



## ACTIVITIES

by Grant Abbott

This summer's fieldwork for the Yukon Geological Survey (YGS) consists of a variety of activities including bedrock mapping, mineral deposit studies, hydrocarbon-related studies, surficial (gravel and other loose material) mapping and related studies, topical studies, outreach, and regional airborne geophysical surveys. Most field projects involve two people in small fly camps or working from roads, however, one exception this year is the Windy McKinley Project which will involve a helicopter-supported crew of approximately eight geologists working from a base camp.

## FIELDWORK *Projects are keyed to the map at right.*

### 1:50 000-SCALE BEDROCK MAPPING ■

**1. DR. DON MURPHY** is leading the Windy McKinley Project in the area of poorly exposed and poorly understood Windy-McKinley terrane in the Stevenson Ridge map area of southwest Yukon (pictured left). The project is a partnership between YGS and the Geological Survey of Canada (GSC). In addition to bedrock mapping, there will also be surficial geological mapping, and possibly a high-resolution multispectral (magnetics, radiometrics, VLF) airborne geophysical survey.

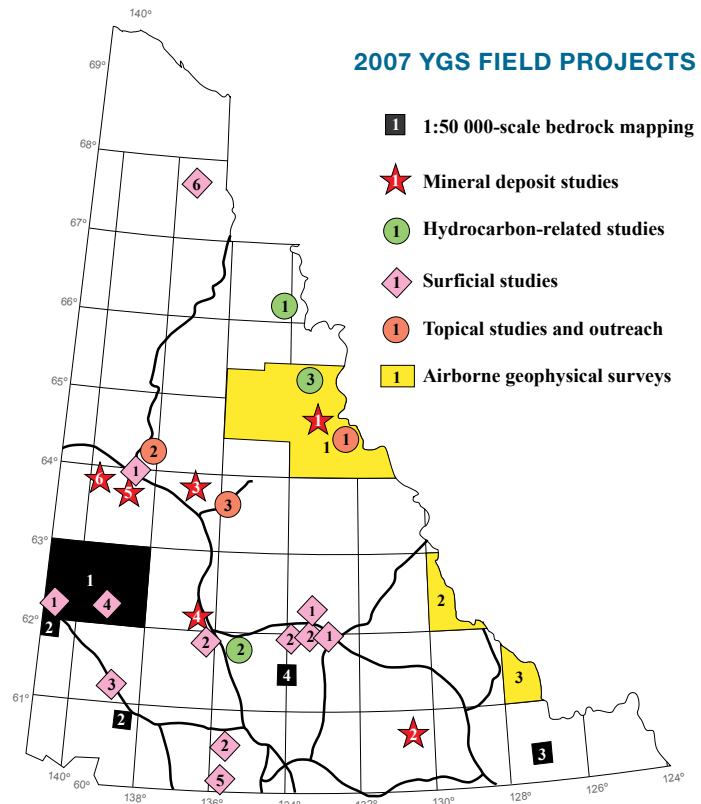


**2. STEVE ISRAEL** is continuing mapping in the Kluane Ranges where significant occurrences of nickel, copper and platinum group elements are known. Steve will focus on the White River area where the Canalask deposit is located. Studies of recent deformation associated with the Denali Fault are also taking place in collaboration with Don Murphy (YGS) and workers from the United States Geological Survey in Alaska.

**3. DR. LEE PIGAGE** will continue the Otter Creek bedrock geology mapping project in southeast Yukon. This work aims to improve the understanding of the regional geology along the south edge of Selwyn Basin. This geological region contains some of the world's largest zinc/lead deposits including Howards Pass and Faro, and the Mel barite/lead/zinc deposit is located in the map area.

**4. ELIZABETH WESTBERG**, working on her MSc. thesis through Simon Fraser University under the supervision of Maurice Colpron and H.D. Gibson, will carry out detailed bedrock mapping to help constrain the nature and location of the boundary between Yukon-Tanana and Cassiar terranes in eastern Laberge and western Quiet Lake map areas. This project will contribute to refining the geoscience database in a region prospective for gold, tungsten and base metals.

