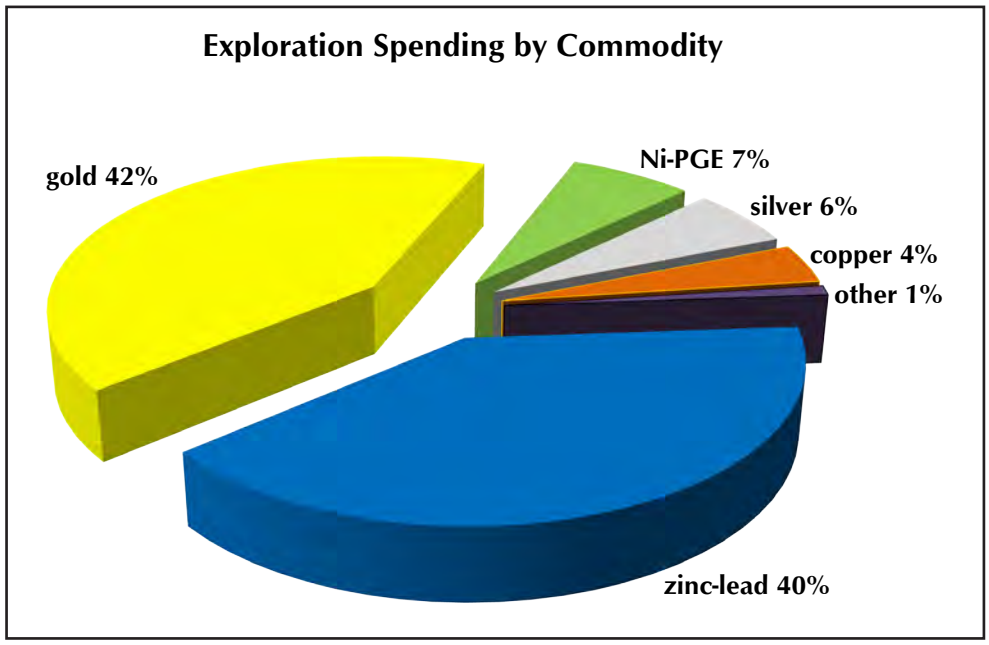

Figure 4. *Pie chart of estimated percentage of exploration expenditures on Yukon projects, 2014, sorted by primary metal of interest for exploration project. Total exploration expenditures for 2014 were $80 million.*

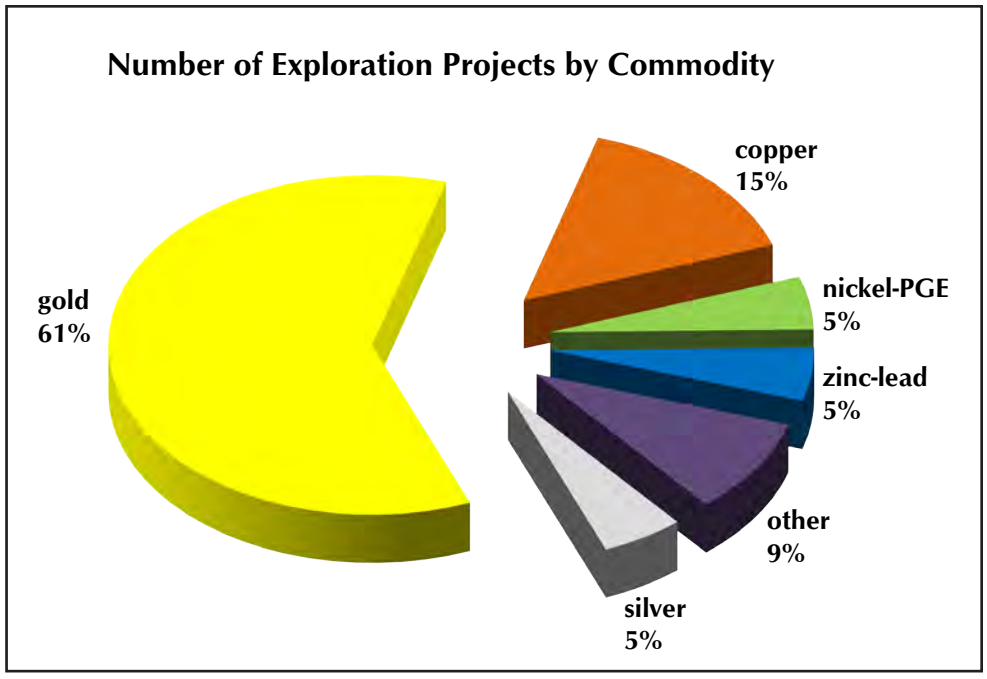

Figure 5. *Pie chart of estimated percentage of exploration projects by commodity, based on the primary metal of interest for exploration project. There were 64 exploration projects in Yukon in 2014.*

Claim staking was almost imperceptible in 2014: only 2100 quartz claims were staked, down from the peak activity of 2011 when almost 115 000 hardrock claims were staked (Fig. 6). The number of claims in good standing has dropped slightly to 207 000 claims, representing approximately 11% of the total Yukon land base.

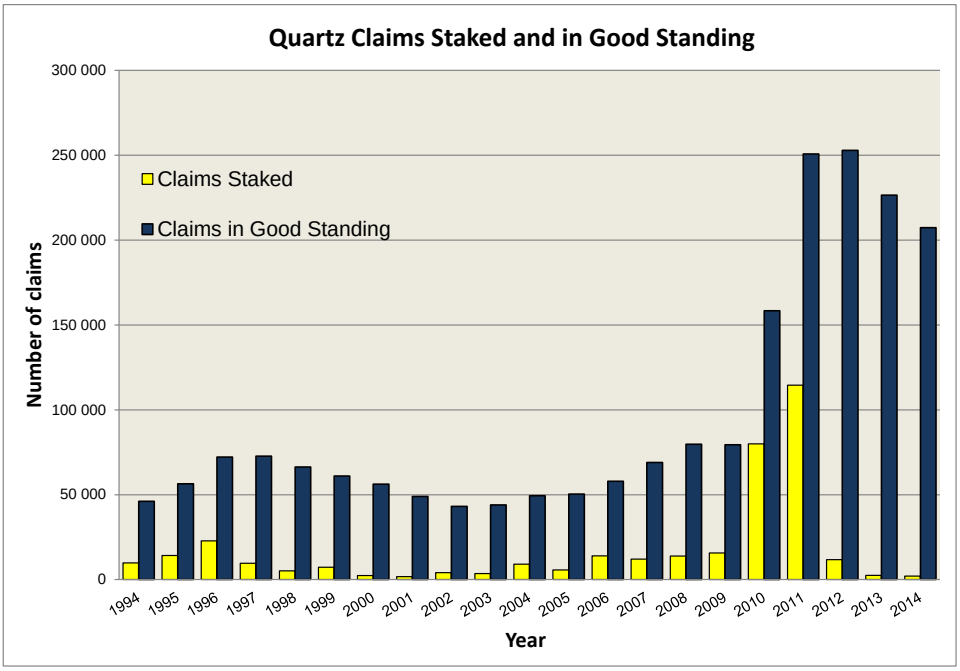

Figure 6. *Number of claims staked and number of claims in good standing in Yukon between 1994 and 2014.*

PRECIOUS METALS – GOLD

Sediment associated (Carlin-style)

ATAC Resources (www.atacresources.com) was active on the Nadaleen trend of its **Rackla Gold Project**, spending approximately $6.8 million primarily exploring the Osiris zone (Conrad, Osiris, Isis, Isis East and Sunrise zones) and the Anubis zone (Yukon MINFILE numbers pending). Work in 2014 included diamond drilling, overburden auger drilling, trenching, prospecting, mapping and soil sampling. The 2014 program at the Anubis area resulted in the completion of 1050 m of trenching, 50 overburden drill holes and the collection of 172 soil samples and 786 rock samples. Assays from trench samples returned gold values from below detection up to 2.30 g/t Au over 5 m. Highlights of drill result assays at the Conrad zone (Table 1) include 30.79 m of 9.5 g/t Au in drillhole DDH OS-14-227 and 40.22 m of 6.57 g/t Au from drillhole DDH OS-14-228. The 2014 program results have enabled ATAC to define geochemical anomalies and track the geochemical response back to areas of bedrock alteration, trace known faults and identify new intersecting structures that are potential feeder systems for mineralizing fluids.

Table 1. *Selected intercepts from diamond drilling on the Nadaleen Trend of ATAC Resources' Rackla Gold Project (compiled from ATAC Resources' August 26 and October 7 News Releases). *Intervals are drilled thicknesses and are believed to represent approximately 60 to 100% of true widths.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
OS14-230	Conrad	624.8	3.0 g/t Au over 42.7 m
and		697.6	3.15 g/t Au over 21.7 m
OS14-229	Conrad	281.9	4.2 g/t Au over 19.2 m
and		371.9	2.8 g/t Au over 9.1 m
and		448.1	5.1 g/t Au over 36.6 m
OS14-228	Conrad	321.5	6.6 g/t Au over 40.2 m
including		323.4	18.2 g/t Au over 11.9 m
and		426.7	3.0 g/t Au over 24.4 m
OS14-227	Conrad	452.8	9.5 g/t Au over 30.8 m

Cantex Mine Development (www.cantex.ca) focused its work on the **North Rackla** and **Mt. Good** properties (Yukon MINFILE numbers pending) collecting a total of 6740 soil-talus samples in 2014. The analytical results of these samples have not yet been released. Rotary air blast drilling (RAB) in 2014 consisted of 130 holes focused on the Central North Rackla soil anomaly where a total of 46 bedrock samples were collected from 39 RAB drill holes; the highest gold value was 75 ppb. Due to extensive glacial till in the area a ground-based magnetic survey was also completed over the anomaly. A single grab sample from the North Rackla claims contained 2.9 g/t Au, 7510 ppm As, 318 ppm Sb, 77 g/t Ag, 0.3% Cu, 1.64% Pb and 19.2% Zn (October 30, 2014 News Release).

Carlincore Resources Ltd. (www.carlincoresources.com) continues to explore the potential for Carlin-type gold mineralization on its **CL and HJ** properties (Yukon MINFILE number pending) located just north of ATAC Resources' Osiris cluster. In 2014, exploration activities included detailed soil sampling, mapping and prospecting. The company also increased its footprint in Yukon to 913 quartz claims between the two properties. Nearly 2000 soil samples and over 250 grab samples were collected during the course of the program. A number of property to regional-scale faults and favourable calcareous rock units were mapped within the property boundaries; multiple gold and Carlin-gold pathfinder element anomalies have been identified for future follow-up.

Porphyry/sheeted vein (intrusion-related)

Victoria Gold Corp. (www.vitgoldcorp.com) conducted a $2 million exploration program on its **Olive** prospect (Yukon MINFILE number pending), 2 km northeast of the gold resource at the Eagle deposit on its Dublin Gulch property. The Phase 1 and 2 Olive exploration programs included 49 exploration diamond drill holes, 12 metallurgical diamond drill test holes, 7 geotechnical drill holes and 882 m of surface trenching which resulted in 6757 new assays.

Phase 1 drilling intersections provided very encouraging results including 69.7 m of 2.29 g/t Au, 96.1 m of 1.22 g/t Au and 89.6 m of 1.18 g/t Au including 42.5 m of 2.36 g/t Au (Table 2). Phase 2 Olive zone exploration drilling was targeted as a series of step-out and exploration drillholes along strike (~850 m) and across (~300 m) the interpreted Olive shear zone defined by Phase 1 drilling. Phase 2 results included intercepts of 22.5 m of 1.03 g/t Au, 20.1 m of 1.10 g/t Au and 20.9 m of 1.16 g/t Au in drillholes DG14-602C, DG14-606C and DG14-626C, respectively (November 4, 2014 News Release).

Table 2. *Selected intercepts from diamond drilling on Victoria Gold Corporation's Olive prospect (compiled from June 24, July 28 and November 4 News Releases).*
**Intervals are drilled intersections; true widths have not yet been determined but are estimated at approximately two-thirds down-hole length.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
DG14-584C	Olive	60.7	2.3 g/t Au over 69.7 m
including		65.5	2.9 g/t Au over 49.4 m
including		85.3	3.9 g/t Au over 29.6 m
DG14-586C	Olive	26.8	1.2 g/t Au over 96.1 m
including		33.4	2.2 g/t Au over 25.0 m
and		107.3	2.0 g/t Au over 15.6 m
DG14-588C	Olive	46.2	1.0 g/t Au over 99.9 m
including		46.2	2.2 g/t Au over 31.5 m
DG14-590C	Olive	36.6	1.0 g/t Au over 94.5 m
including		74.4	1.7 g/t Au over 35.3 m
DG14-600C	Olive	3.0	1.2 g/t Au over 89.6 m
including		42.2	2.4 g/t Au over 42.5 m

During the Phase 2 Olive program, 17 trenches were excavated and 800 trench samples were collected and analyzed. This trenching program proved effective in defining high-grade surface mineralization within the Olive shear zone and confirmed that the Olive zone mineralization defined at depth extends to surface along strike with results returning up to 3.42 g/t Au over 9 m.

As part of the Phase 1 program, three metallurgical holes were run with 96-hour bottle roll tests on 3 composite oxide and 3 composite sulphide samples. All samples were tested using a crush size to match the proposed crushing facility for Eagle (P80 6.3 mm), the proposed open pit mine on the property. Gold recovery exceeded expectations and averaged 61% on the oxide samples.

Aben Resources Ltd. (www.abenresources.com) explored its **Justin** property (Yukon MINFILE 105H 035) in southeast Yukon. The property is host to numerous styles of intrusion-related mineralization, most notably the newly discovered auriferous gold-silver-tungsten skarn and sheeted vein system which comprise the POW zone.

The Justin property includes the POW, Confluence, Main and Kangas zones which form part of a 12-km-long mineralized corridor. Work completed during the 2014 exploration program included the collection of 60 channel samples from 4 trenches, 24 rock samples, re-analysis of 230 drill core samples, 4 silt samples and 151 soil samples with coverage totaling 7.2 line km. The program was focused on two areas, the POW zone and the Big Swifty zone, where previous exploration by the company has shown the potential for intrusion-related gold mineralization at surface.

Assays from the 2014 trenching program returned encouraging results defining gold-bismuth-tellurium bearing sheeted vein systems at surface within the Justin granodiorite stock and adjacent POW zone skarn. Highlights of the 2014 trenching program include 1.15 g/t Au over 7.9 m including a higher grade intersection of 2.76 g/t Au over 1.9 m in trench TR14-004 (September 17, 2014 News Release). A total of 230 samples from 7 of 9 previously drilled POW zone holes were re-analyzed for tungsten to provide a preliminary assessment of the potential for economic tungsten mineralization. Results from JN12016 returned 8.50 m grading 0.39% WO_3 including 1.00 m of 1.12% WO_3 (Table 3).

Table 3. *Selected intercepts from diamond drilling on Aben Resources' Justin property. These holes were drilled in 2011 and 2012, but not rigorously assayed for tungsten until 2014 (compiled from October 16, 2014 News Release). *Intervals are drilled thickness; true thicknesses have not been calculated.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
JN11010	POW	194.0	0.25% WO_3 over 12.0 m
including		195.0	0.45% WO_3 over 5.0 m
JN12013	POW	4.1	0.10% WO_3 over 28.9 m
including		23.8	0.14% WO_3 over 9.2 m
and		45.8	1.15% WO_3 over 1.1 m
and		88.7	0.46% WO_3 over 2.1 m
including		88.7	0.87% WO_3 over 1.0 m
JN12016	POW	104.7	0.39% WO_3 over 8.5 m
including		106.3	1.12% WO_3 over 1.0 m
and		110.1	0.50% WO_3 over 3.1 m
including		111.2	0.88% WO_3 over 1.4 m
JN12019	POW	192.5	0.27% WO_3 over 7.2 m
including		197.8	0.52% WO_3 over 1.6 m

Gorilla Minerals Corp. (www.gorillaminerals.com) flew an airborne geophysical survey over its **Wels West** property (Yukon MINFILE pending) located 50 km east of Beaver Creek. In the fall, the company carried out trenching and rock sampling on the Saddle zone. The trenches cut strongly weathered biotite granite which hosts intrusive-related gold mineralization similar to deposits in the Tintina Gold Belt. The gold mineralization has been traced for 50 m over an average width of

10 m and is open in all directions (Fig. 7). Sampling from Trench 14-02 returned a weighted assay of 13.81 g/t Au over 21 m (Table 4); the sample contained visible gold. The company resubmitted five of the samples for Metallic Screen Assays which confirmed the nugget effect, but the effect on sample assay intervals appears minimal. Further work is underway to evaluate the nugget effect of samples from the property (November 21, 2014 News Release).

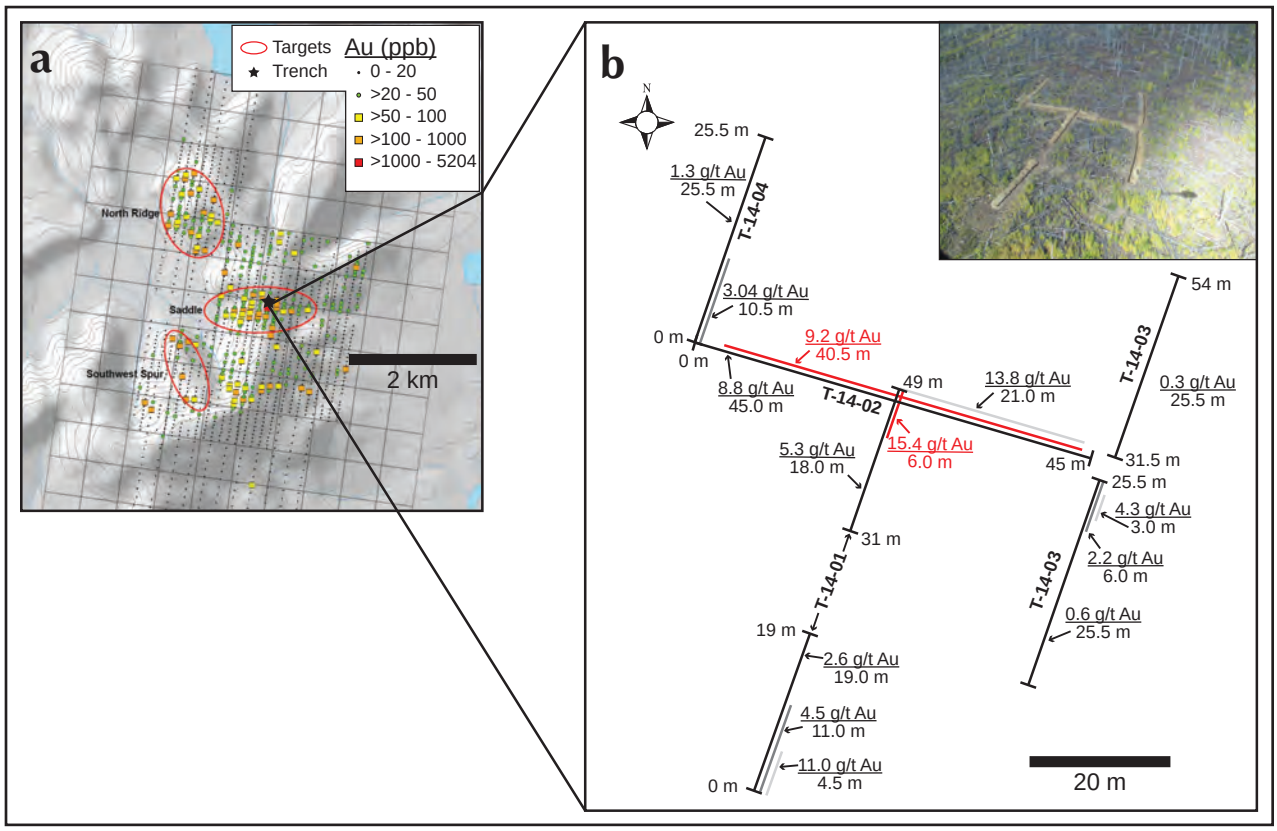

Figure 7. *a) 2013 gold-in-soil map of the Wels West property (modified from company website); 2014 trenching was done at the Saddle zone at the centre of map. b) Plan view map of the Saddle zone discovery trench with gold assays and composite intervals (modified from November 21, 2014 News Release). Photo in top right shows the covered nature of the area.*

Table 4. *Significant trench results from Gorilla Resources' Wels West property (modified from November 21, 2014 News Release). *True thicknesses of mineralized zones have not been determined.*

Trench Name	*Weighted Average Intervals
T-14-01	4.53 g/t Au over 11.0 m
including	11.0 g/t Au over 4.5 m
and	5.30 g/t Au over 18.0 m
including	15.40 g/t Au over 6.0 m
T-14-02	8.80 g/t Au over 45.0 m
including	9.15 g/t Au over 40.5 m
also including	13.81 g/t Au over 21.0 m

In 2013, Golden Predator Corp. merged with Northern Tiger Resources, consolidating a package of Yukon properties: 3Ace (Yukon MINFILE 105H 066), Sonora Gulch (Yukon MINFILE 115J 008) and R15 (Yukon MINFILE 105G 071) properties, as well as the Clear Lake (Yukon MINFILE 105L 045) and Marg (Yukon MINFILE 106D 009) deposits. Golden Predator processed three large volume bulk samples from the Sleeping Giant zone at the **3Ace property** that were collected in 2013. Overall gold recoveries for the 3 samples were 98.3%, 97.9% and 93.5% (December 2, 2014 News Release).

Vein/breccia (orogenic gold)

Kaminak Gold Corp. (www.kaminak.com) continued to expand known mineralization on its **Coffee property**, 130 km south of Dawson City (Yukon MINFILE 115J 110, 111). At the end of January 2014, Kaminak announced an updated NI 43-101 resource estimate on the project (Table 5). At a base cut-off of 0.5 g/t Au for oxide and transitional material and a 1 g/t Au cut-off for sulphide material, the updated resource estimate consists of an Indicated Resource of 14 million tonnes grading at 1.56 g/t Au for 719,000 oz, including 480,000 oz gold classified as oxide, and an Inferred Resource of 79 million tonnes grading at 1.36 g/t Au for 3,434,000 oz of gold, which includes 2,078,000 oz of gold classified as oxide (January 28, 2014 News Release).

Table 5. *Updated NI 43-101 resource estimate for the Coffee Gold Project 2014. Resources for Supremo, Latte, Double Double and Kona deposits. A cut-off grade of 0.5 g/t Au for oxide and transitional material and 1 g/t Au for sulphide material were used (modified from January 28, 2014 News Release).*

Deposit	Classification	Tonnes (Mt)	Au (g/t)	Contained Au (oz)	Contained Au (kg)
Oxide	Indicated	8.555	1.75	480,000	14 930
	Inferred	50.437	1.28	2,078,000	64 635
Upper Transition	Indicated	3.619	1.32	153,000	4759
	Inferred	15.967	1.39	714,000	22 208
Lower Transition	Indicated	2.141	1.21	83,000	2582
	Inferred	6.662	1.43	306,000	9518
Sulphide	Indicated	0.042	1.52	2,000	62
	Inferred	5.525	1.89	336,000	10 451
Total	Indicated	14.357	1.56	719,000	22 364
	Inferred	78.591	1.36	3,434,000	106 812

In mid-May, Kaminak commenced a $5.5 million dollar Phase 1 exploration program focused on drilling new high-priority near-surface oxide gold targets and expanding previously drilled discoveries in the immediate vicinity of the established Coffee gold deposits. The company collared 27 drillholes which successfully intersected shallow, predominantly oxidized gold-bearing structures within the Kona North zone; identified mineralization 900 m along strike on the Supremo T3 trend; and intersected gold mineralization at the Cappuccino zone. Kaminak also continued

environmental and heritage baseline studies, and began a study to determine the optimal route and design of an access road to the property (September 2, 2014 News Release).

In the beginning of September 2014, Kaminak announced a $2 million dollar Phase 2 exploration program targeting primarily Kona North and other priority gold-in-soil anomalies proximal to the defined resource. The Phase 2 program proceeded in conjunction with the company's feasibility study and resulted in a total of 1600 m of drilling across 8 holes centred on the Kona North zone. All holes intercepted mineralization, including drillhole CFR0657 which intersected 28.95 m of 3.12 g/t Au (October 28, 2014 News Release).

Centerra Gold Inc. (www.centerragold.com) spent slightly less than $1 million conducting exploration on the recently optioned **Betty and Hayes** claim blocks, 50 km southeast of the Coffee project. The bulk of the 2014 exploration program was focused on the Betty claim block (Yukon MINFILE 115J 070, 071, 074). The company carried out grid soil sampling over the central and western parts of the property. Mineralized areas were geologically mapped and the White, Grable and Ford target areas were covered by ground induced polarization (IP) and magnetic geophysical surveys. The company carried out a rotary air blast (RAB) percussion drill program (>16 holes ~ 365.7 m) over the White and Grable target areas. The drilling confirmed gold mineralization in the two target areas. The company also carried out ridge and spur soil sampling on the Hayes claim block (Yukon MINFILE number pending).

In mid-September, 2014 Centerra Gold optioned Pacific Ridge Exploration's **King Solomon Dome** property (Yukon MINFILE 115O 083). Centerra immediately commenced an exploration program consisting of a ground magnetometer survey over the entire southern half of the property, an extension of the previous soil geochemical grid and extensions to the resistivity/induced polarization survey initiated by Pacific Ridge in 2013. The company also carried out a rotary air blast (RAB) percussion drill program targeting the King, Prince and other priority targets; results are pending.

Comstock Metals Ltd. (www.comstock-metals.com) announced an initial NI 43-101 compliant Inferred Mineral Resource in early July for the **VG** deposit on the company's QV project (Yukon MINFILE 115O 004) located 67 km southwest of Dawson City. Using a 0.5 g/t gold cut-off grade the VG hosts an Inferred Resource of 4 390 000 tonnes grading 1.65 g/t Au (Table 6). The resource calculation incorporates data from 17 diamond drill holes collared between 2012 and 2013. The deposit is hosted in felsic metavolcanic gneiss and is associated with silicified sericite-altered breccia, sharing similarities with Kinross Gold Corp.'s Golden Saddle deposit (Yukon MINFILE 115O 165) located 10 km to the south. The VG deposit remains open along strike and down dip (July 8, 2014 News Release).

Table 6. *Initial NI 43-101 compliant resource estimate for Comstock Metal's VG deposit on the QV property. Calculated using a cut-off grade of 0.5 g/t gold (modified from July 8, 2014 News Release).*

Deposit	Classification	Tonnes (Mt)	Au (g/t)	Contained Au (oz)	Contained Au (kg)
VG	Inferred	4.4	1.65	230,000	7154

Rockhaven Resources Ltd. (www.rockhavenresources.com) completed soil geochemical sampling, hand trenching and prospecting on its Kluane gold property northwest of Killermun Lake, approximately 45 km north-northwest of Haines Junction (Shut; Yukon MINFILE 115H 047: Lib; Yukon MINFILE 115H 055). The **Kluane** property (formerly called the Ruby Range project) consists of eight zones of quartz ± carbonate veins with native gold and/or arsenopyrite hosted in Kluane schist. The veins trend north to northwest and are discordant to foliation in the host rocks. In 2014, soil geochemical coverage was extended onto a vegetated and overburden-covered slope lying north and west of the Delor and Switchback zones and nearby electromagnetic conductors. This sampling returned several strongly anomalous results ranging from 100 to 738 ppb gold-in-soil. The highest gold-in-soil values largely coincide with surface traces of the known showings and geophysical conductors. Both geochemical and geophysical anomalies project northward into unsurveyed areas (November 6, 2014 News Release).

Northern Freegold Resources' (www.northernfreegold.com) 2014 exploration program at the **Freegold Mountain** project was designed to build on the 2013 discovery of the Irene showing (Yukon MINFILE pending). The program consisted of trench mapping and sampling, prospecting, and a total of 29 km of ground magnetic and electromagnetic surveys. Gold mineralization occurs in veins and breccia along a structural corridor that transects the contact between sedimentary rocks and an intrusive body. Bedrock sampling extended the known mineralized structure 50.0 m along strike with gold assays from trench TR-14-037 returning 9.45 g/t Au, 114.5 g/t Ag and 0.79% Cu over 1.0 m including 19.9 g/t Au, 145.0 g/t Ag and 0.68% Cu over 0.35 m (Table 7). The zone is currently defined along strike for 130 m and remains open in all directions with bedrock exposure in the immediate area encumbered by extensive gravel cover (November 17, 2014 News Release).

Table 7. *Significant trench results for Northern Freegold Resources' Irene zone (modified from November 17, 2014 News Release). *True thickness of the mineralized zone has not been determined to date.*

Trench Name	*Mineralized Interval
TR14-027	0.98 g/t Au over 4.50 m
including	2.69 g/t Au over 1.00 m
TR14-031	1.53 g/t Au over 5.00 m
including	2.08 g/t Au over 2.00 m
TR14-036	5.19 g/t Au, 66.8 g/t Ag, 0.29% Cu over 1.00 m
including	9.03 g/t Au, 50.3 g/t Ag, 0.24% Cu over 0.50 m
TR14-037	9.45 g/t Au, 114.5 g/t Ag, 0.79% Cu over 1.00 m
including	19.90 g/t Au, 145.0 g/t Ag, 0.68% Cu over 0.35 m

Goldstrike Resources Ltd. (www.goldstrikeresources.com) conducted excavator trenching, soil sampling, prospecting and a ground magnetic survey on its **Lucky Strike** property (Yukon MINFILE 115O 170, 171), 67 km southwest of Dawson City. Soil sampling confirmed a 7.7-km-long gold trend on the property that remains open. A new anomaly was discovered at the northwest end of this trend, with soil samples returning up to 923.7 ppb Au. A trench dug in 2013 in the vicinity of this anomaly returned values from detection level up to 2.1 g/t Au over 3 m. Deepening of the trench in 2014 returned visible gold in rusty orthogneiss, confirmed by a metallic screen assay that returned 1.1 g/t Au. The 2014 detailed geochemistry results show that trenches were dug oblique to the main northwest structural trend, which remains largely unexplored (October 8, 2014 News Release). Goldstrike also worked its Plateau South and Summit (Yukon MINFILE numbers pending) properties in the Selwyn basin area. The primary focus for 2014 was on the Plateau South property where the company conducted a 3D induced polarization survey over the Gold Dome and VG zones. The survey outlined a large, well defined chargeability anomaly near discovery hole PSVG13-03. The core of the anomaly measures approximately 200 by 100 m, and extends from about 100 m below surface to 200 m depth (September 9, 2014 News Release).

Banyan Gold Corp. (www.banyangold.com) performed a small late-season soil and rock sampling program at the **Hyland Gold** project (Yukon MINFILE 095D 011) in 2014 in southeast Yukon. The program followed up on encouraging results from the 2013 program and included focused soils/rock sampling with coincident geological mapping targeted upon the Cuz South (Yukon MINFILE 095D 033) and Montrose Ridge zones located approximately 6.5 km south of the Hyland gold deposit. In total, 496 soils and rocks were collected from over 2.2 km^2 of ground between and flanking the Cuz South and Montrose Ridge zones. Soils were sampled at 50-m-centres on grid lines of 100 m spacing; results are pending (September 30, 2014 News Release).

PRECIOUS METALS – SILVER±GOLD

Vein/breccia (epithermal)

Rockhaven Resources Ltd. (www.rockhavenresources.com) completed 104 holes (19 242 m) of diamond drilling on its 100% owned **Klaza** property (Esansee; Yukon MINFILE 115I 067), located 50 km west of Carmacks (Table 8). Drilling was focused on delineating areas of high-grade gold and silver mineralization in the BRX and Klaza zones (Fig. 8). Condemnation and geotechnical drilling were also completed in strategic areas to aid in project design for the Klaza property. The Klaza property currently hosts nine mineralized zones, which have a cumulative mineralized strike length of 9.4 km. The zones occur in a 1.8-km-wide structural corridor crosscutting mid-Cretaceous granite. Individual zones range from 1 to 75 m in width and consist of quartz-sulphide veins, breccia and fracture networks that are spatially associated with unmineralized quartz-feldspar porphyry dikes. The zones exhibit exceptional lateral and down-dip continuity, and remain open for extension along strike and depth. The company completed further geophysical surveys and excavator trenching concurrently with the diamond drill program.

Table 8. *Selected drill results from Rockhaven Resources' Klaza property (modified from September 17, October 8 and October 22, 2014 News Releases). *True widths are estimated to be approximately 80-90% of the drilled interval.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
KL-14-178	Klaza	95.9	25.30 g/t Au and 637 g/t Ag over 1.0 m
KL-14-184	Klaza	170.0	30.90 g/t Au and 5.28 g/t Ag over 0.7 m
KL-14-220	Klaza	277.2	15.38 g/t Au and 741 g/t Ag over 1.5 m
including		277.2	33.20 g/t Au and 1625 g/t Ag over 0.5 m
KL-14-238	Western BRX	502.4	2.19 g/t Au and 120 g/t Ag over 18.5 m
including		502.4	4.27 g/t Au and 46.1 g/t Ag over 2.4 m
including		519.6	16.29 g/t Au and 1435 g/t Ag over 1.4 m
KL-14-171	Central Klaza	76.8	22.90 g/t Au and 1100 g/t Ag over 0.6 m
KL-14-222	Central Klaza	275.4	5.15 g/t Au and 179 g/t Ag over 1.5 m
and		410.6	8.33 g/t Au and 201 g/t Ag over 1.5 m

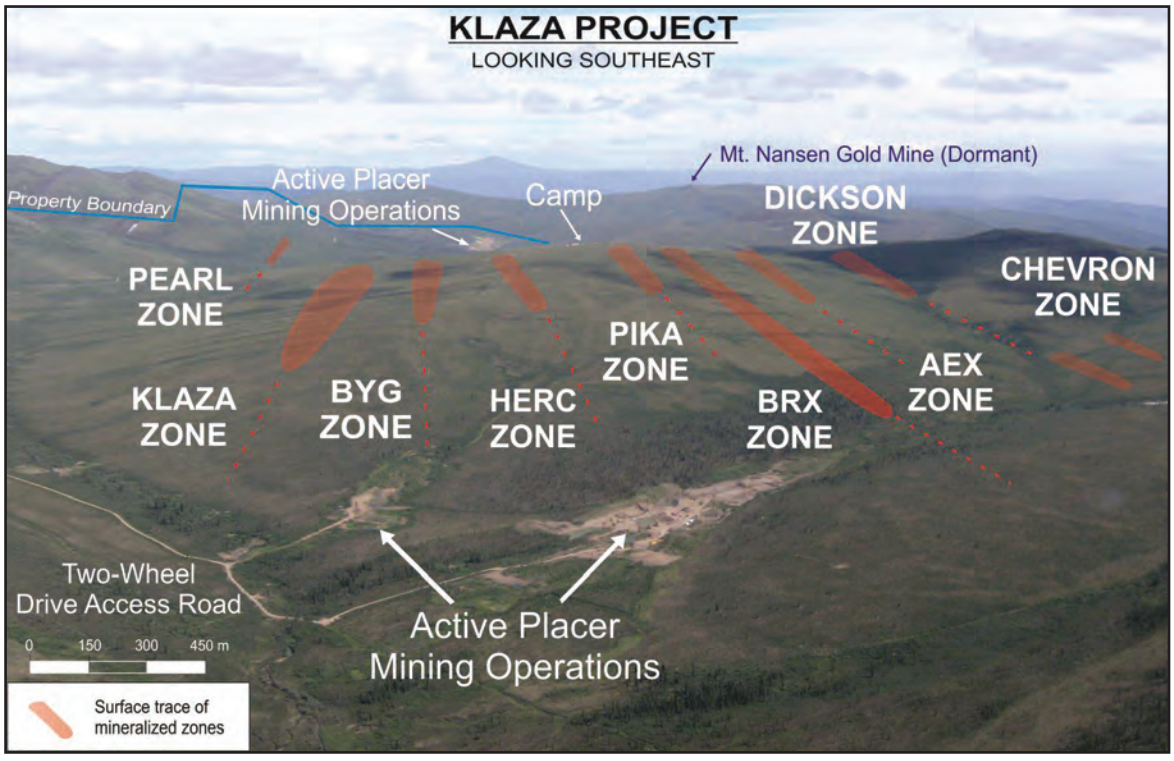

Figure 8. *View looking to the southeast of Rockhaven Resources' Klaza property (Rockhaven Resources' October 2014 corporate presentation). The majority of 2014 work was done on the Klaza and BRX zones.*

Alexco Resources' (www.alexcoresource.com) $5 million exploration program consisted of 18 267 m of drilling. Drilling occurred mainly on the **Bermingham** (Yukon MINFILE 105M 086) and **Flame & Moth** deposits (Yukon MINFILE 105M 087). An additional 2667 m of drilling was completed in eight holes to both infill and extend known Bermingham mineralization to the northeast, toward the Hector-Calumet deposit. Results from this drilling include drillhole K-14-0537 which intercepted 6.39 m (true width) with a composite silver grade of 5667 g/t Ag (165.3 oz/ton), including 1.81 m (true width) assaying 18 270 g/t Ag (532.9 oz/ton). This is the highest grade intercept Alexco has ever drilled on the property. Three other holes within 200 m of drillhole K-14-0537 intercepted between 529 g/t Ag and 714 g/t Ag over true widths ranging from 3.03 to 7.97 m (Table 9). A new resource estimate for Bermingham is expected to be completed in early 2015.

Table 9. *Selected diamond drill intercepts from the Bermingham and Flame & Moth deposits on Alexco Resources' Keno Hill property (modified from November 5, 2014 News Releases). *True widths.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
K-14-0524	Bermingham	236.4	545 g/t Ag, 0.06 g/t Au, 0.83% Pb and 1.21% Zn over 8.0 m
K-14-0531	Bermingham	233.0	529 g/t Ag, 0.03 g/t Au, 1.12% Pb and 0.49% Zn over 4.9 m
including		237.6	3260 g/t Ag, 0.17 g/t Au, 7.87% Pb and 4.61% Zn over 0.3 m
K-14-0537	Bermingham	280.0	5667 g/t Ag, 0.26 g/t Au, 8.57% Pb and 1.79% Zn over 6.4 m
including		284.6	23 389 g/t Ag, 1.15 g/t Au, 33.14% Pb and 3.05% Zn over 0.4 m
K-14-0538	Bermingham	271.8	714 g/t Ag, 0.29 g/t Au, 0.34% Pb and 0.29% Zn over 3.0 m
including		275.0	4850 g/t Ag, 1.30 g/t Au, 1.71% Pb and 0.04% Zn over 0.4 m
K-14-0539	Bermingham	332.8	472 g/t Ag, 0.14 g/t Au, 2.42% Pb and 0.56% Zn over 2.7 m

In the first quarter of 2014, Metals Creek Resources Corp. (www.metalscreek.com) completed bottle roll cyanide extraction test work on drill core and trench samples collected in 2013 from the **Squid East** project (Yukon MINFILE pending) in west-central Yukon. The primary objective for this metallurgical testing was to evaluate the leaching characteristics of the weathered gold-bearing material intersected in both the 2013 drilling and trenching programs. Six samples were collected to test gold recovery and four samples for silver recoveries. Gold recoveries ranged from 83.8 to 95.7% and averaged 92% overall. Gold grades for the six samples ranged from 0.71 g/t Au to 9.99 g/t Au. Silver recoveries from the four samples collected, ranged from 60.6% to 92.6% and averaged 81.75%. Silver grades for the four samples ranged from 53.7 g/t Ag to 158 g/t Ag. All ten samples were collected from the mineralized zone, which consists of a weathered section of sericite schist with associated porphyritic sections, that remains completely open. The discovery is trail-accessible and located within the unglaciated part of west-central Yukon near an existing placer mine.

BASE METALS – LEAD+ZINC

Sediment associated (sedimentary exhalative)

Selwyn-Chihong Mining Ltd. (www.selwynchihong.com) undertook an ambitious program at its wholly-owned **Selwyn** project (Yukon MINFILE 105I012, 037, 067, 068). It was the largest drill program ever completed on the Selwyn project. The company budgeted $32 million for exploration costs and completed exploratory and definition diamond drilling (39 920 m; 219 holes), metallurgical drilling (2850 m; 20 holes) and geotechnical/hydrological drilling (12 020 m; 45 holes). Assay results from drilling include 12.2 m of 16.80% combined lead and zinc in DDH XYC-308 at the XY Central deposit (Table 10; Fig. 9).

Table 10. *Selected diamond drill intercepts from the Selwyn property of Selwyn-Chihong Mining Ltd. (personal communication, December 15, 2014). *All intersections are apparent thicknesses.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
ANC-191	Anniv Central	125.3	7.10% Zn and 2.41% Pb over 15.1 m
ANE-215	Anniv East	75.4	6.57% Zn and 2.50% Pb over 23.6 m
DNE-071	Don East	143.0	10.81% Zn and 2.77% Pb over 13.0 m
HCW-067	HC West	183.5	15.71% Zn and 4.88% Pb over 8.8 m
XYC-308	XY Central	99.1	10.25% Zn and 6.55% Pb over 12.2 m
XYN-106	XY Nose**	209.0	8.22% Zn and 4.92% Pb over 31.1 m

***XY Nose is located in the Northwest Territories.*

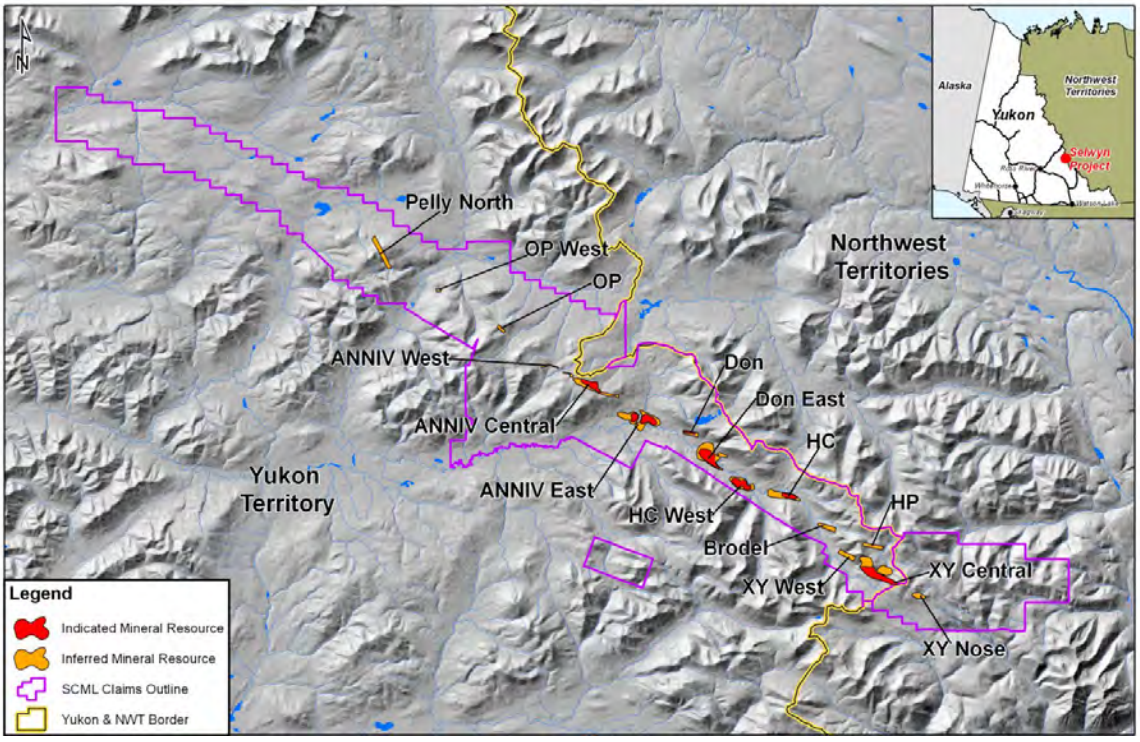

Figure 9. *Deposits along trend on the Selwyn property of Selwyn-Chihong Mining Ltd. (Image from Kirkham et al., 2012).*

Silver Range Resources (www.silverrangeresources.com) acquired the **Mel** property (Yukon MINFILE 095D 005) in 2014, and released a recalculated resource for the Mel Main zone based on historical data (Table 11). The newly calculated Inferred Resource of 5.4 million tonnes at an average grade of just below 9% Zn-equivalent is slightly smaller than previous estimates but represents the first NI 43-101 compliant resource estimate for the property. The company also conducted a preliminary assessment of barite markets in western Canada.

Table 11. *Updated NI-43-101 compliant resource estimate for Silver Range's Mel Main zone deposit. A cut-off grade of 5% zinc-equivalent (Zn-EQ%) was calculated using metal prices of US$0.89/lb zinc and US$0.96/lb lead and assuming 90.3% zinc recovery and 97.7% lead recovery (modified from November 12, 2014 News Release).*

Deposit	Classification	Tonnes (Mt)	Zn (%)	Pb (%)	Zn EQ (%)	BaSO4 (%)
Mel Main	Inferred	5.38	6.45	1.85	8.61	44.79

Volcanic associated (volcanogenic massive sulphide)

In northern Selwyn basin, Manson Creek Resources (www.manson.ca), in conjunction with its option partner Guatavita Gold Corp., drilled 4 holes totaling 673 m at the **Guaman** property (Tell; Yukon MINFILE 106C 091). The drill program was designed to test a large induced polarization coincident chargeability and conductivity corridor, with a strong associated surface geochemical anomaly underlying gossanous spring seeps. All drillholes intersected anomalous values of silver and zinc throughout the sulphide-bearing shale units, and in the contact zone above underlying volcanic units. Highlights of the drilling include DDH2 which returned 220 m of 3.16 g/t Ag and 0.12% Zn.

Merah Resources Ltd. (www.merahresources.com.au) optioned the **Fyre Lake** property (Yukon MINFILE 105G 034) from Pacific Ridge Exploration Ltd. in July, 2014. The property includes the Kona deposit with a NI 43-101 Indicated Resource of 3.6 million tonnes grading 1.57% Cu, 0.10% Co and 0.61 g/t Au, and an Inferred Resource of 5.4 million tonnes grading 1.48% Cu, 0.08% Co and 0.53 g/t Au (Blanchflower, 2006). Both resources have a 1% Cu cut-off grade. In 2014, Merah Resources, an Australian public company, contracted a helicopter-borne VTEM (versatile time-domain) electromagnetic and magnetic geophysical survey over the property. The survey successfully detected the Kona deposit as well as anomalies along strike potentially extending the Kona deposit a further one kilometre beyond the current limit of drilling (October 22, 2014 News Release).