## 2007 YGS FIELD PROJECTS



## MINERAL DEPOSIT STUDIES ★

**1. LARA LEWIS** will continue to gather data on intrusion-related and Wernecke Breccia uranium occurrences for a compilation on uranium exploration in Yukon. New age-dates for uranium mineralization are expected to provide constraints on timing of the mineralizing event.

**2. JAKE HANLEY**, under the supervision of Dr. E. Spooner at the University of Toronto, is continuing a post-doctoral study of the evolution and generation of magmatic fluids in mid-Cretaceous granites and their relationship to gold mineralization.

**3. KIRSTEN RASMUSSEN** is beginning a PhD thesis at UBC, under the supervision of Dr. Jim Mortensen. This project will help wrap up 15 years of research by researchers from YGS and the Mineral Deposit Research Unit of UBC into the Cretaceous magmatism in Yukon and adjacent portions of southwestern Northwest Territories and eastern Alaska. During the two-year study, the data will be brought into the new YGS Igneous Database, and all existing U-Pb age determinations will be finalized and major gaps in both crystallization age and lithogeochemical data will be filled. Comprehensive models will be constructed to explain the evolution of Cretaceous magmatism, and the project will investigate the influence of pre-existing crustal geometry (i.e., 'lower-plate' vs. 'upper plate' geometry) during crustal shortening and melting.

## ACTIVITIES (continued)

**4. THIERRY BETSI**, under the supervision of Dr. David Lentz at the University of New Brunswick, will begin Doctoral research on gold occurrences in the southern part of the Dawson Range Mineral Belt. There and elsewhere in the northern Cordillera, there appears to be a close link between Cretaceous magmatism and base- and precious-metal mineralization. The specific timing and regional-to-local controls on precious metal mineralization are poorly constrained, thus they hope to formulate more robust applied exploration criteria for the region.

**5. WILLIAM LeBARGE** and **DR. VLADIMIR NAUMOV** from the University of Perm, Russia are continuing a study of the sedimentology, stratigraphy and gold characteristics of gravel and conglomerate deposits in the Indian River area. These gravel terraces and the underlying conglomerates are currently the focus of exploration by Boulder Mining Corporation and Klondike Star Ltd. New interpretations of geology and data from this study may help to identify and locate undiscovered bedrock sources of gold, as well as new placer deposits in nearby drainages of unglaciated western Yukon.

**6. WILLIAM LeBARGE** and **DR. YANA FEDORTCHOUK** are conducting a pilot program to explore the potential for alluvial diamonds in Yukon. They are visiting selected localities where diamonds have been reported, collecting samples for analyses and consulting with world class diamond experts including Dr. Valentin Afanasiev from the Russian Academy of Sciences in Novosibirsk, Russia.

## HYDROCARBON-RELATED STUDIES ●

**1. TAMMY ALLEN** and **TIFFANI FRASER** are in the second year of a four-year project to assess the hydrocarbon potential of the Peel Region in northeastern Yukon. The study involves collaboration with GSC, Northwest Territories Geoscience Office, and industry and university affiliates. This year, Yukon geologists will be looking at Upper Paleozoic and Mesozoic clastic systems, since these systems have been identified as the most prospective plays. The program will involve detailed sedimentological fieldwork, laboratory analyses, and subsequent subsurface analysis of existing well-log and seismic-reflection data.

**2. DR. GRANT LOWEY** is completing his three-year study of the sedimentology, stratigraphy and hydrocarbon potential of the Laberge Group and Tantalus Formation in the Whitehorse Trough between Whitehorse and Carmacks. The project will conclude in 2008 with a revised assessment of the hydrocarbon potential of this part of southern Yukon.

**3. DR. GRANT LOWEY** will undertake a reconnaissance assessment of the Bonnet Plume Basin in northern Yukon in anticipation of undertaking a longer term study. The basin contains several large thermal coal deposits. This work will provide new information that will help to better assess the coal and gas potential of the basin.

## SURFICIAL STUDIES ◆

Terrain destabilization by landslides and permafrost degradation is becoming a major concern in Yukon in recent years, driven by uncertainty surrounding the distribution and nature of permafrost and the effects of climate change. The influence of climate change on the occurrence of forest fires, glacial retreat and permafrost degradation is of prime importance to terrain stability. Continued efforts to characterize these issues are required to support impending development, infrastructure maintenance and land-use planning within communities and along infrastructure corridors.