BASE METALS – COPPER

Porphyry/Sheeted Vein

Copper North Mining Corp. (www.coppernorthmining.com) focused its efforts on reviewing all aspects of the **Carmacks Copper** project (Yukon MINFILE 115I 008) in west-central Yukon. On the exploration front the company carried out trenching and induced polarization geophysical surveys over Zone 2 and Gap areas with the aim of expanding known copper oxide resources (Fig. 10). Initial trenching has met with

success and has extended the mineralization in Zone 2 from the initial 100 m of strike length to more than 500 m (May 20, August 21, September 2 and October 14, 2014 News Releases).

Figure 10. *Looking southeast towards Williams Creek from a Zone 1 trench at Copper North Mining's Carmacks Copper property.*

Strategic Metals Ltd. (www.strategicmetalsltd.com) explored its road-accessible **Hopper** gold-copper-porphyry/skarn property (Yukon MINFILE 115H 019, 034) in southwest Yukon with prospecting, trenching, soil sampling and geophysical surveys. The mineralization system is inferred to be a gold-copper-molybdenum porphyry with sub-horizontal copper-gold skarn zones (Fig. 11).

Figure 11. *Archer Cathro geologists Heather Burrell and Andy Mitchell in front of an outcrop of the Hopper pluton at the Hopper North anomaly.*

BASE METALS – NICKEL+PLATINUM GROUP METALS (PGM)

Wellgreen Platinum Ltd. (formerly Prophecy Platinum Ltd.) (www.wellgreenplatinum.com) continued to advance its platinum group metals (PGM)–nickel-copper **Wellgreen** deposit (Yukon MINFILE 115G 024). In mid-July, the company released an updated NI 43-101 compliant resource for the project (Table 12). Measured and Indicated Mineral Resources increased to 330 million tonnes at 1.67 g/t platinum equivalent or 0.44% nickel equivalent employing a 0.57 g/t platinum equivalent cut-off or 0.15% nickel equivalent cut-off in a pit-constrained resource containing 5.53 million oz of platinum+palladium+gold, 1894 million lbs of nickel and 1021 million lbs of copper. A large Inferred Mineral Resource (846 million tonnes) was also identified (July 24, 2014 News Release). The company reported that updated metallurgical test work using conventional flotation showed improved recoveries for all major metals versus the 2012 Preliminary Economic Assessment, including increases of 35% for platinum and 13% for nickel (September 3, 2014 News Release). On the exploration front, the company drilled 6 diamond drill holes (~3700 m) and re-logged and sampled 11 000 m of historic drill core at Wellgreen. All results will be incorporated into a pre-feasibility study to be released in 2015. Wellgreen Platinum also carried out rock and soil sampling, and geological mapping on the adjoining Burwash property (Walsh, Yukon MINFILE 115G 100).

Table 12. *Updated NI 43-101 resource estimate for the Wellgreen PGM-Ni-Cu project. A cut-off grade of 0.57 g/t Pt Eq. or 0.15% Ni Eq. was used (modified from July 24, 2014 News Release).*

Deposit	Classification	Tonnes (Mt)	Pt g/t	Pd g/t	Au g/t	Ni %	Cu %	Co %	Pt Eq. g/t	Ni Eq. g/t
Wellgreen	Measured	92.293	0.252	0.246	0.052	0.260	0.155	0.015	1.713	0.449
	Indicated	237.276	0.231	0.238	0.042	0.261	0.135	0.015	1.656	0.434
	Total M&I	329.569	0.237	0.240	0.045	0.261	0.141	0.015	1.672	0.438
	Inferred	846.389	0.234	0.226	0.047	0.237	0.139	0.015	1.571	0.412

Longford Exploration Services (www.longfordexploration.com) conducted a small reconnaissance exploration program on its **Outpost** property (Yukon MINFILE 115B 012) located in the Kluane Ranges 85 km southeast of the Wellgreen deposit. One grab sample from the property yielded 1.2 ppm Au; another sample assayed 0.13 % Cu (Fig. 12). Magnetic highs delineated from a previously flown aeromagnetic survey suggest large-scale mineralizing structures or large mafic/ultramafic intrusive rocks may underlie the property.

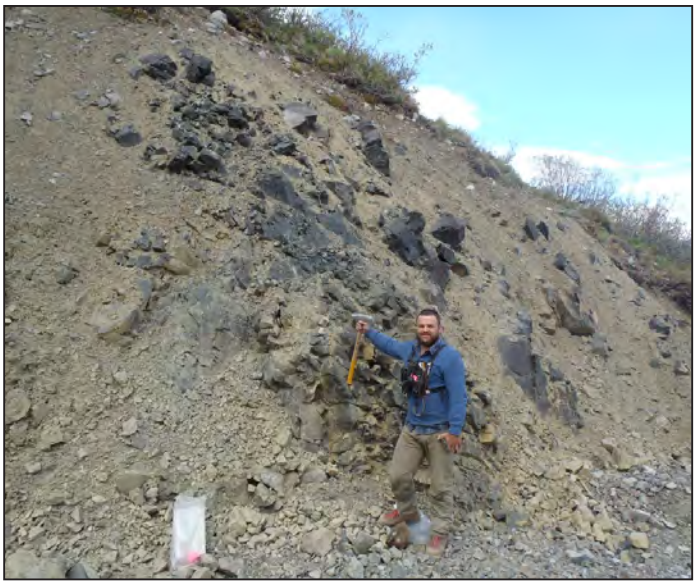

Figure 12. *Longford Exploration geologist James Rogers samples an ~100 m wide ultramafic dike on the Outpost property, near Kluane Lake.*

First Point Minerals (www.firstpointminerals.com) explored for an unusual nickel-iron alloy, awaruite, in serpentinized ultramafic rocks of the Cache Creek terrane in southern Yukon. The company carried out detailed geological mapping and channel rock sampling on the key target area of the **Mich** claims (Yukon MINFILE 105D 070, 071, 153) before drilling two diamond drill holes (873 m) in opposite directions from the same set-up. Drillhole 1 returned 255.2 m averaging a grade of 0.087% Davis Tube magnetically recoverable (DTR) nickel; drillhole 2 returned 453.6 m (entire hole) averaging 0.087% DTR nickel (Table 13). Exploration work carried out to date has defined a 2-km-long southeast-trending zone of disseminated awaruite mineralization marked by a number of strong rock anomalies grading better than 0.08% DTR nickel.

Table 13. *Selected drill results from First Point Minerals' Mich property. Assays were determined using Davis Tube magnetic separator to produce a Davis Tube magnetically recovered (DTR) nickel value (modified November 13, 2014 News release).*Drilled intervals only, true widths have not been calculated.*

Drillhole	Zone/Area	Depth of intersection (m)	Intersection*
Hole 1	Key Target	3.0	0.087% DTR nickel over 255.2 m
including		3.0	0.096% DTR nickel over 156.1 m
including		186.0	0.079% DTR nickel over 72.2 m
Hole 2	Key Target	2.7	0.087% DTR nickel over 453.6 m
including		2.7	0.079% DTR nickel over 81.3 m
including		104.0	0.073% DTR nickel over 65.0 m
including		179.0	0.096% DTR nickel over 223.0 m
including		424.1	0.123% DTR nickel over 32.2 m

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APPENDIX 1: 2014 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit
PRECIOUS METALS - GOLD						
3Ace	Golden Predator Mining	105H 066	105H09	BS	Gold	vein/breccia
50 Mile Project	0908937 B.C. Ltd.		116C02		Gold	vein/breccia
BBB	Strategic Metals Ltd.		115I04		Gold	vein/breccia
Betty	Centerra Gold Inc.	115J 074	115J 15	P, G, GGP, SGC, RGC, T, RC	Gold	vein/breccia
CL	Carlincore Resources Ltd.		106C07		Gold	sediment associated
Coffee Project	Kaminak Gold Corp.	115J 110	115J14	RGC, DD, RC, ES	Gold	vein/breccia
Dorian Miner	All-Terrane Mineral Exploration Services		105D10	DD	Gold	vein/breccia
Dun	Long, Charlie		115G01		Gold	Unknown
Dublin Gulch (Olive)	Victoria Gold Corp.	106D 025	106D04	RGC, T, DD, GGP	Gold	porphyry/ sheeted vein
Einarson	Anthill Resources		106B03	P, RGC	Gold	sediment associated
Forty mile	Golden Predator Mining	116C 118	116C02		Gold	vein/breccia
Guder	Northern Freegold Resources	115I 053	115I06	P, G, GGP, RGC, T	Gold	vein/breccia
HJ	Carlincore Resources Ltd.		106C01		Gold	sediment associated
Hyland Gold	Banyan Gold Corp.	095D 011	095D12	G, SGC, RGC	Gold	vein/breccia
Justin	Aben Resources Ltd.	105H 035	105H09	P, G, RGC, T	Gold	vein/breccia
King Solomon Project	Centerra Gold Inc.	115O 083	115O15	G, GGP, SGC, RGC, RC	Gold	vein/breccia
Klaza	Rockhaven Resources Ltd.	115I 067	115I03	GGP, RGC, T, DD	Gold	vein/breccia
Kluane	Rockhaven Resources Ltd.	115H 047	115H04	P, GGP, SGC, RGC, T	Gold	vein/breccia
Lake	Richards, Gord		115P06		Gold	Unknown
Livingstone	Goldspike Exploration Inc.		105E08	GGP	Gold	vein/breccia
Lone Star	Klondike Gold Corp.	115O 072	115O14	P	Gold	vein/breccia
Loonie	Geo Zone Exploration Ltd.		115O12		Gold	vein/breccia
Lucky Strike	Goldstrike Resources Ltd.	115O 170	115O 03	P, GGP, SGC, RGC, T	Gold	vein/breccia
Marsh Lake	Clarke, Joseph		105D08		Gold	vein/breccia
Mt. Good	Cantex Mine Development Corp.		106D08	SGC, RGC	Gold	sediment associated

Abbreviations

G – geology
AGP – airborne geophysics
BS – bulk sampling
CR – road construction
CS – claim staking
DD – diamond drilling
ES – economic studies
RC – reverse circulation/percussion
GGP – ground geophysics
MD – mine development
P – prospecting
RGC – rock geochemistry
SGC – soil grid geochemistry
T – trenching

Appendix 1 (continued): 2014 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit
Rackla Project - Nadaleen Trend	ATAC Resources Ltd.	New	106C01	P, G, SGC, RGC, T, DD	Gold	sediment associated
North Rackla	Cantex Mine Development Corp.		106C12	GGP, SGC, RGC, RC	Gold	sediment associated
Plateau South	Goldstrike Resources Ltd.		105N06	P, GGP, RGC	Gold	vein/breccia
QV	Comstock Metals Ltd.	115O 004	115O05	ES	Gold	vein/breccia
Snail	Silver Range Resources Ltd.		105K01		Gold	vein/breccia
Staff	Strategic Metals Ltd.		106D07		Gold	Unknown
Tiger	ATAC Resources Ltd.	106D 005	106D 01	ES	Gold	skarn/ replacement
Toshingermann	Berdahl, Scott		115G14		Gold	Unknown
Wand	Strategic Metals Ltd.		106C04		Gold	Unknown
Wels West	Gorilla Minerals Corp.		115J12	AGP, RGC, T	Gold	porphyry/ sheeted vein
PRECIOUS METALS - SILVER						
Keno Hill	Alexco Resource Corp.	105M 001	105M14	RGC, DD	Silver	vein/breccia
Lyn	Panarc Resources Ltd.	105K 011	105K03		Silver	vein/breccia
Nabob	Keno Hill Exploration Corp.	105M 006	105M14	BS	Silver	vein/breccia
BASE METALS - COPPER						
Apcar North	Kreft, Bernie				Copper	porphyry/ sheeted vein
Apcar South	Kreft, Bernie				Copper	Unknown
Canopus	Sumac Mines Ltd.	new	115H13	P, G, SGC, RGC, DD	Copper	Unknown
Carmacks Copper	Copper North Mining Corp.	115I 008	115I07	GGP, RGC, T, DD	Copper	porphyry/ sheeted vein
Casino	Western Copper and Gold Corp.	115J 028	115J10	ES	Copper	porphyry/ sheeted vein
Fyre Lake	Merah Resources Ltd.	105G 034	105G02	AGP	Copper	volcanic associated
Hopper	Strategic Metals Ltd.	115H 019	115H07	P, G, GGP, SGC, RGC, T	Copper	porphyry/ sheeted vein
Minto	Capstone Mining Corp.	115I 021	115I11	MD	Copper	porphyry/ sheeted vein
Pirate	Mieras, Jeff				Copper	porphyry/ sheeted vein

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Appendix 1 (continued): 2014 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit
Stu	Harris, Bill	115I 011	115I07	CS, P, RGC, T	Copper	porphyry/ sheeted vein
West Creek	Ryan, Shawn		115I08		Copper	porphyry/ sheeted vein
BASE METALS - LEAD, ZINC						
Mel	Silver Range Resources Ltd.	095D 005	95D06	ES	Zinc-Lead	sediment associated
Selwyn Project	Selwyn Chihong Mining Ltd.	105I 037	105I 06	RGC, DD, CR, ES	Zinc-Lead	sediment associated
Tell	Manson Creek Resources Ltd.	106C 118	106C04	RGC, DD	Zinc-Lead	volcanic associated
Wolverine	Yukon Zinc Corp.	105G 072	105G08	RGC, DD	Zinc-Lead	volcanic associated
BASE METALS - TIN, TUNGSTEN, MOLYBDENUM						
North Creek	Ryan, Shawn		095E05		Tungsten	skarn/ replacement
BASE METALS - NICKEL, PGEs						
Arch	Duncastle Gold Corp.		115G12		Nickel-PGE	mafic/ultramafic associated
Mich	First Point Minerals Corp.	105D 070	105D09	G, RGC, T, DD	Nickel	mafic/ultramafic associated
Outpost	Longford Exploration	115B 012	115B16	P, RGC	Nickel-PGE	mafic/ultramafic associated
Wellgreen	Wellgreen Platinum Ltd.	115G 024	115G05	RGC, DD, ES	Nickel-PGE	mafic/ultramafic associated
UNKNOWN						
Expo	Berdahl, Scott		105G01		Unknown	Unknown
JPL	Sphere Exploration Inc.		116B04		Unknown	Unknown
McConnell's Jest	Koe-Carson, Bill		105M14		Unknown	Unknown
Rude Creek Gold	0890763 B.C. Ltd.		115J10		Unknown	Unknown

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P – prospecting
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APPENDIX 2: 2014 DRILLING STATISTICS

Property	Optioner/Owner	# of drillholes	# of metres
Diamond drilling			
Canopus	Sumac Mines Ltd.	8	3539
Carmacks Copper	Copper North Mining Corp.	6	1200
Coffee Project	Kaminak Gold Corp.	147	26 894
Dorian Miner	All-Terrane Mineral Exploration Services	2	240
Dublin Gulch (Olive)	Victoria Gold Corp.	71	9832
Keno Hill	Alexco Resource Corp.		18 267
Klaza	Rockhaven Resources Ltd.	104	19 242
Mich	First Point Minerals Corp.	2	873
Rackla Project - Nadaleen Trend	ATAC Resources Ltd.	10	4733
Selwyn Project	Selwyn Chihong Mining Ltd.	284	54 790
Tell	Manson Creek Resources Ltd.	4	673
Wellgreen	Wellgreen Platinum Ltd.	16	3700
Wolverine (underground)	Yukon Zinc Corp.		
Percussion/Reverse Circulation/Rotary Air Blast			
Betty	Centerra Gold Inc.	15	450
Coffee Project	Kaminak Gold Corp.	206	25 867
King Solomon Project	Centerra Gold Inc.	17	918
North Rackla	Cantex Mine Development Corp.	169	

Yukon Placer Mining 2014 Exploration and Development Overview

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Yukon Geological Survey

Bond, J.D. and Van Loon, S., 2015. Yukon Placer Mining 2014 Exploration and Development Overview. *In:* Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 43-56.

INTRODUCTION

The Yukon placer mining industry had a strong year that exhibited stable production from the development sector and encouraging results from a growing number of exploration properties. This healthy outlook has helped offset reduced spending by the hardrock exploration business, and even saw hardrock geologists trading hammers for shovels. Some growth is attributed to the growing number of rookie miners and prospectors arriving in the territory as a result of continued television exposure. This presents some uneasiness amongst the existing operators and challenges for regulators that coach newcomers through the process. Regardless, renewed interest in Yukon's placer industry will undoubtedly introduce new professionals to the industry helping to offset attrition.

CLIMATE

The 2014 mining season started off favourably with mild early season temperatures allowing many operations to commence sluicing prior to the third week of May. Overall, precipitation was consistent for the Kluane, Dawson and Mayo regions, which contrasted with the Carmacks area mining camps (Mt. Nansen and Mt. Freegold) that experienced dry conditions through the month of July. In Dawson, mid-summer temperatures were below normal, which reduced ground thawing rates. This was somewhat offset by favourable late season temperatures that enabled sluicing into the third week of October.

GOLD PRODUCTION SUMMARY

Yukon placer gold production for the reporting period of May 1st to November 14th, 2014 was 54,360 crude ounces for a value of CDN $60.1 million (Fig. 1). Production was down 5000 crude ounces from 2013 however, additional gold will likely be reported after January 1st, 2015. The current production is consistent with levels since 2008 and the third highest dollar value in the last 10 years (Fig. 1). The total number of active operations in the Territory for 2014 was 160 out of 236 sites documented in the latest industry report covering the years 2010 to 2014 (Van Loon and Bond, 2014).

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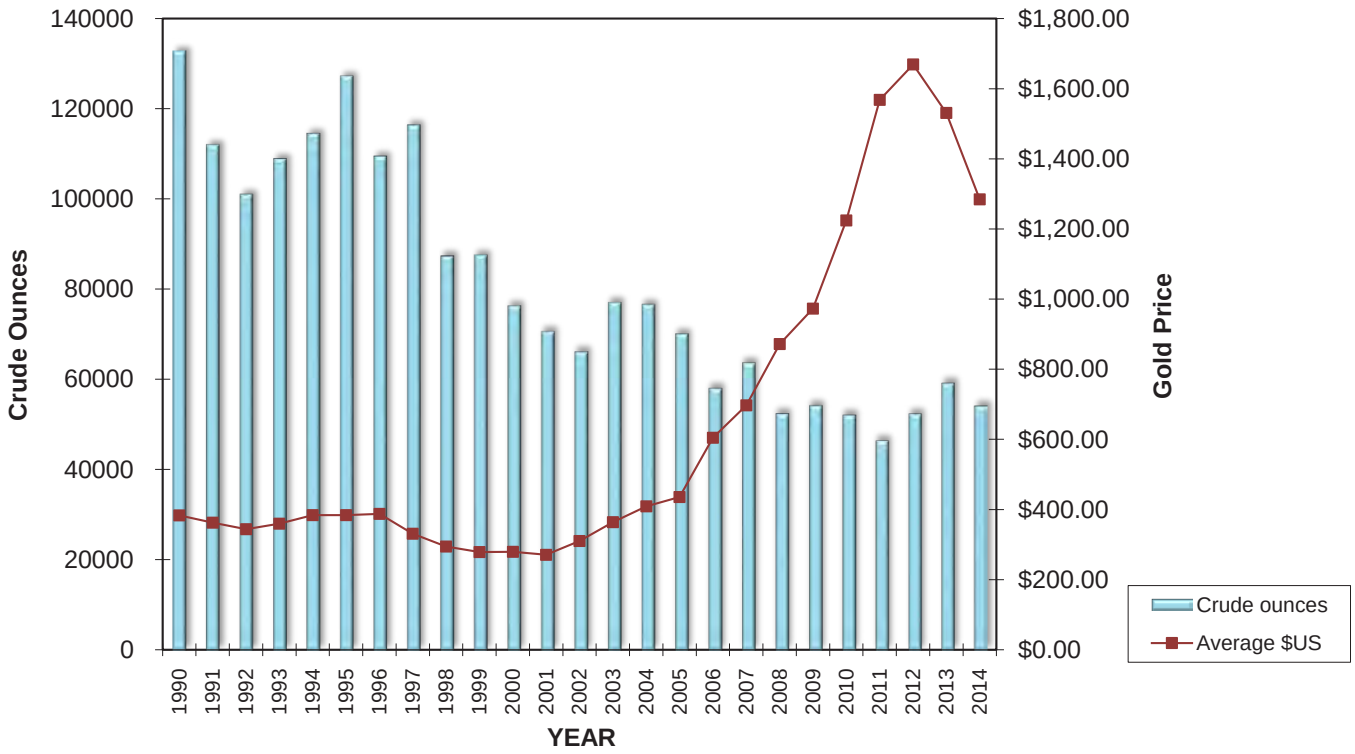


Figure 1. *Placer gold production versus the production value (USD) for the last 25 years.*

REGIONAL PRODUCTION SUMMARIES

The Yukon placer producing regions are divided into broad geographic groupings that in some areas are related to drainage and other areas to common location. Like most years the majority of placer production (71% in 2014) is derived from two drainages and their tributaries, the Indian River and the Klondike River. The bulk of the remaining production is accounted for from six regions. For all the regions, production figures will reference crude ounces rather than fine ounces. For conversion to fine ounces the general rule of thumb is to multiply the crude ounce figure by 0.80. The production data is derived from the royalty reporting figures collected by the Yukon Mining Recorder.

INDIAN RIVER

Production from the Indian River drainage continued to be the highest for all regions with 25,835 crude ounces reported (Fig. 2). This value is more than 10,000 ounces higher than production in the drainage from 2010 and 2011. The increase is owed largely to activity on Quartz Creek and on the Indian River (Fig. 3). Production was also strong from Gold Run Creek with a total of 3383 crude ounces reported, which is up 2000 ounces from 2012 (Fig. 2 and 3). Eureka Creek also had a strong year and accounted for 14% of the total production from the Indian River drainage (Fig. 3). Placer gold production from Dominion Creek has been relatively low compared to previous years however it is expected to increase with production ramping up from Dominion Gold Resources on the old Ross mine property.

KLONDIKE RIVER

Production from the Klondike River, which includes Hunker and Bonanza creeks, was 12,184 ounces (Fig. 2). This total has remained very consistent over the past five years. The top producing creeks were Bonanza (3426 oz), Hunker (3093 oz) and Last Chance (1892 oz). Reporting on Bonanza Creek also included production from a significant operation at the base of Jackson Hill, which is geographically part of the Klondike River.

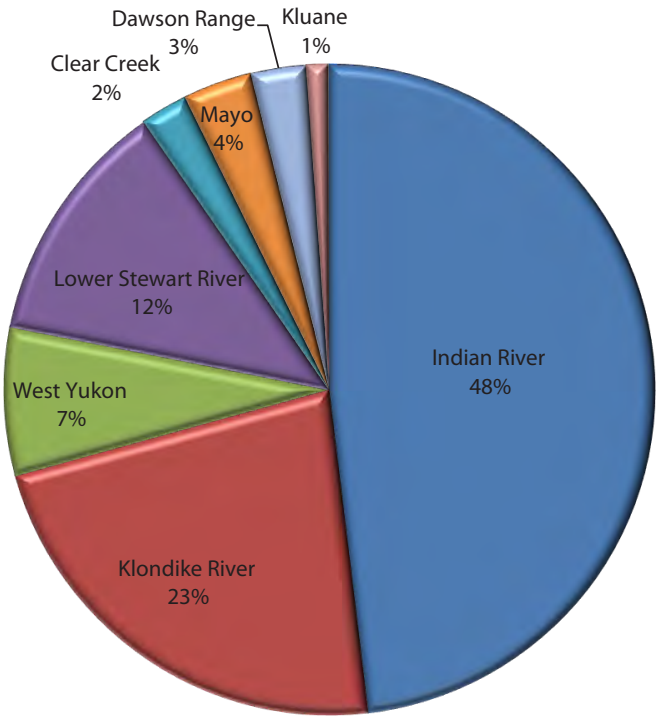


Figure 2. *Relative placer gold production from the various production regions in 2014.*

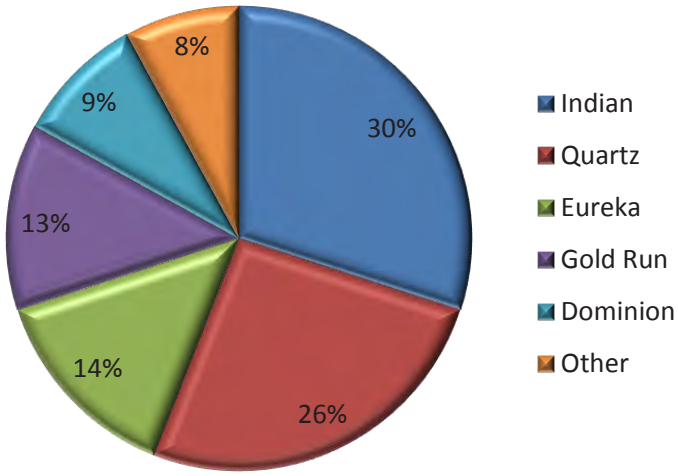


Figure 3. *Relative placer gold production from the Indian River drainage.*

LOWER STEWART RIVER

In the regional district of the lower Stewart River, production has remained consistent over the past four years. The total reported production for 2014 was 6583 ounces (Fig. 2). The top creeks in the region include Black Hills (1912 oz), Kirkman (1459 oz) and Henderson (1403 oz).

WEST YUKON – FORTY MILE, SIXTY MILE AND MOOSEHORN

Production from the West Yukon placer region was dominated by production from the Sixty Mile River. The total production from the region was 3948 ounces, of which 2500 ounces was derived from the Sixty Mile River and its primary producing tributaries Miller and Glacier creeks. Overall, production in the region was down by 3000 ounces from last year.

CLEAR CREEK AND MAYO

The combined production from Clear Creek and the Mayo area was 3113 crude ounces for 2014. The top producing drainage was Clear Creek where 1275 ounces was reported. Mayo, Davidson Creek, Thunder Gulch, Secret Creek and Duncan Creek produced the majority of the placer gold. Overall production from the Clear Creek drainage is down by almost 600 ounces from 2012. In contrast, production from Mayo has risen steadily in the past four years.

DAWSON RANGE

The Dawson Range placer area includes camps such as Mt. Nansen, Mt. Freegold and Sonora Gulch. Combined production from the region totalled 1470 crude ounces, which is up by 400 ounces from last year. The top producing drainages for 2014 were Guder Creek, Nansen Creek, Klaza River and Summit Creek. Average production from the region over the last 5 years is 1411 crude ounces.

KLUANE

The Kluane region includes placer streams in both the Kluane and Ruby ranges. Production reporting, at the time of this publication, was limited to results from Burwash and Ruby creeks. Additional operations were visited on Kimberley, Arch and Wade creeks, however no royalties were filed. Total production from the two reporting creeks totalled 578 crude ounces.

EXPLORATION HIGHLIGHTS

Placer industry reporting is often focused on the development projects, such as those described in the latest Placer Industry Report (Van Loon and Bond, 2014). Placer exploration is a vital and often under-recognized sector that operates in the industry background. This section highlights some of the diversity of placer exploration projects happening in 2014 (Fig. 4).

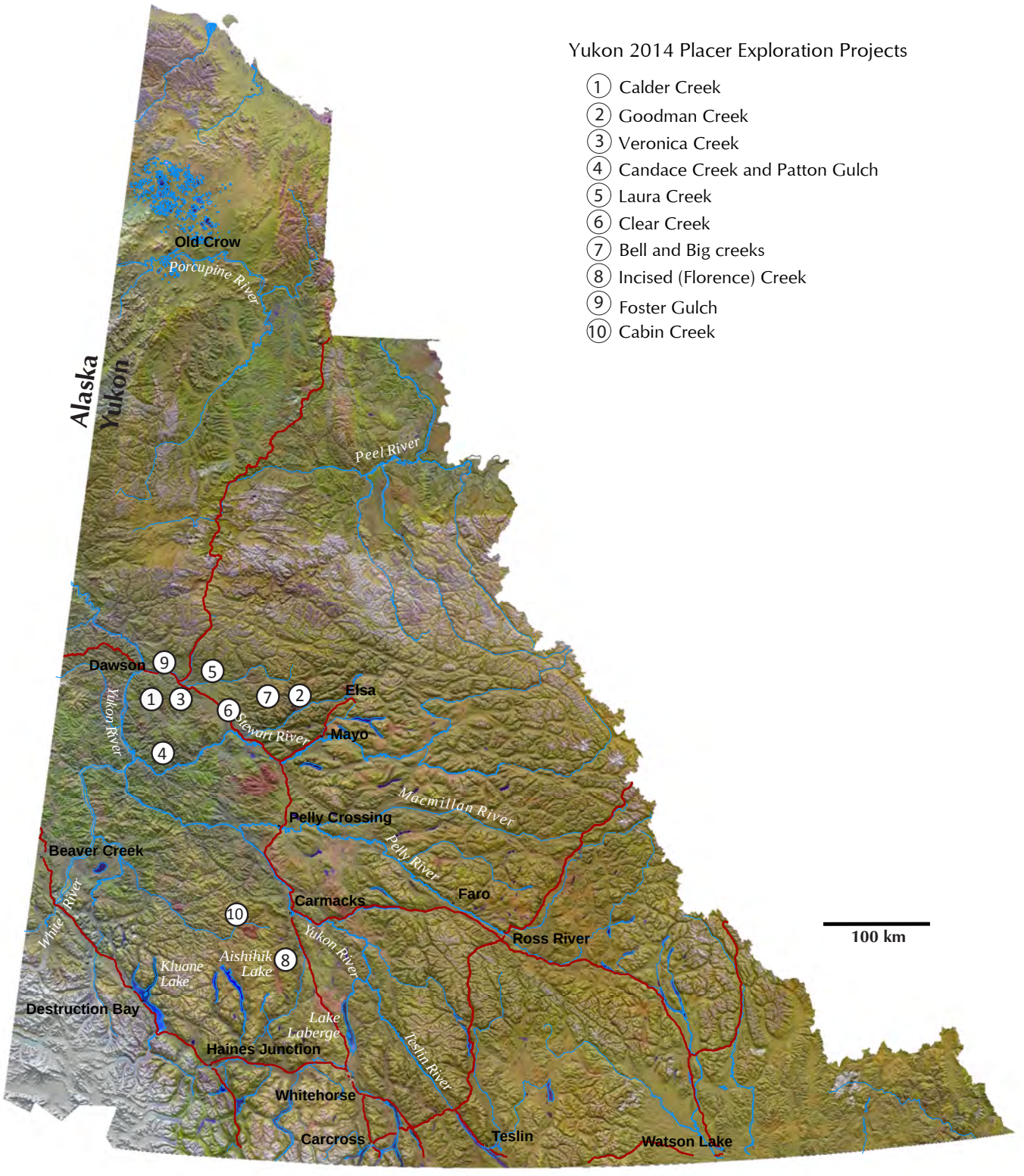
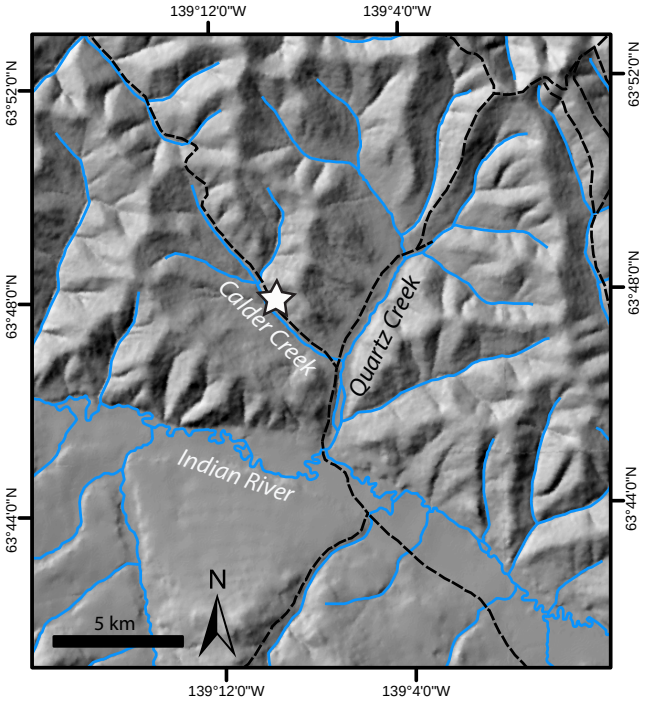


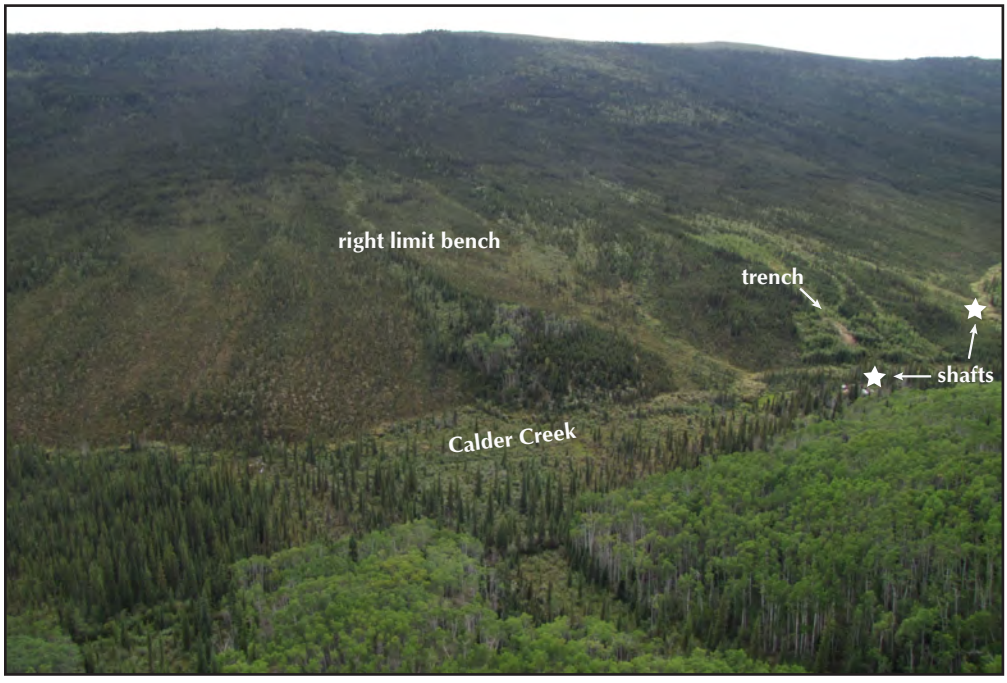
Figure 4. *The location of the 2014 placer exploration projects discussed in this overview.*

GARY LEE AND PANARC RESOURCES – CALDER CREEK

Exploration activity, with the assistance of the Yukon Mineral Exploration Program (YMEP), was once again active on Calder Creek, a right-limit tributary to Quartz Creek. Calder Creek is a sizeable 8-km-long drainage in the heart of the Klondike Goldfields that has never been mechanically mined. A dirt road provides good access along the north side of the valley bottom. Panarc Resources began exploring the ground in 2011 with work focusing on a left-limit shaft below the access road. In 2014, Gary Lee, in partnership with Panarc Resources, dug two additional shafts that would test the main valley bottom and a right-limit tributary that dissects a bench. Work also included a hand test pit at the base of an old bulldozer trench on the right-limit bench. The shaft in the main valley bottom reached 7 m (23 ft) before encountering ground water problems. Bedrock was not reached and it was decided to return to the shaft during the winter. The shaft in the tributary was started late in the season and reached 6 m (20 ft) before being suspended until the winter. Hand test pitting on the right-limit bench target at the base of the old bulldozer trench reached 4.5 m (15 ft) below the surface of the bench. Fine gold colours were recovered in the trench wall, which provided some encouragement. The right-limit bench is a promising target due to its substantial width and length. The unusual width of the bench appears related to colluviation of loess (muck). The south ridge above the bench has acted as a lee-side trap to loess being carried by the dominant winds. Under permafrost conditions there has been colluviation of loess downslope and pushed Calder Creek to the north side of the valley. Calder Creek appears offset by approximately 200 m from its paleo-valley center line, which may explain why an economic placer deposit has been so difficult to locate in the valley. Additional work on the existing shafts is expected in early 2015.



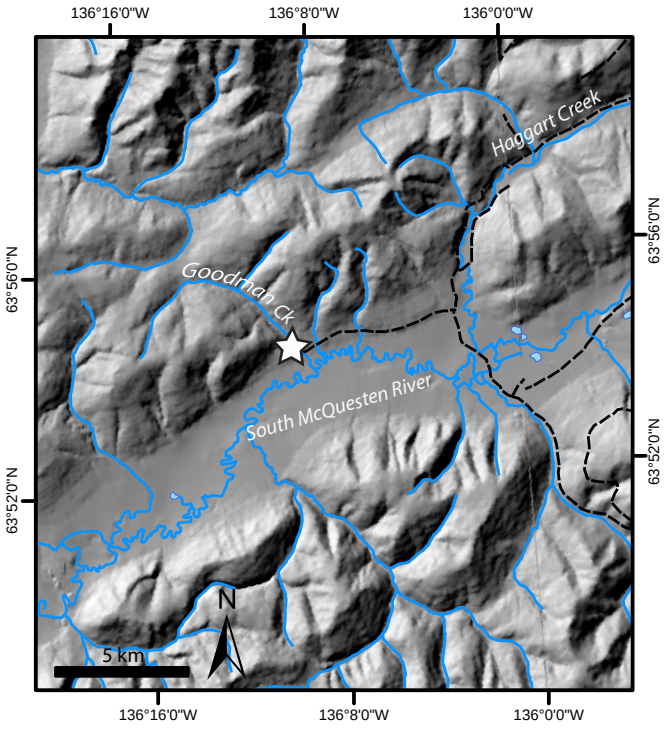
Location of the Calder Creek shafting program.



Aerial view of Calder Creek looking to the southwest. The 2014 shafting locations are visible on the right hand side of the photo and the large right-limit bench is visible on the opposite side of the creek.

GIMLEX ENTERPRISES LTD. – GOODMAN CREEK

Gimlex Enterprises explored Goodman Creek, a right-limit tributary to the South McQuesten River in the Mayo District. This project was conducted with assistance from the YMEP program. Exploration activity on Goodman Creek consisted of a 42 hole auger drilling program and 44 test pits near the mouth of the valley. Drilling encountered up to 12 m (40 ft) of clay-rich Reid till on the left-limit of the creek. Most drill locations did not reach bedrock, however fluvial or glaciofluvial gravel was discovered in some holes and returned encouraging gold values. Test pitting was focused near the modern fluvial channel and on a right-limit bedrock bench. Additional drilling in 2015 is expected to delineate a potential (pre-Reid) deep channel.

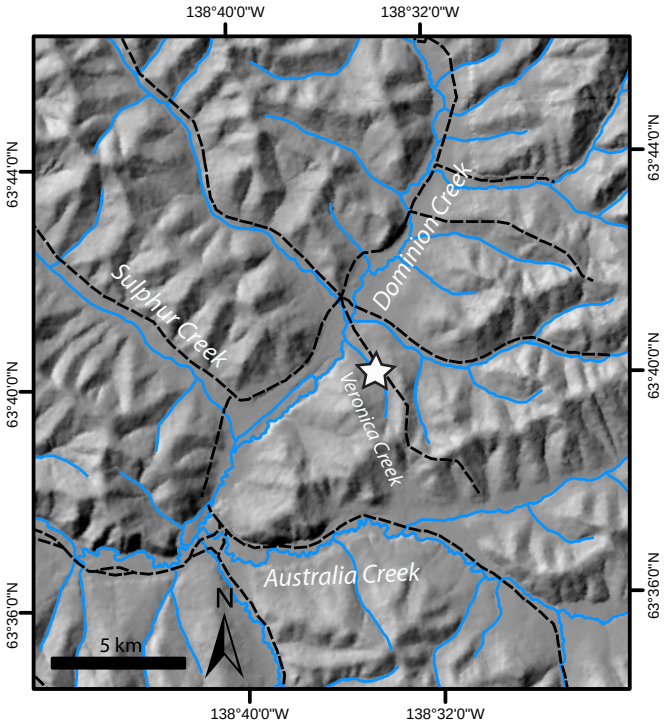


Location of Goodman Creek in the Mayo District.

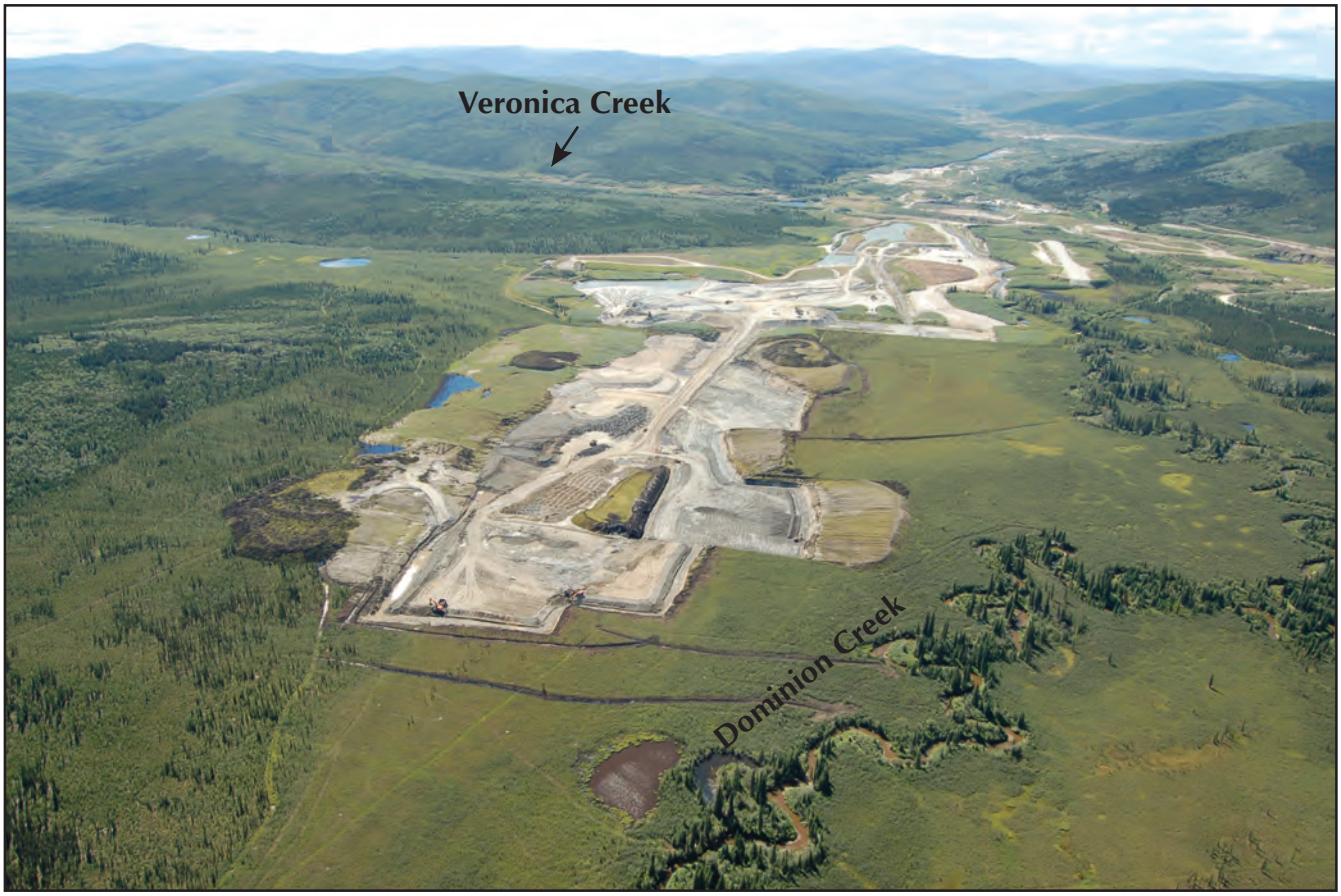
View of the 8″ auger drill and Nodwell used for testing Goodman Creek.

GIMLEX ENTERPRISES LTD. – VERONICA CREEK

Gimlex Enterprises explored Veronica Creek, a left-limit tributary to Dominion Creek in the Dawson District. This project was conducted with assistance from the YMEP program. Exploration work on Veronica Creek consisted of a 15 hole auger drilling program on middle Veronica Creek above the previous mine workings. The rationale for targeting Veronica Creek included previous placer production near the mouth of the creek and favourable bedrock geology identified at the GO-GR property, located adjacent to the creek. The stratigraphic section in the old channel consisted of 9 m (30 ft) of muck overlying 1-3 m (3-10 ft) of fluvial gravel. The old (deposit) channel of Veronica is estimated to be less than 30 m in width in the area drilled.



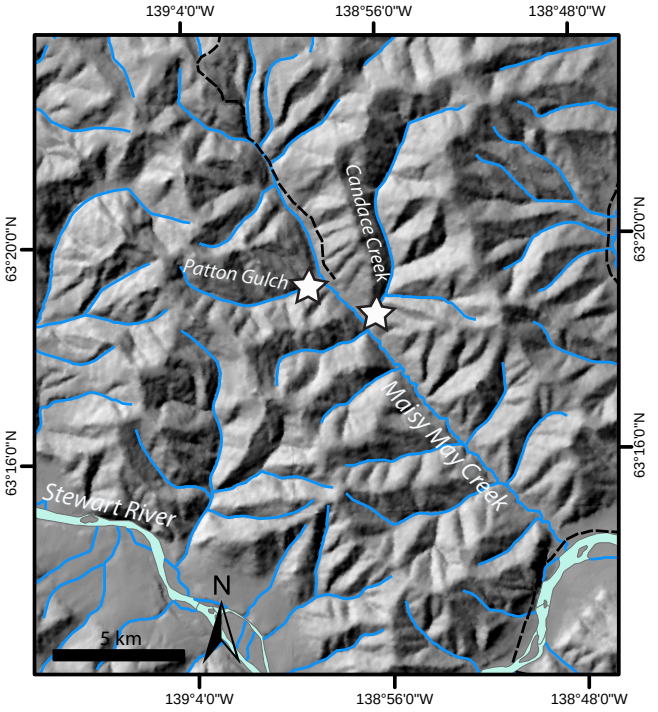
Location of Veronica creek.