## YGS PREPARES FOR THE FIELD



This year we have nine students working with us as geological assistants. There are several from the Yukon: Sean O'Conner, Chris Fozard, Brandon Pike and Sarah Shoniker; and a number from southern Canada: Katrine Vanderlely and Rosie Cobett from BC, Kristy Long and Amaris Page from Ontario, and Lise Robichaud from New Brunswick. We welcome their youth and energy, and hope they have an enjoyable summer working in the Yukon with us.

We have beefed up the wilderness training for our geologists and assistants this year. We offered courses in wilderness readiness, firearms and bear awareness, wilderness first aid, helicopter safety, and overland and ATV driving. Let's all make this a safe summer!

**1. PANYA LIPOVSKY** has recently studied the distribution, geomorphology and potential impacts of various terrain hazards in southern and central Yukon, using a wide variety of techniques, including detailed field-based geomorphological studies, regional inventories, two-dimensional resistivity geophysical surveys, differential GPS surveys, and Interferometric Synthetic Aperture (InSAR) analysis. Panya will continue monitoring active permafrost-related failures near Carmacks and Little Salmon Lake. Panya will also provide support to Yukon Parks in implementing a monitoring system for the Kusawa fan drainage basin, including assistance with assembling, calibrating and installing the weather station, developing an early warning system and response program, and conducting occasional aerial surveys over the drainage basin to look for potential signs of new instability.

**2. DR. KENJI YOSHIKAWA** at the University of Alaska Fairbanks (pictured at right below) is coordinating a permafrost health outreach program consisting of installing long-term permafrost temperature monitoring systems at public schools in Alaska, Yukon and the Russian far east. The program allows students to be fully involved with the data collection, and to regularly upload the data to a central website and compare trends with other schools. Long-term permafrost temperature data is also collected to support academic research on permafrost, climate change and infrastructure issues. The installation consists of a small borehole drilled near a school, lined with plastic pipe and thermistor temperature sensors at various depths, and a small battery-operated data logger to monitor ground temperatures. Kenji and **PANYA LIPOVSKY** travelled in



early May, 2007 to drill boreholes and install monitoring equipment at schools in Ross River, Faro, Dawson, Beaver Creek and Destruction Bay.

**3.** A large volume of permafrost and surficial geology information (stratigraphy, texture, and ice character and content) exists in the over 30 years of logs of boreholes drilled along the Alaska Highway and the proposed pipeline route. **PANYA LIPOVSKY** will continue to develop a drill-hole database of the Alaska Highway corridor that will help map the distribution of permafrost. The database currently contains records from over 5000 drill holes from Beaver Creek to east of Haines Junction. This year, **MEGAN JAMES**, a M.Sc. student at the University of Ottawa with Dr. Antoni Lewkowicz, will continue data entry and borehole location capture to extend the coverage of the database eastward toward Watson Lake. This digital GIS-compatible database will be extremely useful for a variety of planning purposes within the corridor, including modeling thaw settlement sensitivity and mapping the distribution of permafrost in greater detail than currently exists.

**4.** **JEFF BOND** and **PANYA LIPOVSKY** will begin surficial mapping in Stevenson Ridge (115J) and northeast Kluane Lake (115G) map areas, the last unmapped part of southwest Yukon, which straddles the all-time limit of Pleistocene glaciation originating from the St. Elias Mountains. Multiple glacial limits are preserved and glacial deposits from early to middle Pleistocene local ice cap complexes are present. This area has excellent potential for the preservation of complex Quaternary stratigraphy, and this mapping offers the chance to increase significantly our understanding of Yukon's recent glacial history. The combination of favourable bedrock geology and large areas of unglaciated terrain make this region prospective for new placer discoveries. It also covers one of the proposed routes for a new railway, which increases the need for surficial mapping as a base for engineering and feasibility studies.

**5.** **AMBER CHURCH** will begin a project for her M.Sc. thesis under the direction of Dr. John Clague at Simon Fraser University. This project sets out to address a series of questions:

- How will climate warming and deglaciation alter the landscape and hydrology of the Wheaton River watershed?
- Is it possible to isolate glacial influences on hydrology and river planform in northern alpine river systems from other system variables?
- Can these findings be applied more generally to other northern river systems?
- Can we use this information in land-use planning?