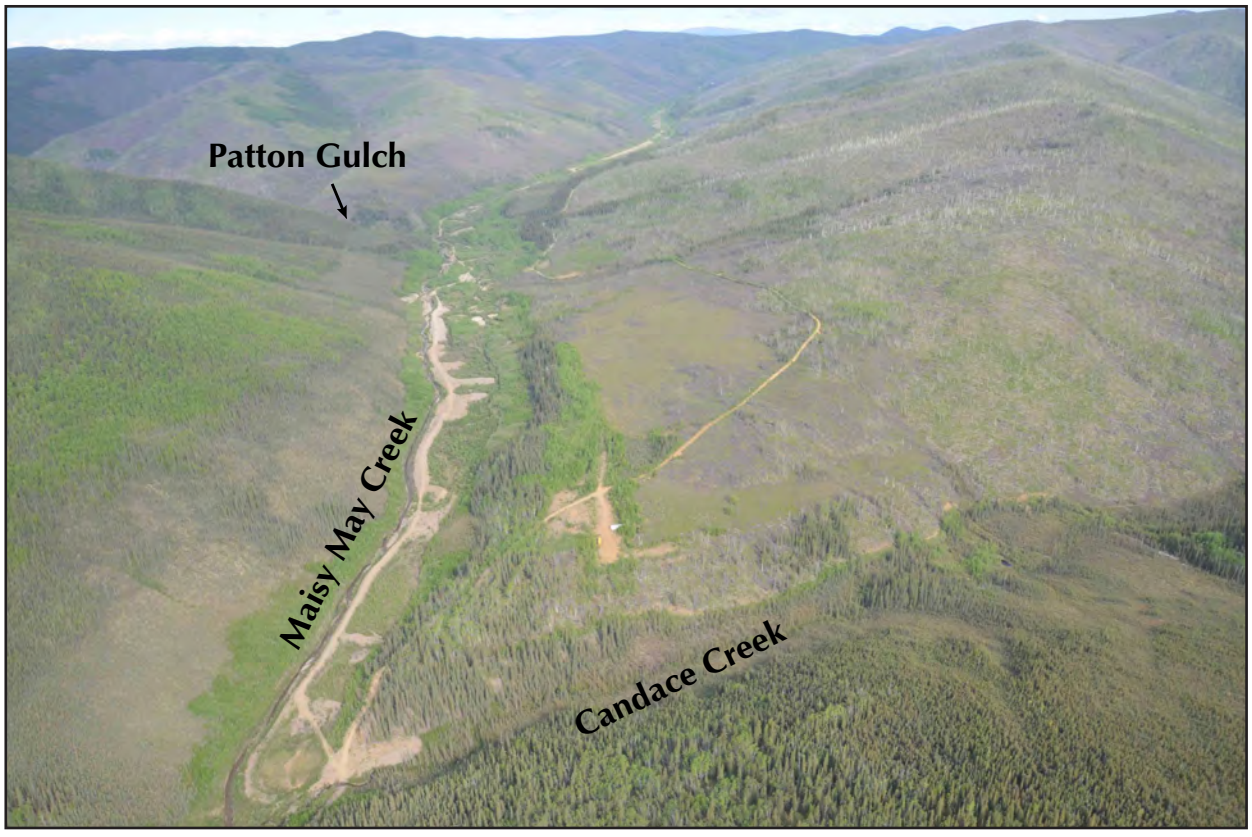
Aerial view looking southwest down Dominion Creek towards Veronica Creek. The 2014 exploration focused upstream of the old workings. Photo courtesy of Bill LeBarge.

GEOPLACER EXPLORATION LTD. AND CANDACE CREEK MINING LTD. – PATTON CREEK AND CANDACE CREEK

In the Maisy May Creek drainage, two tributaries were explored with assistance from YMEP funding. Patton Creek is a right-limit tributary that is 2 km upstream from Candace Creek (left-limit tributary). Previous placer production along this stretch of Maisy May Creek provides the main rationale for targeting the tributaries. Between 1984 and 1989, Queenstake Resources mined 20,000 ounces from this stretch of ground. According to Bill LeBarge of Geoplacer Exploration Ltd., the rich ground may be due to a mineralized bedrock structure that is subparallel to Maisy May Creek and extends through both of the tributaries. Work in 2014 included excavator test pitting/trenching and geophysics. Shallow depths (<4 m) were encountered and placer gold was recovered. Trenching and test pitting is expected to continue in 2015 to further refine the economic viability of the targets.



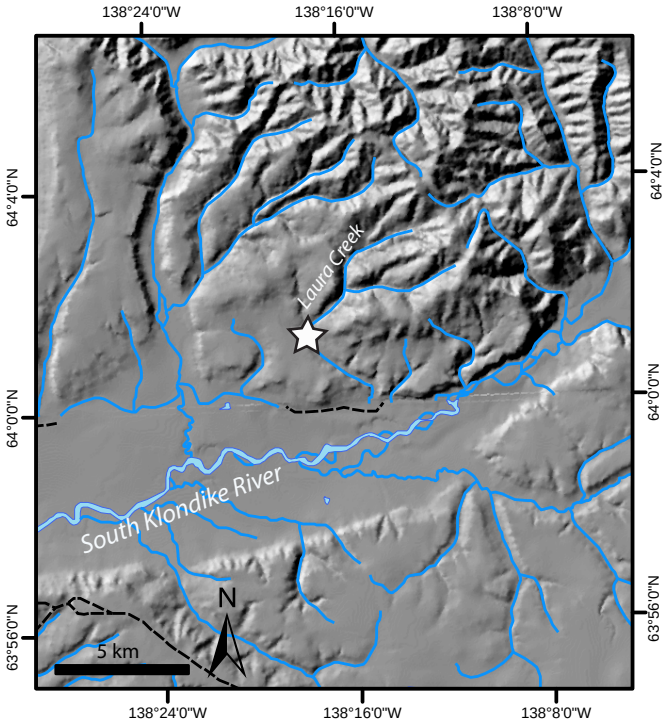
Location of Candace Creek and Patton Gulch in the Maisy May Creek drainage.



Aerial view looking north up Maisy May Creek valley. Candace Creek and Patton Gulch are located on the photograph. A former rich section of Maisy May Creek is located between the two tributaries. Photo courtesy of Bill LeBarge.

CLAYTON JONES – LAURA CREEK

A new discovery was made on Laura Creek near the Brewery Creek mine site. Laura Creek is a right-limit tributary to the South Klondike River and drains the uplands that host to the Brewery Creek deposits. A 9.7 m (32 ft) shaft was constructed to bedrock using an electric jackhammer in early spring. The stratigraphy consists of 6.4 m (21 ft) of organic muck overlying 1 m (3 ft) of matrix-supported gravel, 1.4 m (4.5 ft) of oxidized cobble-pebble gravel and 0.75 m (2.5 ft) of clay-rich gravel. The clay-rich gravel and 0.3 m (1 ft) of foliated shale/siltstone bedrock was sluiced with a total gold recovery of 0.6 grams. The approximate grade of the deposit is CDN $10.07/cubic yard at CDN $1350/ounce with an approximate fineness of 80%. The largest placer grain recovered weighed 0.2 grams and has a rounded, flattened shape. A minor population of angular gold grains was also recovered from the deposit. Old timer shafts were discovered lower in the drainage and will be the focus of additional exploration in 2015. This project received funding from the YMEP program.

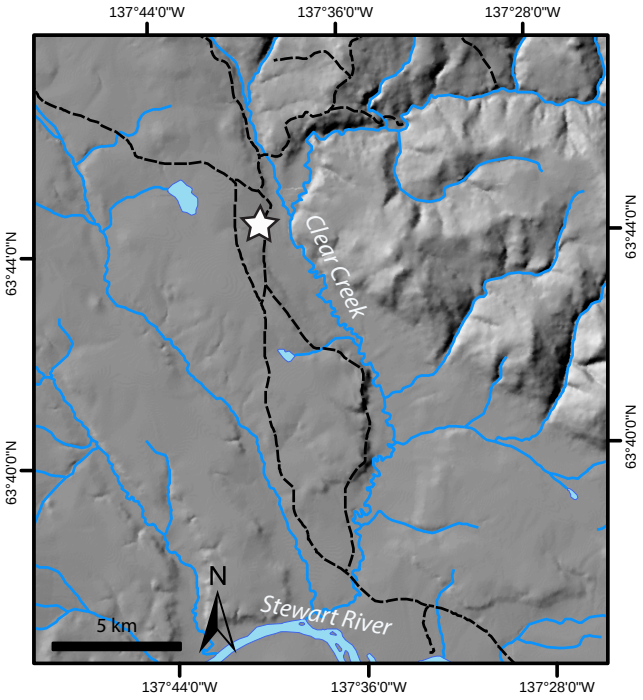


Location of Clayton Jones' property on Laura Creek.

Washing samples from the exploration shaft on Laura Creek. The shaft is visible under the tarp.

WOLFHEAD DISCOVERY AND MINING LLC. – CLEAR CREEK

Exploration and pre-development construction was undertaken on the Big Alex bench deposit on Clear Creek in 2014. This new discovery is located on a right-limit bench to Clear Creek in the Tintina Trench, named after Big Alex MacDonald who prospected in this area. The prospect is conveniently located near the Klondike Highway and features no permafrost and minimal overburden. The origin of the bench deposit is thought to be a cut and fill sequence of coarse Clear Creek gravel on a false-bedrock of pre-Reid sandy glaciofluvial gravel. The thickness of the bench gravel is estimated to be 8-10 m, however additional drilling is required to fully understand thickness variation on the property. A Wounded Moose paleosol, characterized by soil oxidation to depths of >2 m, is preserved in the bench gravel suggesting an early to mid-Pleistocene age for the deposit. Up to 7000 cubic yards of test pit and bulk sample material was processed in 2014. The placer gold tends to be very flat and well-travelled, making it challenging to recover. Pre-development construction work was completed on the water line, holding pond, settling pond and wash plant. Additional exploration is expected in 2015 that will consist of geological mapping, drilling, geophysics and sluice engineering.

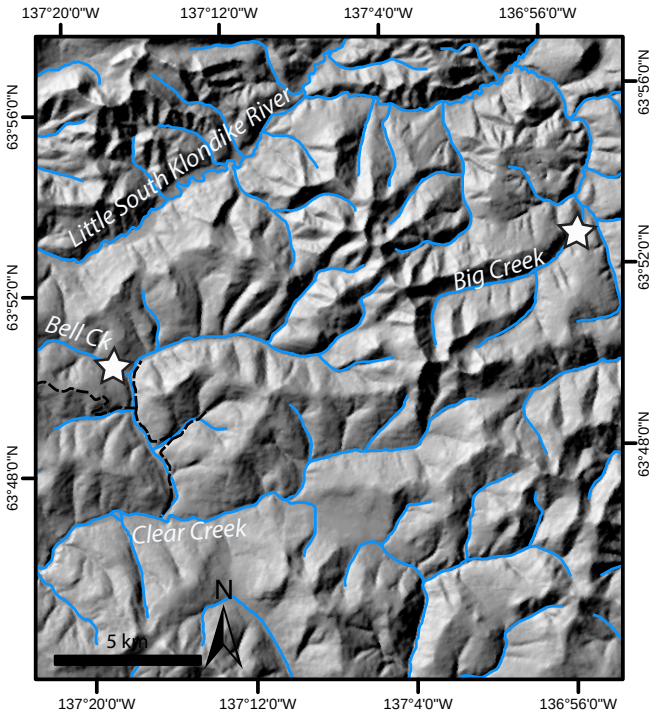


Location of Wolfhead Discovery and Mining's property on Clear Creek.

A view of the water line constructed from Clear Creek. The Big Alex bench and the wash plant is visible in the distance.

SANDRO FRIZZI, JOERG LOTZ AND BRUCE MCARTHUR – BIG AND BELL CREEKS

Exploration in the Clear Creek area included YMEP assisted work on both Big and Bell creeks. Big Creek is located east of Clear Creek on the access road to Red Mountain and is a left-limit tributary to the Little South Klondike River. A complex history of alpine glaciation is present in the upper reaches of the drainage and the Cordilleran Ice Sheet glaciated the lower reaches during the early Pleistocene pre-Reid glaciations. Exploration work included excavator test pitting a series of low-level benches and floodplain locations. Coarse gold was discovered in a right-limit bench deposit and future work will focus on characterizing the deposit genesis and mapping its distribution. A placer discovery in Bell Creek, a right-limit tributary to Left Clear Creek, proved to be challenging. Excavator test pitting suggests the drainage may have been affected by a high energy glacial meltwater flow during a past glaciation. A low pass at the headwaters of the right fork supports this theory, which would have allowed a glacier in the Little South Klondike River valley to direct meltwater into Bell Creek.



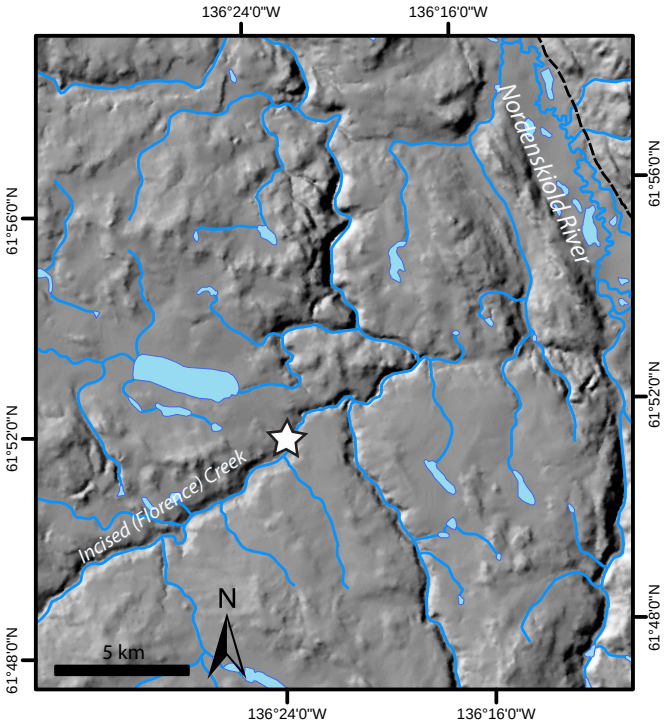
Location of Big and Bell creeks in the Clear Creek area.

The test plant set up on a right-limit bench of Big Creek.

Using a Komatsu 138 and a small test plant to prospect Bell Creek.

CHARLIE BROWN – INCISED (FLORENCE) CREEK

A late season, YMEP supported exploration program was conducted on Florence Creek, south of Carmacks. Florence Creek, also known as Incised Creek, is a right-limit tributary to Rowlinson Creek. The drainage is over 50 km long and is cut deeply into a low plateau surface. Placer gold and platinum is known to occur immediately above the lower canyon. The primary target on the property is the valley bottom and the lower benches that border both sides of the creek. Excavator testing on the lower bench exposed 3.5 m (12 ft) of coarse glaciofluvial gravel on weathered granitic bedrock. Gold and platinum appear to be mixed within common placer grains and the dominant grain size is greater than 50 mesh. Exploration on the property has focused on the north side of the valley where permafrost is discontinuous, whereas little work has been undertaken in the valley bottom or on the south side benches. Limited testing in the valley bottom suggests depths to bedrock are as shallow as 1 m (3 ft).

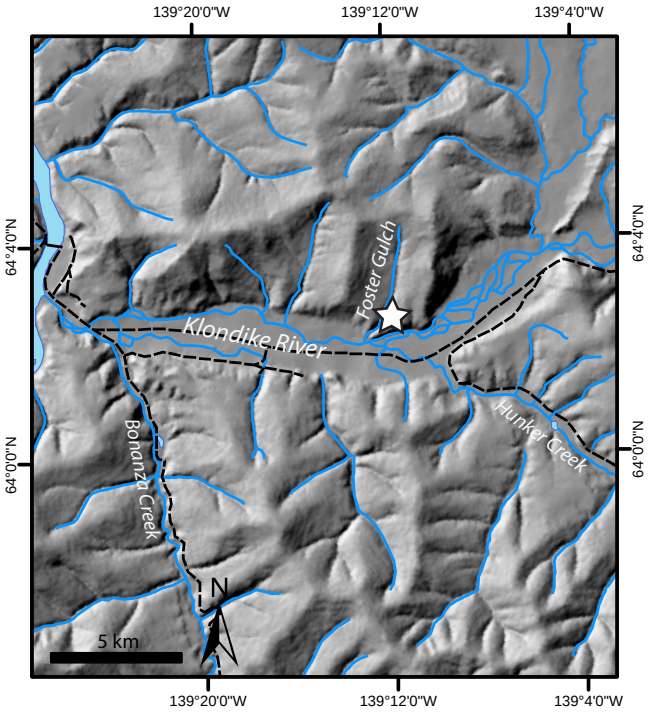


Location of Charlie Brown's property on Florence Creek.

Nick Sawrenko and Charlie Brown using a #10 Gold Machine and a 121-3 Kubota excavator to test the left-limit bench deposit on Florence Creek.

CHARLIE BROWN – FOSTER GULCH

Exploration on Foster Gulch, a right-limit tributary to the Klondike River, in 2014 was limited to hand sluice testing the lowest level, left-limit bench at the mouth of the gulch. Previous mining on the bench exposed a rusty gravel on a soft, brown schist bedrock. Following the first glaciation and deposition of the Klondike wash, considerable incision occurred in the Klondike River valley. Remnant intermediate terraces are preserved (*e.g.*, Slinky Mine) that contain concentrated deposits of pre-glacial White Channel gravel and new placer gold. Foster Gulch has potentially two intermediate-level benches on the left-limit before reaching the glaciofluvial, Klondike wash bench.

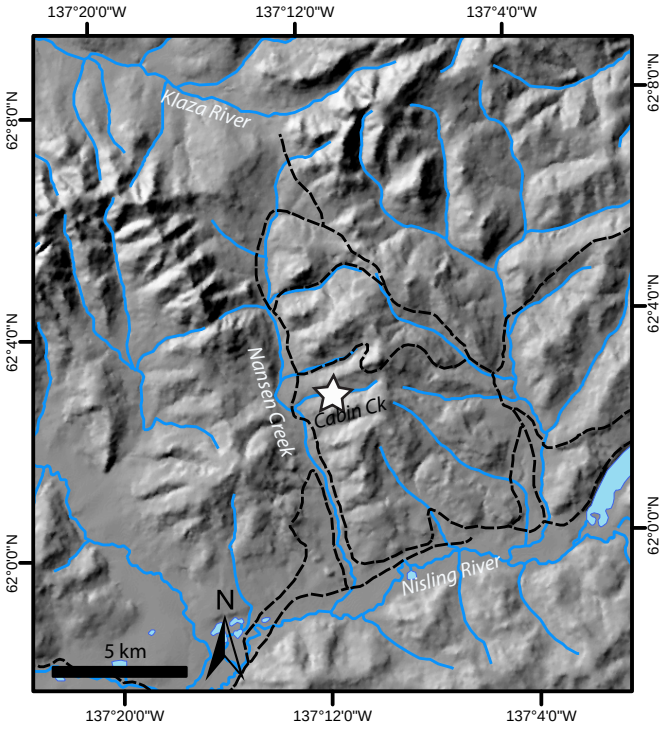


Location of Charlie Brown's Foster Gulch property on the Klondike River.

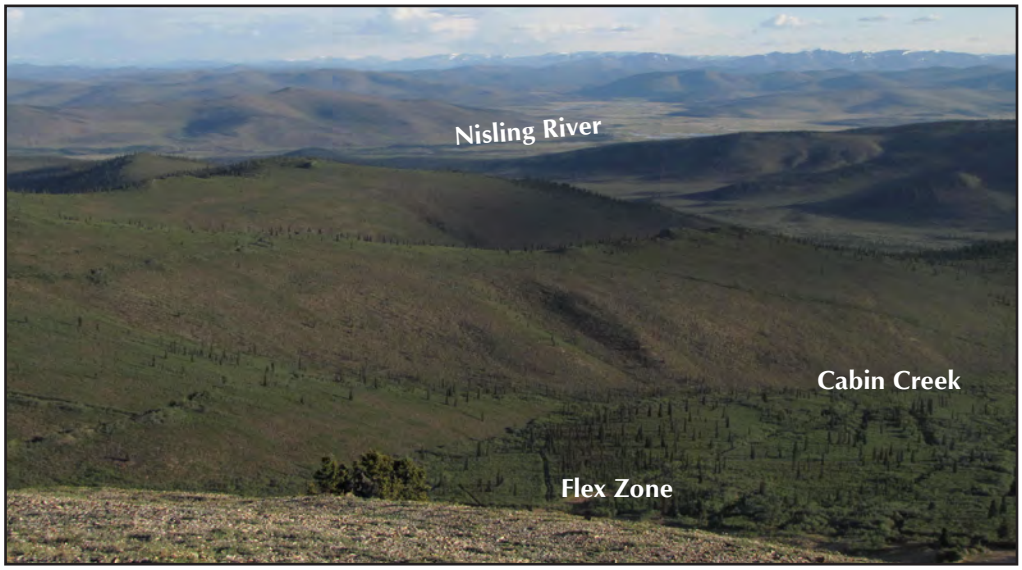
An exposure of the left-limit bench gravel on Foster Gulch. Coarse gravel is visible on bedrock and is the main pay unit.

RON BERDAHL – CABIN CREEK

Placer exploration, with the assistance of YMEP funding, in the Mt. Nansen area included a 7 line 2D resistivity survey on Cabin Creek. Cabin Creek is a left-limit tributary to Nansen Creek and contains epithermal vein mineralization near the headwaters (Flex zone). Recent development work on nearby Back Creek has demonstrated that deep pre-glacial placer deposits can be economically mined. The geophysical survey results hope to identify the distribution of near surface non-auriferous aeolian sand, glacial sediment stratigraphy, pre-glacial fluvial deposit geometry and bedrock morphology. Follow up shafting or drilling in 2015 is planned to verify the stratigraphic interpretations.



Location of Ron Berdahl's Cabin Creek property in the Mt. Nansen district.



A view to the south from the porphyry Dickson stock over the Flex zone and Cabin Creek drainage. The Nisling River is visible in the distance.

REFERENCES

Van Loon, S. and Bond, J.D. (compilers), 2014. Yukon Placer Mining Industry 2010-2014. Yukon Geological Survey, p. 230.

Yukon Mineral Exploration Program: 2014-2015 update

Derek Torgerson[1]
Yukon Geological Survey

Torgerson, D., 2014. Yukon Mineral Exploration Program: 2014-15 update. *In*: Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 57-65.

PROGRAM SUMMARY

The Yukon Mineral Exploration Program (YMEP) is a funding program designed to support individual prospectors, partnerships and companies by providing a portion of the risk capital required to locate, explore and develop mineral occurrences in Yukon. YMEP funding has consistently demonstrated its impact as an effective economic incentive by supporting the exploration community in its efforts. This support has led to numerous discoveries, which in turn, have provided significant long term economic benefits to the territory.

YMEP funding supports placer and hardrock exploration projects by reimbursing a percentage of approved exploration expenditures. Funding is merit-based; a panel of geologists evaluate submissions using a ranking system designed to score a range of criteria, quantifying the quality of the target, the proposal, the work plan and the applicant's previous YMEP performance. This scoring system is available to the applicants through on our website at http://www.geology.gov.yk.ca/ymep.html. The program comprises three different modules of varying reimbursement rates and maximum allowable funding (Table 1 and Fig. 1). Figure 2 is a map indicating project locations of successful applicants.

Table 1. *YMEP 2014 funding.*

2014 Funding Levels	Grassroots	Focused Regional	Target Evaluation
maximum funding	$15 000	$25 000	$50 000
reimbursement rate	up to 100% of eligible expenses	up to 75% of eligible expenses	up to 50% of eligible expenses
no. of approved placer applications	2	0	12
no. of approved hardrock applications	1	7	29

[1]*derek.torgerson@gov.yk.ca*

YMEP 2014 At A Glance			
	Grassroots	**Focused Regional**	**Target Evaluation**
Funding	max $15 000	max $25 000	max $50 000
Reimbursement rate	up to 100% of eligible expenses	up to 75% of eligible expenses	up to 50% of eligible expenses
Scope of work	to generate new targets and advance existing ones	to generate new targets	to evaluate and advance already known targets
Who is it for	individual prospectors only (no companies nor anyone working on behalf of a company)	prospectors, companies, partnerships	prospectors, companies, partnerships; projects with total exploration expenditures less than $200 000
Work to proceed on	on claims, leases, or crown land	on claims, leases, or crown land	on claims, leases, coal exploration licenses, or quarry leases, not crown land
Advance of funds	no advance	no advance	no advance
Field time requirements	minimum 30 person-days in field, daily log	no constraints on time in field, final technical report	no constraints on time in field, final technical report
Holdback/reports	15% holdback until submission of final reporting requirements		
Reporting deadlines	Project proposal: March 31, Status Report: September 30, Final Financial Report and Final Summary/ Technical report and release of funds: January 31 of following calendar year. 15% of funds will be held back until submission of final reporting requirements		
Confidentiality	reports will be kept confidential for 5 years	reports will be kept confidential for 2 years	
Module-specific eligible expenses	applicant cannot draw wages but wages for one assistant are eligible		road building costs up to <25% of YMEP contribution if pre-approved, drilling
Eligible expenses	conventional exploration work, travel within Yukon (truck, helicopter, etc.; up to 25% of eligible claim), assays, shipping, wages (applicant not eligible in grassroots module), WCB, contracts, equipment rental, daily field expenses, fuel, claim staking (up to 20% of eligible claim), reclamation, limited physical work		
Reimbursement rate guidelines	Expenses reimbursed according to YG guidelines. Private and commercial rates are provided. Private rates for heavy equipment are 75% of commercial rate as approved by YG.		
Staking	staking costs up to 20% of eligible contribution		
Travel	travel within Yukon (truck, helicopter, etc.) up to 25% of eligible contribution		
Eligible use of machinery	use of light equipment (<5 tons)		use of light or heavy equipment
Non-eligible expenses	GST, recording fees, management fees, costs of applying for permits or licenses, project planning and compilation, legal fees, promotional expenses, transportation outside Yukon, underground work, preparation for mining, mining, acquisitions, repairs		
Compliance	applicants must ensure that proper permitting is in place and that their work programs satisfy existing laws and regulations		

Figure 1. *YMEP 2014 at a glance.*

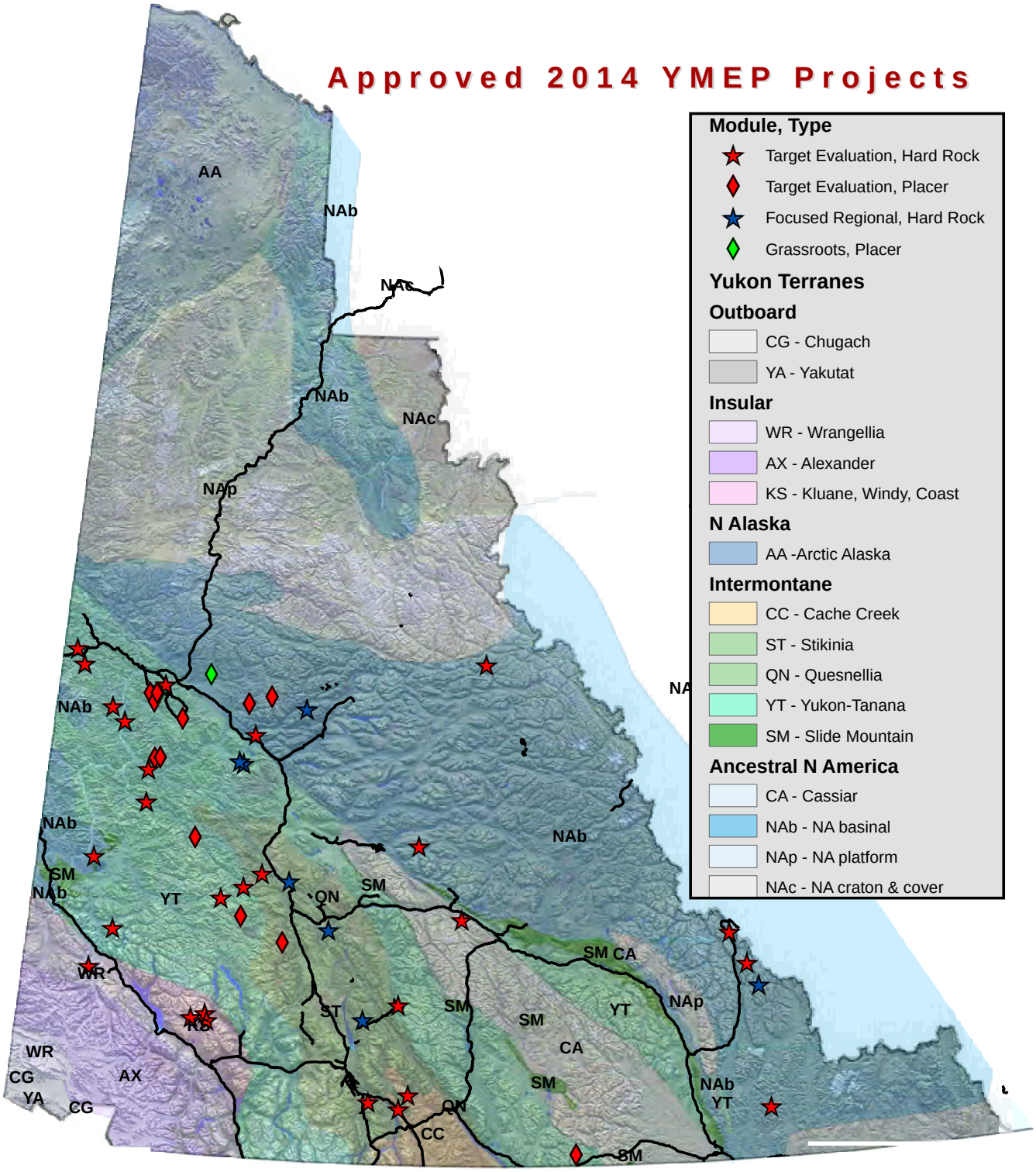


Figure 2. *Yukon map of approved 2014 YMEP projects.*

UPDATE FOR 2014

The program was oversubscribed again in 2014, with 111 applicants competing for $1.4M in funding. The amount of funding available for successful applicants was increased from the previous year which was $1.17M. The Government of Yukon recognized the capital crisis in the mining markets and increased funding by $230 000 in 2014. This increase in funding is intended to support the exploration industry through these challenging times. In light of the current financial challenges facing the exploration industry, YMEP funding was highly successful in pushing projects forward and has resulted in several potentially significant hard rock and placer discoveries in 2014.

The competition for YMEP funding was very tight in 2014 and many quality projects were unable to be funded due to budget constraints. Challenges to secure equity financing, especially amongst the junior mining applicants, led multiple applicants to withdraw their applications. Table 2 outlines historical funding levels for the past six years.

A total of 51 applications were offered funding. The amount available under the Grassroots module was unaltered from 2013 at $15 000. The Focused Regional module saw funding increased by $10 000 to $25 000 and the Target Evaluation module was increased by $15 000 to a maximum of $50 000. Of the 51 successful applicants 3 projects were in the Grassroots module, 7 in Focused Regional and 41 in the Target Evaluation module. This year, most applications were funded at the maximum allowable based upon the proposed budget.

Of the 51 applications that were offered funding in 2014, hardrock projects account for 78% of the successful applications and placer projects account for the remaining 22%. Individual prospectors and private companies secured approximately 69% of available funds while public junior mining/exploration companies received approximately 31% of the funds. The breakdown between the different modules and the demographics of the applicants over the past three years is outlined in Table 3.

In 2014, the bulk of placer projects were centered in the Klondike placer district, three projects were in the Carmacks area and two in the McQuesten area. Hardrock projects were fairly evenly distributed throughout the territory. Gold appeared to be the most sought after commodity again this year and some clustering of projects occurred around exciting recent discoveries in the Klondike/White Gold area, with the majority of projects south of the Tintina trench. Other successful applications were located in south and central Yukon (Fig. 2). Forty-one projects targeted gold as the primary commodity (placer, structurally controlled, epithermal, Carlin style, intrusion related and orogenic deposit types), one project identified vein hosted silver as the target, five projects explored for porphyry copper potential, one for VMS style mineralization, one placer rare earth project, one nickel iron alloy project and one proposal looked at magmatic massive sulphide copper/nickel/PGE prospects.

YMEP's aim is to keep a variety of projects at various stages of advancement. During the 2014 season, 22 of the projects indicated that soil/silt sampling and prospecting/geological mapping would be the primary focus of the program; 5 programs completed various ground and airborne based geophysical surveys, 22 of the project proposals were for drilling and/or trenching and 2 projects proposed hand shafting.

Table 2. *YMEP historical funding, fiscal years 2009-10 through 2014-15.*

Historical funding	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
available funding	$1.67M	$1.67M	$570 000	$570 000	$1.17M	$1.4M
no. of applications	173	165	83	79	81	111
approved projects	102	83	34	29	55	51
max funding level grassroots	$10 050	$15 000	$15 000	$15 000	$15 000	$15 000
max funding level focused regional	$18 750	$25 000	$15 000	$15 000	$15 000	$25 000
max funding level target evaluation	$50 000	$50 000	$25 000	$25 000	$35 000	$50 000

Table 3. *YMEP funding statistics for fiscal years 2012-13 through 2014-15.*

	2012-13		2013-14		2014-15	
Approved projects	**# of approved projects**	**% of approved funding**	**# of approved projects**	**% of approved funding**	**# of approved projects**	**% of approved funding**
approved placer	7	28%	7	15%	14	22%
approved hardrock	22	72%	48	85%	37	78%
total projects approved	29		55		55	
prospectors/ individuals	17	59%	28	36%	20	30%
private companies	8	27%	16	33%	12	29%
public companies	4	14%	13	31%	19	41%

The success of the program can be measured by a number of indicators. In 2014, successful applicants proposed ~$3.7M would be leveraged with YMEP funding. It was a very challenging year across the board for option agreements, as many options were returned to the vendors. However, a number of very encouraging YMEP discoveries were made in 2014 which should stimulate exploration expenditures in the years ahead (Table 4). In 2014, YMEP funding contributed to the discovery of seven new potentially significant occurrences. One junior explorer was able to option their property to a mid-tier gold producer and one prospector was able to option their placer prospect to a major Yukon based placer miner. Several other applicants have been in discussions regarding the optioning or sale of their YMEP funded projects. Benefits of the program can span several years: follow-up property option and/or exploration work may occur several years after the initial YMEP funding. A number of significant properties have benefited from YMEP funding in the past which has led to important expenditures.

Program materials have been updated and posted on the YMEP website. New versions of the application form, scoring criteria, and the program's guidelines are now available for download.

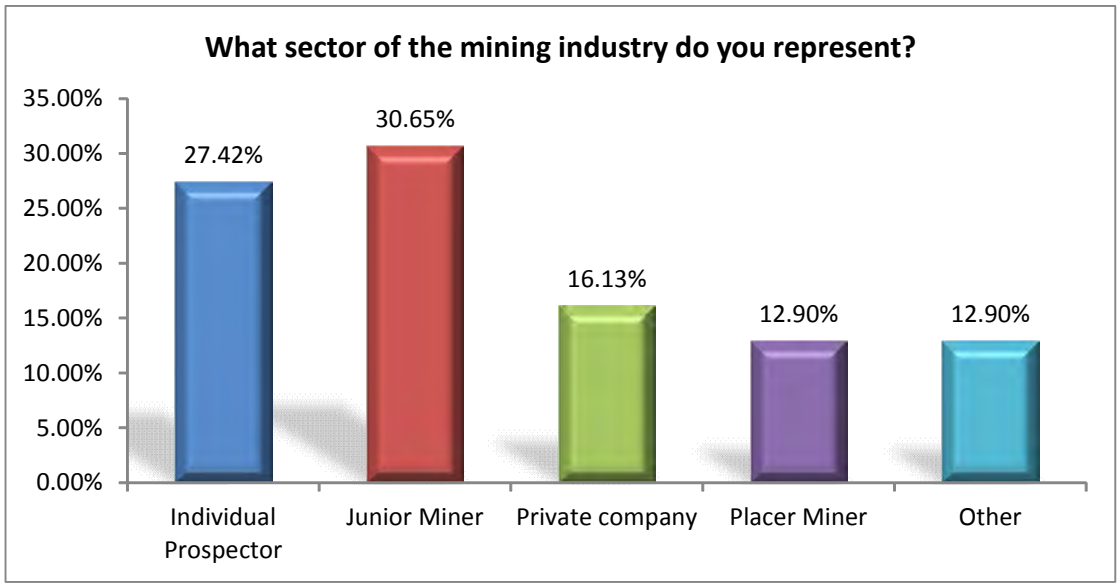
In the fall of 2014, YMEP began conducting a review of the program. An on-line survey was posted asking for feedback on the program. Uptake was good with a total of 62 respondents submitting comments and providing feedback. Results are currently being compiled in an attempt to improve the overall customer satisfaction with the program. Comments are largely quite positive with the majority of respondents expressing overall satisfaction with the operation and effects of the YMEP. The charts following Table 4 give a snap-shot of some of the survey responses.

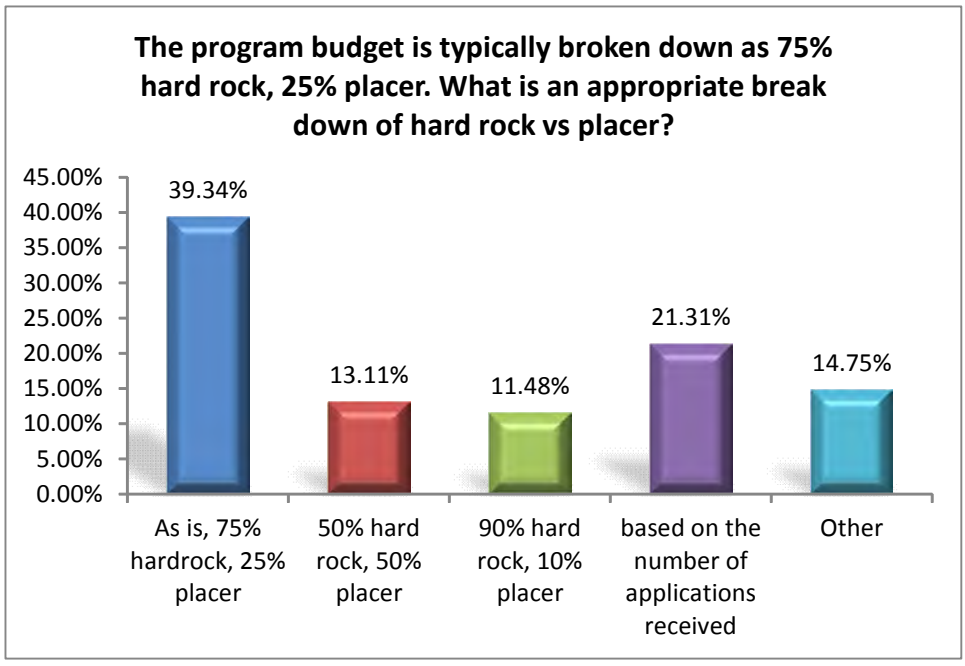
YMEP is designed to meet the needs of the users of the program and to act as an engine for stimulating economic development; therefore the program is continually evolving to meet these goals. Any additional changes to the program's guidelines and maximum funding levels will be announced upon completion of the program review. Funding for 2015 was announced at the Yukon Geoscience Forum and will remain at $1.4M.

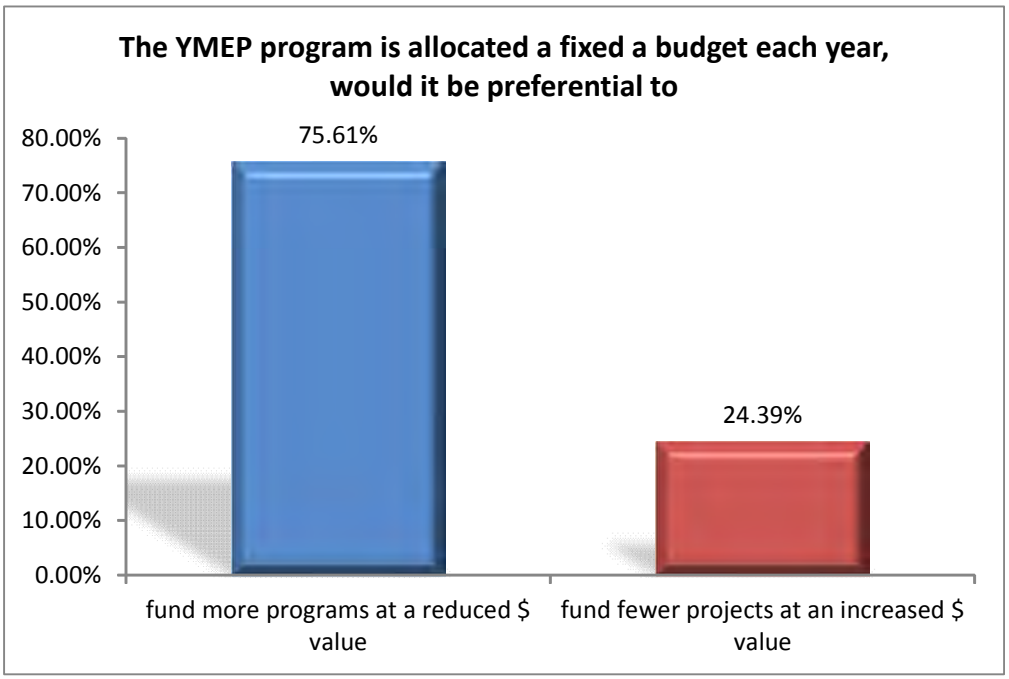
Table 4. *YMEP 2014 successful options.*

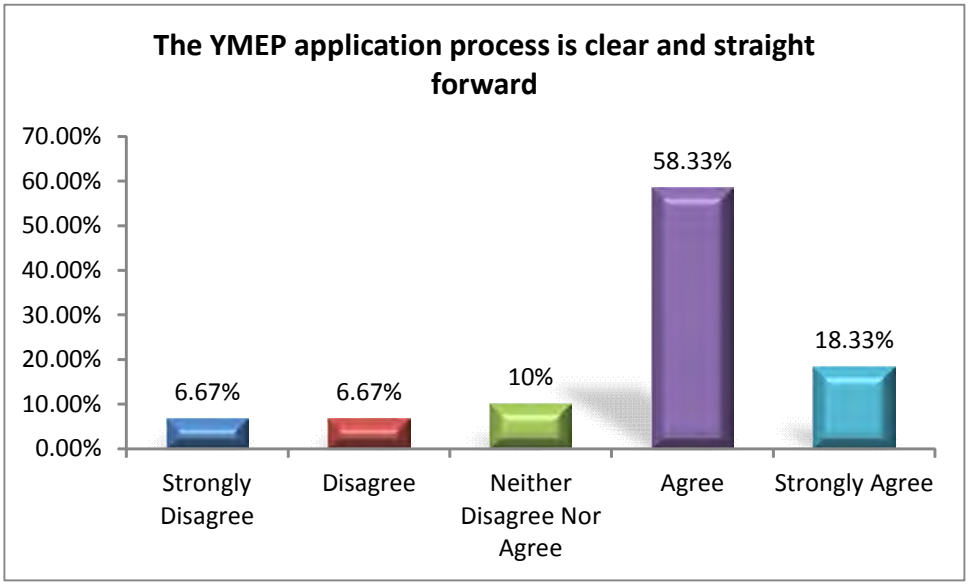
YMEP Successful Options (2000-2014)				
YMEP#	**Property Name**	**Total YMEP Contribution(s)**	**Optioned by**	**Company investment or work commitment**
01-011	Ice/Red Mountain	$12 500	AM Gold	~7.5M
03-079	White Gold	$10 000	Madeilena/Underworld/Kinross	~$33.2M
04-072 and 05-043	Blende	$30 000	Blind Creek Resources	>$5M
05-058	Andrew	$14 400	Overland Resources	~$5.5M
06-054	Antimony Creek	$10 000	Logan Resources/Golden Predator	~$0.35M
04-041 and 07-043	Coffee	$35 000	Kaminak Gold Corp.	~$85M
07-056, 08-012 and 09-112	Toni/Sixty Mile	$33 000	Radius Gold	~$4.5M
03-023, 06-033 and 09-137	Scheelite/Gold Dome	$75 000	Golden Predator	~$1.4M
09-015	Clear Creek	$10 450	Golden Predator	~$4.1M
09-016 and 017	Ten Mile Creek	$25 600	Radius Gold	~$0.63M
09-158	Prospector Mountain	$30 750	Silverquest Resources	~$3.85
09-116	Cynthia	$15 350	Golden Predator	~$1.7M
09-173	Shark/True Blue	$21 354	Great Western Minerals	~$1M
10-097	Portland	$14 320	Taku Gold	~$1.25M
00-069 and 06-005 and 06-006	Mariposa	$36 000	Pacific Ridge	~$4.5M