**6.** **KRISTEN KENNEDY** will begin a project in the Eagle Plains area of northern Yukon for her M.Sc. thesis at the University of Alberta under the direction of Dr. Duane Froese. Scarce aggregate resources have been identified as a serious impediment to future development of oil and gas resources in the area. Regional mapping and stratigraphic and sedimentological studies will be undertaken to produce a regional map of surficial materials and a process-based model of flood channel development for the Eagle meltwater channel. This is a feature related to the late stages of the last continental glaciation (Laurentide).

## TOPICAL STUDIES AND OUTREACH ●

**1.** **FRANCESCA FURLANETTO** will begin a project in the Wernecke Mountains for her Ph.D. thesis at Simon Fraser University under the direction of Dr. Derek Thorkelson. She will examine the age of the detrital minerals of the Wernecke Supergroup and compare the data to published results from other formations of approximately the same age in Canada and other continents. This new information on the

Wernecke Supergroup should clarify the geological setting of many mineral occurrences in northern Yukon.

**2.** **LUKE BERANEK**, a PhD candidate at the University of British Columbia under the supervision of Dr. Jim Mortensen, has been steadily adding to the detrital zircon-age database for Late Paleozoic and Triassic rocks on both sides of the boundary between the North American continental margin sequence, and Slide Mountain and Yukon-Tanana terranes. Luke's earlier work has shown that the terranes were already shedding debris well into North America by the Early Triassic, substantially earlier than previously thought. This work is changing our understanding of how and when these terranes formed and collided with one another.

**3.** In response to growing public demand, **KAREN PELLETIER** and **CHARLIE ROOTS** are developing a Yukon Geological Road Guide for laypeople. Work will continue this summer with scouting of appropriate geological stops of interest along the Top of the World Highway, Silver Trail and Robert Campbell Highway. A final product is expected to be available by spring 2008.

## AIRBORNE GEOPHYSICAL SURVEYS ■

**1.** GSC, in collaboration with YGS, will complete an extensive aeromagnetic survey in the Wernecke and Mackenzie mountains that was begun in 2006. Funding was provided by DIAND under the Strategic Investments for Northern Economic Development Program.

**2.** GSC, in collaboration with YGS, will fly aeromagnetic surveys over the Yukon portions of the Little Nahanni River and Flat River map areas. These areas have potential for lead, zinc, gold and tungsten. The surveys will aid in the interpretation of the regional geologic setting of important mineral deposits such as Howards Pass.

## MINING WEEK WAS A BLAST!

For Mining Week **KAREN PELLETIER** and **CHARLIE ROOTS** organised a great slate of activities for both students and adults. Karen had a great display of minerals and rocks from the various Yukon mineral



deposits, with some examples of everyday items made from metals, gems and rocks (including jewellery, copper piping, door knobs, etc.). The rock talk this year had students creating rock kits they could take home, with Yukon samples. They really enjoyed this, and it was a great way to keep up their interest in rocks over the summer holidays.

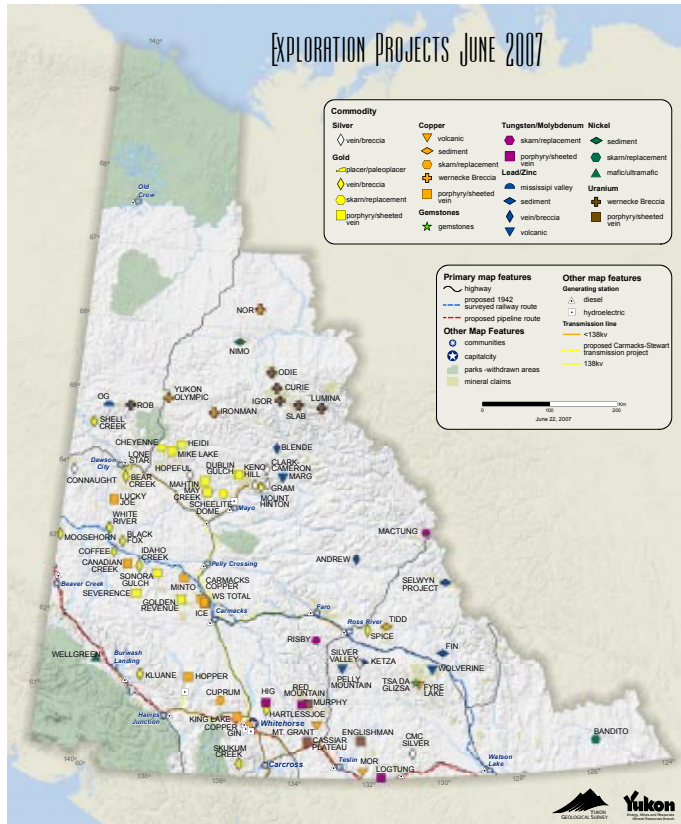
There was even a draw for three beautiful pieces of jade and rhodonite donated by Sidrock.