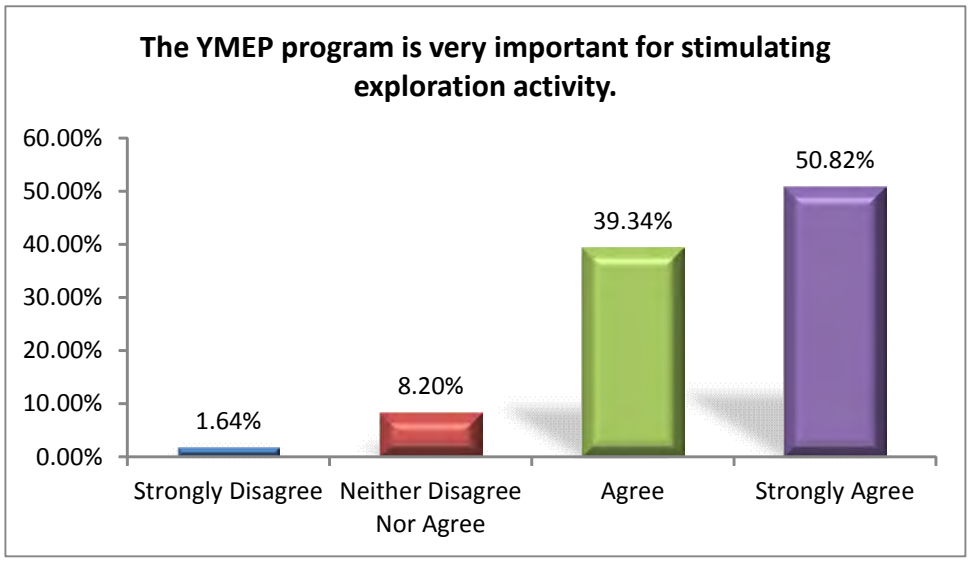
RESULTS OF 2014 YMEP ON-LINE SURVEY

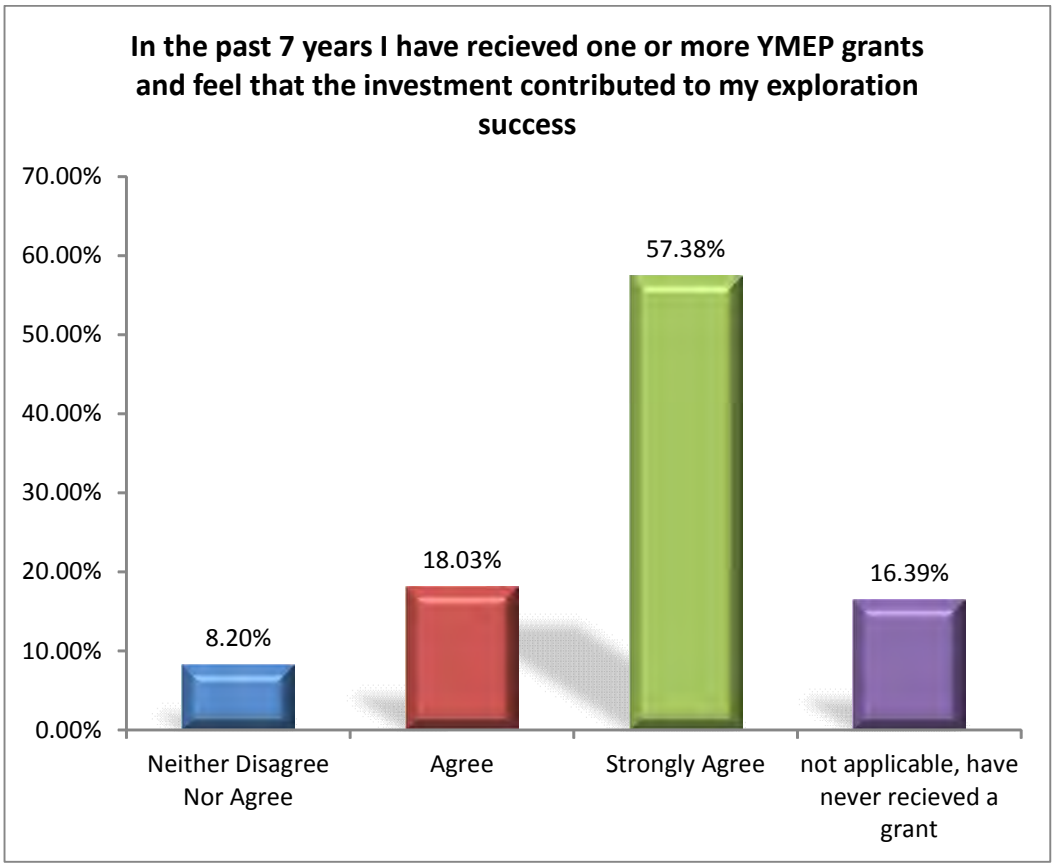





The YMEP program is allocated a fixed a budget each year, would it be preferential to
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
75.61%
24.39%
fund more programs at a reduced $ value
fund fewer projects at an increased $ value


The YMEP application process is clear and straight forward
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
6.67%
6.67%
10%
58.33%
18.33%
Strongly Disagree
Disagree
Neither Disagree Nor Agree
Agree
Strongly Agree


The YMEP program is very important for stimulating exploration activity.
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1.64%
8.20%
39.34%
50.82%
Strongly Disagree
Neither Disagree Nor Agree
Agree
Strongly Agree


In the past 7 years I have recieved one or more YMEP grants and feel that the investment contributed to my exploration success
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
8.20%
18.03%
57.38%
16.39%
Neither Disagree Nor Agree
Agree
Strongly Agree
not applicable, have never recieved a grant

Yukon Oil and Gas Overview 2014

Donald C. Murphy[1]
Yukon Geological Survey

Murphy, D.C., 2015. Yukon Oil and Gas Review 2014. *In:* Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 67-72.

INTRODUCTION

Yukon has eight onshore oil and gas exploration regions with a combined total of assessed conventional hydrocarbon resources of 14.77 Tcf (trillion cubic feet) of natural gas and 662.6 MMbbls (million barrels) of oil (mean conventional in-place petroleum potential; Fig. 1). In addition, Yukon has an interest in offshore hydrocarbon exploration and development in the Beaufort Sea with its estimated discovered conventional petroleum resources of 9.20 Tcf of natural gas and 4917.9 MMbbls of oil (Fig. 1; National Energy Board, 2014). Yukon and the Beaufort Sea are frontier exploration regions with only a small number of companies exploring them. Expenditures totalling over $20M were spent on oil-and-gas-related activities in onshore Yukon in 2014.

This paper presents the highlights of oil and gas-related activity in Yukon in 2014 and describes issues that are affecting Yukon oil and gas activity.

2014 HIGHLIGHTS

Exploration and/or development activities are proposed or currently underway in two of Yukon's exploration regions, Eagle Plain and Liard basins, the latter containing Yukon's only natural gas field with historic production (Fig. 1). Furthermore, oil and gas rights were issued for a parcel in the Beaufort offshore by Aboriginal Affairs and Northern Development Canada and regulatory discussions between the National Energy Board and two proponents of offshore drilling are underway.

EAGLE PLAINS EXPLORATION REGION

Northern Cross (Yukon) Ltd. (NCY), with partner CNOOC (Chinese National Offshore Oil Corporation Ltd.), is in its 7th year of exploring its 5261 km^2 permit area in the Eagle Plain region of northern Yukon (Figs. 1 and 2). NCY advanced its exploration effort in the past year by following up their 2012-13 four-hole drilling program (Fig. 2) with 3D seismic and airborne LiDAR, methane and temperature surveys (Fig. 3; Northern Cross (Yukon) Ltd., 2014a,b). Approximately 325 km^2 were covered by the 3D seismic survey, overlapping most 2012-13 well locations.

The results from the 2012-13 drilling and 3D seismic survey have been promising enough that NCY has proposed a 20-hole drilling program within the area of the seismic survey, proposed to start in early 2015 (Fig. 3; Northern Cross (Yukon) Ltd., 2014b). The focus of the program will be the discovery and appraisal of conventional crude oil and natural gas resources. With discoveries and positive drill stem tests, wells are proposed to undergo extended flow testing in order to evaluate the long-term viability of the resource. This proposal is currently undergoing public review in the Yukon Environmental and Socio-economic Assessment Board (YESAB) process, with Board recommendations anticipated in early 2015.

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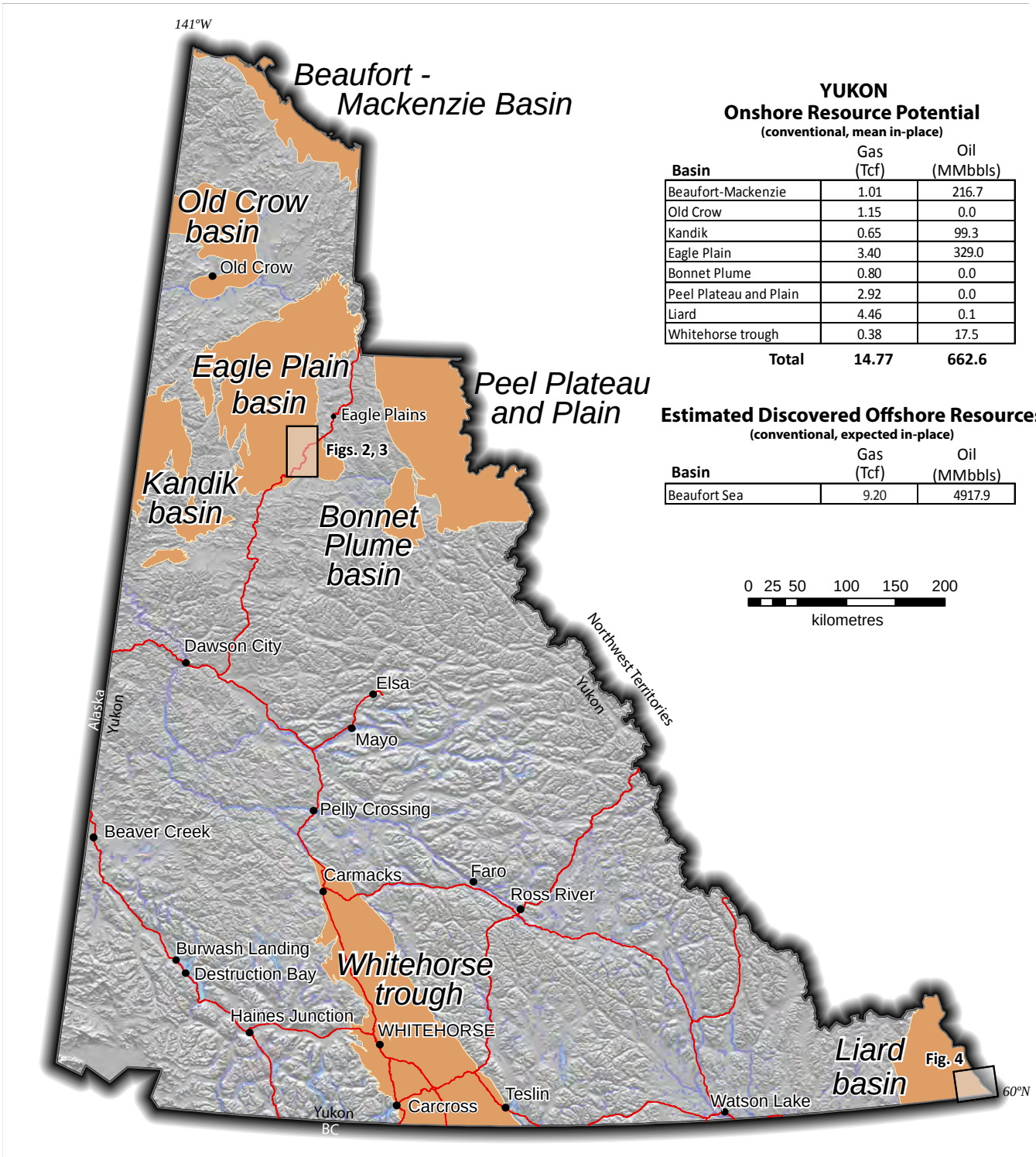

YUKON
Onshore Resource Potential
(conventional, mean in-place)

Basin	Gas (Tcf)	Oil (MMbbls)
Beaufort-Mackenzie	1.01	216.7
Old Crow	1.15	0.0
Kandik	0.65	99.3
Eagle Plain	3.40	329.0
Bonnet Plume	0.80	0.0
Peel Plateau and Plain	2.92	0.0
Liard	4.46	0.1
Whitehorse trough	0.38	17.5
Total	**14.77**	**662.6**

Estimated Discovered Offshore Resources
(conventional, expected in-place)

Basin	Gas (Tcf)	Oil (MMbbls)
Beaufort Sea	9.20	4917.9

Figure 1. *Yukon's onshore oil and gas exploration regions and their assessed conventional resource potential (modified from Yukon Government Oil and Gas Resources Branch, 2014). The resource tables also include the estimated discovered conventional petroleum resources of the Beaufort Sea in which Yukon has an interest (National Energy Board, 2014). The locations of Figures 2-4 are indicated by boxes.*

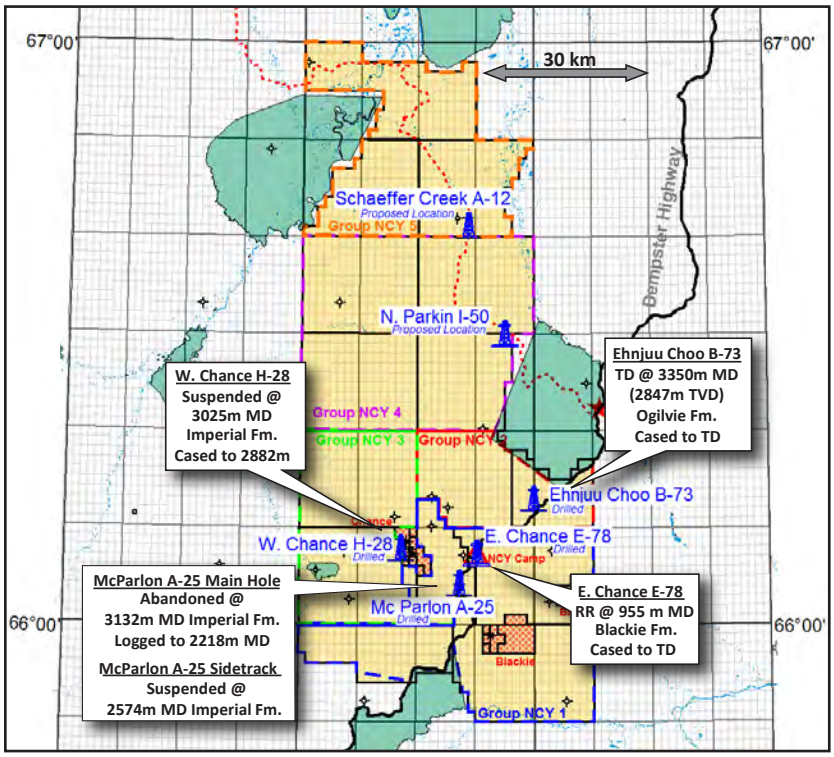

Figure 2. *Location of Northern Cross (Yukon) Ltd.'s exploration licenses and drill holes. The location of Figure 2 in Yukon is indicated in Figure 1 (modified from Northern Cross (Yukon) Ltd., 2014a).*

NCY has spent more than $105M in exploring their permit area since 2011, a significant portion of it on employment and services in Yukon (Northern Cross (Yukon) Ltd., 2014b,c,d). Expenditures associated with the 2012-13 drilling program exceeded $80M with $16M spent in Yukon. Yukon expenditures supported 88 Yukon-based suppliers of goods and services and a work-force averaging 20% Yukon residents, including many First Nation citizens (Northern Cross (Yukon) Ltd., 2014c). Camp construction and maintenance expenditures totalled over $5M. The 2013-14 3D seismic and other programs cost over $20M, with $4.4M (>22%) spent directly in the Yukon supporting 51 businesses and Yukon residents (Northern Cross (Yukon) Ltd., 2014c,d). The seismic program alone entailed 7890 person-days of employment of which 2249 went to Yukon residents (average 29%; Northern Cross (Yukon) Ltd., 2014d). Thirty-six Yukon First Nation citizens were either employed or in industrial training programs which included tree-falling/chainsaw, WHMIS, H_2S, first aid (including AED) and drilling (Don Stachiw (NCY), *pers. comm.*).

LIARD EXPLORATION REGION

EFLO Energy Inc. (EFLO) acquired the rights to the past-producing Kotaneelee gas field of southeastern Yukon in 2012 (Fig. 4). Past production from the Kotaneelee field was the basis for over $46M in royalties to the Yukon government between 1993 and 2012. EFLO's strategy is to re-establish conventional natural gas production from proven reservoirs in hydrothermal dolomite of the Lower to Middle Devonian Nahanni Formation (Manetoe facies), and tested reservoirs in carbonate rocks of the older Arnica and younger Flett formations, while exploring the unconventional shale gas potential in the Upper Devonian-Lower Carboniferous Besa River Formation (Adilman, 2014). EFLO recently submitted a proposal to YESAB to complete workovers on two existing wells (B-38 and I-48) in order to rejuvenate conventional natural gas production (Fig. 4). A decision is anticipated in early 2015.

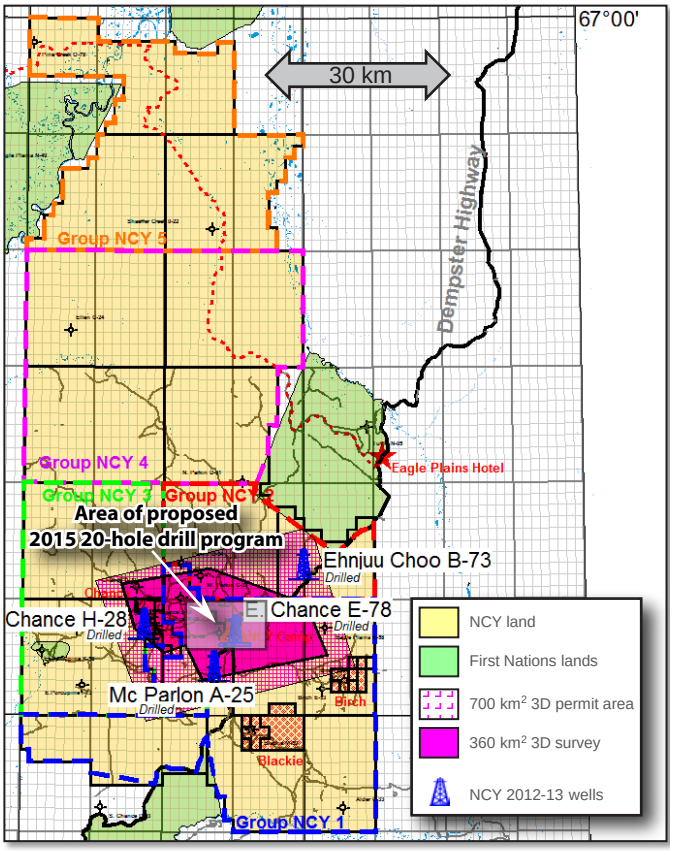

Figure 3. *Areas of Northern Cross (Yukon) Ltd.'s 2014 3D seismic program and proposed 20-hole drilling program (modified from Northern Cross (Yukon) Ltd., 2014b).*

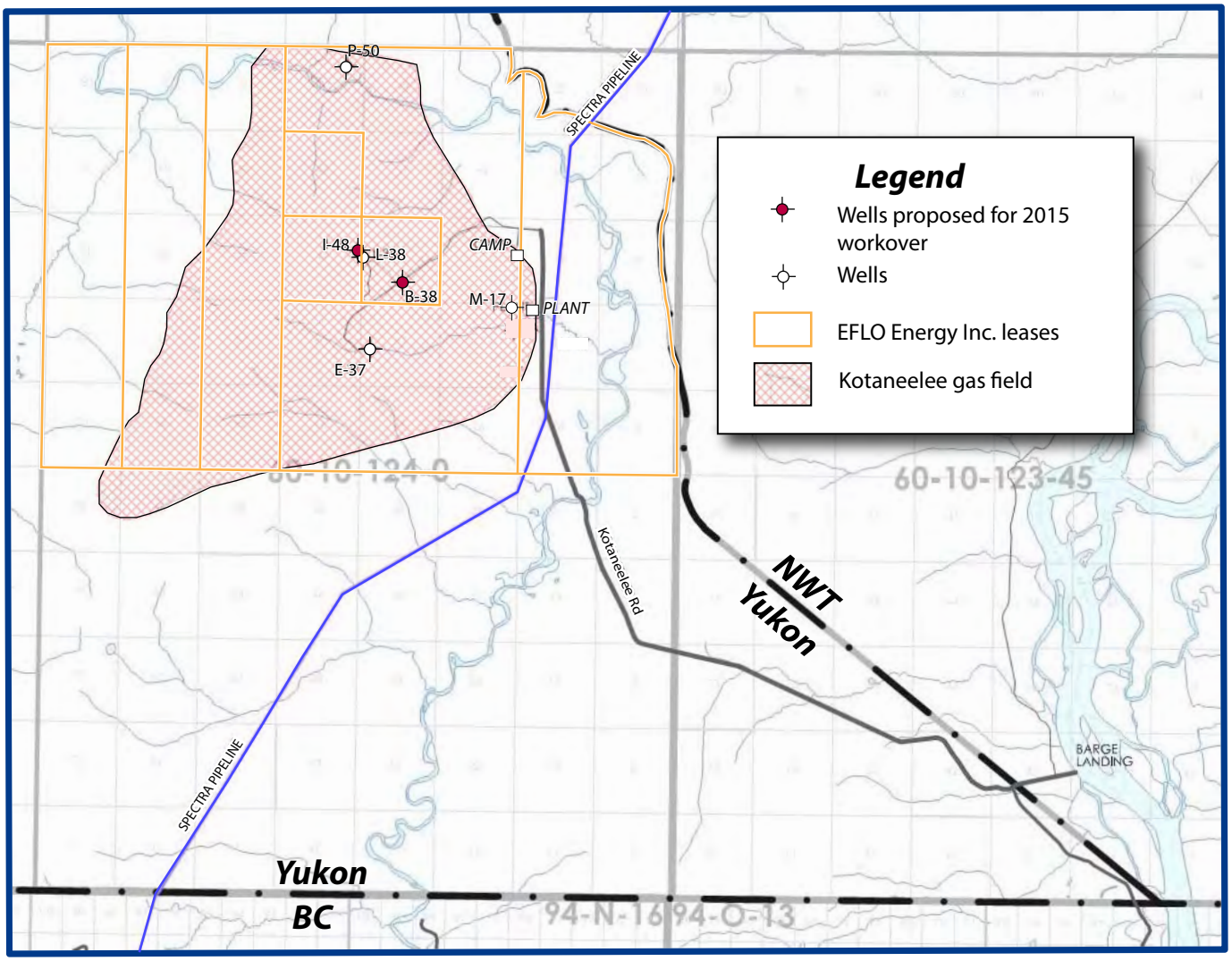

Figure 4. *Map of Kotaneelee gas field in southeastern Yukon showing EFLO's leases and associated oil and gas exploration and development infrastructure. See Figure 1 for location in Yukon. Map modified from EFLO's presentation at Yukon Geoscience Forum, Whitehorse, November, 2013.*

BEAUFORT SEA

The status of Yukon's interest in the Beaufort Sea has not changed since last reported in Adilman (2014). Oil and gas exploration and development activity in the Beaufort Sea in 2014 comprised discussions between the National Energy Board and two project proponents (Imperial Joint Venture and Chevron) seeking a ruling on the requirement for a same-season relief well, and a successful Call for Bids for Exploration Licenses by Aboriginal Affairs and Northern Development Canada in which Franklin Petroleum Canada Ltd. was the successful bidder. Figure 5 shows the locations of the new disposition and the Exploration Licenses over which same-season relief well requirements are being held.

FACTORS INFLUENCING YUKON'S INVESTMENT CLIMATE

A number of recent and impending legal or political developments related to Yukon's resource sector may influence private-sector investment decisions in Yukon's oil and gas sector. These developments include a recent legal

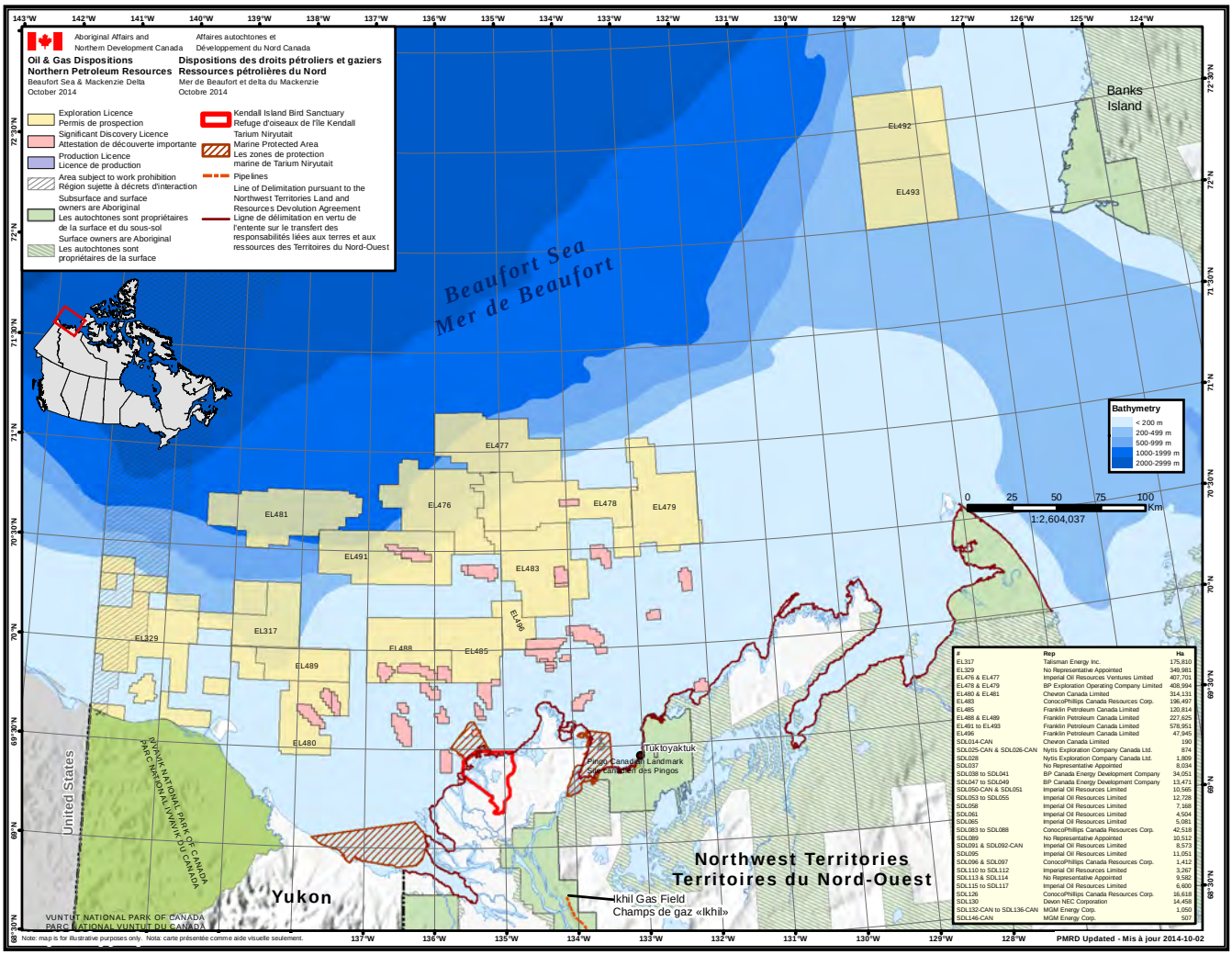

Figure 5. *Location of exploration parcels in the Beaufort Sea. Franklin Petroleum Canada Ltd.'s parcel acquired in the 2014 land disposition is EL 496. Map source: http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-NOG/STAGING/texte-text/le_mp_bsmd_pg_1371579383933_eng.pdf, accessed December 2014.*

decision regarding land use plans for the Peel watershed planning region which includes areas prospective for oil and gas, and an impending report from the Yukon Legislative Assembly's Select Committee on the Risks and Benefits of Hydraulic Fracturing. In addition, moratoria on the issuance of oil and gas rights in the Whitehorse trough and Liard basin are still in place.

For up-to-date information on the status of land within Yukon's exploration regions, please refer to the Yukon Land Status map at: http://www.emr.gov.yk.ca/oilandgas/pdf/Yukon_Land_Status_and_Oil_and_Gas_Interests.pdf.

ONSHORE YUKON DISPOSITIONS

Yukon held two Requests for Postings in 2014 as per the Yukon Oil and Gas Act. The fall 2014 Request for Postings closed on July 9, 2014. The disposition process concluded without any expressions of interest from the oil and gas industry. The spring 2015 Request for Postings closes January 7, 2015.

SUMMARY

The potential of the oil and gas industry to contribute significantly to Yukon's economy was again demonstrated between 2012 and 2014 when Northern Cross Ltd. spent over $105M in exploration on their Eagle Plains parcel, a significant portion of which went to Yukon businesses and employees. Future activities in Yukon and the associated investments by NCY and EFLO Energy Ltd. are currently under review by YESAB. Exploration in all Yukon exploration regions is currently challenged by a number of legal and political issues facing Yukon government. Over the short to medium term, as decisions with respect to land access and multi-stage hydraulic fracturing (MSHF) are made, the future role of oil and gas exploration and development as contributors to the Yukon economy will be clarified.

ACKNOWLEDGEMENTS

Early drafts of this overview were greatly improved by input from Carolyn Relf, Tiffani Fraser, Ron Sumanik and Jesse Devost.

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Robert E. Leckie Awards

Judy St. Amand[1]
Mining Lands, Energy, Mines and Resources

St. Amand, J., 2015. Robert E. Leckie Awards. *In:* Yukon Exploration and Geology Overview 2014, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 73-76.

EXCELLENCE IN ENVIRONMENTAL STEWARDSHIP IN QUARTZ MINING: SÄ DENA HES OPERATING CORPORATION

The Sä Dena Hes Mine is a historic lead-zinc mine 45 km north of Watson Lake in the traditional territory of Liard First Nation and Ross River Dena Council. The Mine was constructed by Curragh Resources Inc. in 1991 and was shut down in 1992 after 16 months of operation. Teck acquired the site in 1993 and has maintained it since that time.

Teck has been working closely with Liard First Nation and the Ross River Dena Council to understand the historic use of the site and how the First Nations would like to use the site post-closure. The company initiated a review based on a risk assessment, which led to many improvements to the decommissioning plan, including the addition of human receptors as opposed to solely ecological receptors.

Their work toward permanent closure of the Sä Dena Hes site included removal of the mill and camp, and reclamation of the waste rock storage, tailings management facilities and adits. The area was covered with a surplus of fill and contoured. The use of additional fill enabled Teck to blend the area into a more natural topography and create surface flow channels to ensure the area remains stable in the long-term. Erosion barrier blankets were used to stabilize steep areas and to provide additional surface area for seeding efforts.

Ongoing reclamation of Sä Dena Hes mine site.

[1]*judy.stamand@gov.yk.ca*

EXCELLENCE IN ENVIRONMENTAL STEWARDSHIP IN PLACER MINING: FELL-HAWK PLACERS

Fell-Hawk Placers were operating on Ballarat Creek in the Dawson mining district until 2013. Throughout the life of this operation, great efforts were put into creating an operation with extremely high environmental standards. Water conveyance structures, new roads and trails, camp construction and the final decommissioning of the site are a few examples of their advanced efforts.

The narrow valleys of Ballarat Creek leave little space for stockpiling material. Tremendous planning was required by the Fellers family to accomplish this high level of reclamation.

Aerial view of reclamation on Ballarat Creek, 2014.

Upstream view of Fell-Hawk Placers' reclamation on Ballarat Creek, 2014.

RESPONSIBLE AND INNOVATIVE EXPLORATION AND MINING PRACTICES IN QUARTZ MINING: GROUNDTRUTH EXPLORATION INC.

GroundTruth Exploration places a priority on developing exploration methods that cause minimal impact. They employ technologies, such as a flying drone for aerial imagery surveys, that can capture baseline data on claims prior to work commencing, and make detailed planning decisions with little to no impact. They have constructed a lightweight, rubber-track vehicle called a GTProbe; this remotely controlled vehicle can traverse land without the need to construct trails. It has a hydraulically operated bedrock sampler which eliminates the need to trench; hence the need for reclamation is also eliminated. Additionally, GroundTruth has developed a new, lightweight drilling rig also on rubber tracks that utilizes rotary air blast (RAB) technology. The method requires no water and no drill pads. These are just a few of the new and exciting methods being developed by GroundTruth.

The innovative research and development ideas explored by GroundTruth significantly reduce impacts to the environment and will influence the way exploration methods and practices are performed throughout the exploration industry.

The rubber-track GTProbe vehicle operating in the field.

The RAB, a lightweight drilling rig, on-site.

Isaac Fage launching the flying drone.

HONOURABLE MENTION FOR EXCELLENCE IN ENVIRONMENTAL STEWARDSHIP IN QUARTZ MINING: CHEVRON CANADA RESOURCES

Chevron has spent three years rehabilitating the Crest lease at Snake River in the Peel region. They removed debris and remediated 705 m^3 of polluted soil that was impacted by mining over 50 years ago. Chevron utilized thermal technology that is more efficient in Northern climates to perform this remediation, spending approximately $9M to complete the work.

Figure 7. *Aerial view of storage and treatment areas at the Crest lease looking SE.*

Yukon Exploration and Geology 2014 Abstracts

The following abstracts are from the Yukon Exploration and Geology 2014 volume. Full versions of the individual papers are available at the Yukon Geological Survey website, www.geology.gov.yk.ca.

GEOLOGY OF THE TAKHANNE RIVER (NTS 115A/02) AND KLUHINI RIVER (115A/07) MAP AREAS, SOUTHWEST YUKON

E. BORDET, S. ISRAEL AND D. MOYNIHAN

Bedrock mapping of the Takhanne River (NTS 115A/2) and Kluhini River (NTS 115A/7) map areas in southwest Yukon extends previous mapping of the Coast plutonic complex from the Haines Junction area south to the British Columbia border. The area is characterized by deformed and metamorphosed rocks of the Yukon-Tanana terrane and other Paleozoic to Mesozoic rocks that occur as roof pendants within the Paleocene Ruby Range plutonic suite. Yukon-Tanana rocks appear to have been thrust over the Paleozoic to Mesozoic rocks to the west, possibly during Late Cretaceous shortening. Metamorphic mineral assemblages indicate a southwest decrease in metamorphic grade with rocks of the Yukon-Tanana terrane showing P-T conditions of 635-655°C and 6.3-7.9 kbar, and rocks in the southernmost part of the study area exhibiting relatively low (~3.5-4 kbar) pressures related to intrusion of the Ruby Range suite. The regional stratigraphic relationships of the Paleozoic to Mesozoic rocks in the study area are not well constrained. They may be related to one of three regionally significant units: 1) the Jura-Cretaceous Dezadeash Formation; 2) the Triassic and older Bear Creek assemblage; or 3) the Kluane schist.

USING TERRESTRIAL COSMOGENIC NUCLIDES TO CONSTRAIN TIMING OF PENULTIMATE ICE ADVANCE IN THE OGILVIE MOUNTAINS, YUKON, CANADA

L. BROWN, B. WARD, J. BOND AND J. GOSSE

Throughout the Pleistocene epoch, Yukon Territory was repeatedly influenced by glacial ice originating from the Cordilleran Ice Sheet and independent alpine glaciers. The penultimate limit in Yukon has garnered controversy in recent years, as moraines in the central region of the territory were found to be older (MIS 6) than moraines in the southwest territory and Alaska (MIS 4). The Ogilvie Mountains, located east of Dawson City, have proven especially problematic for chronological studies. With Chapman Lake acting as the primary study area, this study will attempt to test a relatively new dating method on penultimate surfaces in the Ogilvie Mountains. Using a vertical sampling method to construct a cosmogenic depth versus concentration profile in outwash gravel, this research will determine whether Marine Isotope Stage (MIS) 4 or 6 provided the conditions necessary for ice nucleation to build the penultimate glacial surface. The age calculated by the depth profile will be supported by radiocarbon ages and macrofossil samples, optically stimulated luminescence ages, TCN boulder dating and detailed stratigraphy of significant sites near the Chapman Lake moraine. The results will help determine the effects of climate forcing in this region and its relationship to the existing glacial framework of the territory.

ADVANCES IN THE MINERALIZATION STYLES AND PETROGENESIS OF THE COFFEE GOLD DEPOSIT, YUKON

E. BUITENHUIS, L. BOYCE AND C. FINNIGAN

Gold-bearing, arsenic-rich pyrite in association with enriched As, Sb and minor Ag is found in two separate mineralization styles at Kaminak Gold Corp.'s Coffee Gold Project, Yukon. Arsenian pyrite replaces primary metamorphic mica by sulphidizing Fe in the host, while intense dolomite-illite alteration destroys the host and eventually consumes early mineralized pyrite. Intense silicification of host rocks is observed with associated arsenian pyrite deposition due to cooling. Brecciation of silicified intervals by coarse grained hydrothermal quartz occurs later with additional pyrite deposition. Mineralized intervals are oxidized by late, meteoric fluids which consume Au-bearing pyrite and release micron-scale free gold from the pyrite crystal lattice into the remnant oxides. Sulphidized biotite within the 98 Ma Coffee Creek Granite constrains mineralization to <98 Ma. Similar metal associations (Au-As-Sb *vs.* Au-As-Sb-Pb-Zn-Cu) suggest Coffee potentially represents the shallower, epizonal extension of the mesozonal orogenic Boulevard gold deposit, with a late epithermal overprint.

STRATIGRAPHY, GEOCHEMISTRY AND SOURCE ROCK POTENTIAL OF THE BOUNDARY CREEK FORMATION, NORTH SLOPE, YUKON AND A DESCRIPTION OF ITS BURNING SHALE LOCALITY

T.A. FRASER AND L. REINHARDT

The Cenomanian-Turonian (Upper Cretaceous) Boundary Creek Formation is a mudstone, shale and silty shale unit that is exposed in river and creek beds on Yukon's North Slope. As part of the CASE-15 expedition, co-led by the Yukon Geological Survey and the German Federal Institute for Geosciences and Natural Resources, fieldwork in July 2013 involved measuring and sampling Boundary Creek Formation strata in two locations, and investigating a burning shale exposure near the confluence of Boundary Creek and the Big Fish River. Shale and mudstone samples were analyzed for XRF lithogeochemistry and organic matter quantity, thermal maturity and type using RockEval/TOC (total organic carbon) and vitrinite reflectance techniques. The Boundary Creek Formation is interpreted to have been deposited by turbidity currents onto an outer shelf to slope environment in the distal part of the foreland basin outboard of the Cordilleran orogeny. Lithogeochemical data suggest that throughout the deposition of Boundary Creek Formation shale, ocean water may have been periodically depleted in oxygen, resulting in anoxic conditions that would have been favourable for organic matter preservation. Analyses of surface samples suggest that some areas have poor to no petroleum potential, and are thermally overmature with respect to oil generation; other areas have good to very good petroleum potential with the shale being oil to oil and gas prone, and thermally mature with respect to oil generation. In these latter areas, specifically in the vicinity of the type section on Boundary Creek, the shale has the necessary components for spontaneous combustion: pyrite, organic matter and a fresh supply of oxygen provided by a landslide. Although burning shale is not unknown in northern Canada, the outcrop of burning shale on Yukon's North Slope is the first observed in shale of the Upper Cretaceous Boundary Creek Formation.

PALAEOENVIRONMENT, PALAEOHYDROGRAPHY AND CHEMOSTRATIGRAPHIC ZONATION OF THE CANOL FORMATION, RICHARDSON MOUNTAINS, NORTH YUKON

M.P. HUTCHISON AND T.A. FRASER

Sedimentological and geochemical results from samples in the Richardson Mountains indicate that siliceous shales and chert of the Canol Formation were deposited in stratified, oxygen-depleted waters that favoured the preservation of organic matter. Dilution by terrigenous input was minimal; however, fluctuating palaeoproductivity resulted in significant biogenic silica enrichment that reduced porosity. The Canol Formation was divided into four regionally correlatable chemostratigraphic zones. Each zone was characterized by up-section profiles of: decreasing biogenic silica enrichment, increasing proportions of siliceous shale relative to chert, decreasing redox-sensitive Mo, U and V enrichment factors and decreasing Mo/TOC (total organic carbon) ratios. A preliminary sequence stratigraphic framework was constructed and eustasy was invoked as the dominant allogenic control. Mo/TOC ratios are indicative of a silled, restricted basin with euxinic deepwater. The overall decrease of these ratios up-section suggests increasing restriction over time, associated with relative sea-level fall. Comparison of north Yukon data with similar modern and ancient basins has constrained preliminary reconstructions of Canol basin palaeohydrography.

THE BEAR CREEK ASSEMBLAGE: A LATEST TRIASSIC VOLCANO-SEDIMENTARY SUCCESSION IN SOUTHWEST YUKON

S. ISRAEL, M. COLPRON, J. CUBLEY, D. MOYNIHAN, D.C. MURPHY AND C. RELF

The bedrock geology in the Mount Decoeli area of southwest Yukon is characterized by Paleozoic to Triassic stratigraphy of the Alexander terrane, Wrangellia and the Bear Creek assemblage, overlain and intruded by Jurassic and younger rocks. Alexander terrane rocks comprise mainly Devonian mafic to intermediate volcanic and volcaniclastic rocks overlain by thick successions of carbonate and phyllite. Wrangellia is characterized by Mississippian to Permian volcanic and siliciclastic rocks of the Station Creek and Hasen Creek formations, overlain by Upper Triassic basalts and calcareous rocks of the Nikolai and McCarthy formations respectively. The Alexander terrane and Wrangellia are separated by the Duke River fault, a mainly Late Cretaceous northeast-verging thrust fault. To the northeast, Wrangellia is separated from the Bear Creek assemblage by the Denali fault, a strike-slip fault with as much as 400 km of right-lateral motion.

The Bear Creek assemblage comprises metamorphosed and deformed siltstone, mudstone and sandstone interlayered with mafic to intermediate volcanic and volcaniclastic rocks. Preliminary ages suggest the Bear Creek assemblage is Late Triassic (*ca.* 204 Ma). Regional correlation of the Bear Creek is unclear, but similarities between the assemblage and rocks of the Taku and Alexander terranes suggest possible linkages. Correlation with Upper Triassic rocks of Wrangellia is less favourable.

SUMMARY OF YUKON GEOLOGICAL SURVEY PERMAFROST MONITORING NETWORK RESULTS, 2008-2013

P. LIPOVSKY

Up to 6 years of data have been collected at 7 stations within Yukon Geological Survey's permafrost monitoring network between 2008 and 2013. Warm permafrost conditions (>-0.5°C) governed by latent heat effects exist at the Whitehorse, Watson Lake, Ross River School, and Dawson School monitoring stations, while average permafrost temperatures in Faro are only marginally cooler at -0.6°C. Mean annual ground temperatures at the Beaver Creek and the Dawson dump forest monitoring stations are much colder at -2.9° and -2.0°C respectively. Most sites show either insignificant or very slight short term permafrost warming trends, although slight cooling is apparent at Ross River School, and rapid warming has occurred at Beaver Creek over the monitoring period. Opportunities to expand the network and collaborate with external parties operating similar monitoring stations should be further explored to facilitate more complete and representative reporting on the thermal state of permafrost in Yukon.

PRELIMINARY DETRITAL ZIRCON GEOCHRONOLOGY OF THE NERUOKPUK FORMATION IN THE BARN MOUNTAINS, YUKON

W.C. MCCLELLAND, M. COLPRON, K. PIEPJOHN, W. VON GOSEN, W. WARD AND J.V. STRAUSS

Neoproterozoic to Cambrian siliciclastic rocks in the Barn Mountains, Yukon are stratigraphically similar to coeval strata on the northwest Laurentian margin and the North Slope subterrane of the Arctic Alaska terrane. Sandstone samples collected for detrital zircon U/Pb geochronology from *Oldhamia*-bearing sections in the Barn Mountains yield age spectra with major Paleoproterozoic and subordinate Mesoproterozoic and Archean peaks that are compatible with a Laurentian cratonal provenance. Comparison of data from the Barn Mountains with available data from the Laurentian margin is permissive of derivation from either the northwestern or the north to northeastern margin of Laurentia.

SOFT SEDIMENT TEXTURES IN CLASTS IN WERNECKE BRECCIA: RECONSTRUCTION OF AN ERODED LATE PALEOPROTEROZOIC SUCCESSION IN NORTHERN YUKON

J. VERBAAS, D.J. THORKELSON, H.D. GIBSON, D.D. MARSHALL AND D. MILIDRAGOVIC

The 1.60 Ga hydrothermal Wernecke Breccias are hosted within metasedimentary rocks of the Wernecke Supergroup and exposed in the Wernecke, Ogilvie and southern Richardson Mountains of northern Yukon. Breccia clasts with soft sediment deformation textures were previously identified and interpreted as fragments of the Wernecke Supergroup that were torn off and carried upward during mud volcanism. This model was subsequently discounted because field relations and geochronology indicated that the Wernecke Supergroup was lithified and metamorphosed prior to brecciation. Our recent work confirms the presence of soft sediment within zones of Wernecke Breccia and demonstrates the need for an unlithified sediment source. Two types of soft sediment materials have been identified: red mudstone to sandstone, and green mudstone. These unlithified sediments were likely derived from late Paleoproterozoic water-saturated sediments. During breccia formation, the surface was breached and fragments of the unlithified sediments foundered into the breccia zones, mixing with clasts of lithified wallrock. The sediments descended to depths of at least 4 km where they were lithified and encased by hydrothermal cement. Subsequent erosion removed the source beds and exposed the breccia zones.

FAULT TECTONICS IN THE RAPID DEPRESSION OF THE YUKON NORTH SLOPE (CANADIAN ARCTIC) - SUMMARY OF PRELIMINARY RESULTS

W. VON GOSEN, K. PIEPJOHN, D.C. MURPHY, C. BRANDES, W.C. MCCLELLAND AND M. COLPRON

Mesozoic to Tertiary rocks in the Rapid depression on the Yukon North Slope are dissected by a N-NNE striking fault array. Two phases of Tertiary deformation are recorded across the Rapid depression east of the Barn fault: D_1 is characterized by faults with either sinistral or dextral strike-slip displacement and overall ~W-E to NW-SE contraction; D_2 faults developed under a regime of ~W-E to N-S-oriented contraction. The southern segment of the Barn fault is interpreted as an oblique dextral fault. The structural style is inconsistent with the propagation of a large-scale strike-slip fault zone such as the Kaltag fault through the Rapid depression, as previously suggested, but rather may indicate reactivation of older structural heterogeneity in the subsurface.

2014 LIST OF PUBLICATIONS AND MAPS

YGS released 23 publications in 2014: 3 Annual Reports, 2 Miscellaneous Reports, and 18 Open Files.

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