On the last day, our staff (including the newly arrived students) went on a geological field trip. We visited sites of the Miles Canyon Basalt, the Arctic Chief copper mine pit, Best Chance copper deposit, along with a few sites along the Alaska Highway north and the Ibex valley. We thank Karen for organizing a fun barbeque at her place at the end of the day.



## 2007 YUKON EXPLORATION AND MINING

by Mike Burke



The Minto copper-gold-silver mine of Sherwood Copper Corporation completed initial development and began commissioning of the mill in late May. The company will continue to develop the mine in 2007, with the first expansion of the mill. Additional expansion of the mine could be accelerated with the discovery of the Area 2 deposit located adjacent to the main deposit. Mine development costs at Minto for 2007 are forecast at over \$50 million. Yukon mine development costs could increase substantially with positive production decisions at Yukon Zinc's Wolverine zinc-silver deposit and Tagish Lake Gold Corporation's Skukum Creek gold-silver deposit.

Mineral exploration expenditures in Yukon will exceed \$100 million this year. The exploration season enjoyed an early start, with several drilling projects mobilizing in March and April and others continuing year-round work. Expenditures on mineral deposit appraisal to expand and upgrade known Yukon mineral deposits will capture the bulk of exploration expenditures. Many deposits are undergoing scoping, pre-feasibility and feasibility studies. Drilling on earlier stage projects and grassroots exploration has also increased.

Check out this article in *GSA Today*!

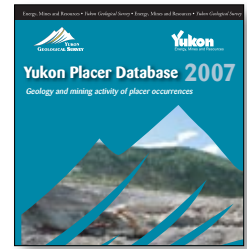
Colpron, M., Nelson, J.L. and Murphy, D.C., 2007. Northern Cordilleran terranes and their interactions through time. *GSA Today*, vol. 17, no. 4/5, p. 4-10.

## NEW YGS PUBLICATIONS

You may view and download many of our publications free of charge from our website at [www.geology.gov.yk.ca/publications](http://www.geology.gov.yk.ca/publications).

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### ANNUAL REPORTS

Burke, M., LeBarge, W., Traynor, S., Abbott, G., Colpron, M. and St. Amand, J., 2007. Yukon Mining, Development and Exploration Overview 2006. 79 p., free.

Emond, D.S., Lewis, L.L. and Weston, L.H., 2007. Yukon Exploration and Geology 2006. 268 p., \$10.

LeBarge, W.P. and Welsh, C.S. (compilers), 2007. Yukon Placer Mining Industry 2003 to 2006. 235 p., \$10.

### BROCHURES

Bond, J.D., 2007. A guide to soil sampling in Yukon. YGS Brochure 2007-2, 4 p., free

West, K., 2007. White River Ash. YGS Brochure 2007-1, 4 p., free

### DATABASES

LeBarge, W.P. (compiler), 2007. Yukon Placer Database 2007: Geology and mining activity of placer occurrences. CD-ROM, \$30.

#### Three databases now searchable online

Yukon Geoscience Publications: A compilation of YGS publications and a list of Yukon geoscience references (compiled by Emond, Lewis and Weston, 2007)

Yukon Igneous Database: A compilation of the known geochemistry of igneous rocks (compiled by Mair, Hart and Lewis, 2007)

Yukon MINFILE: A database of mineral occurrences (compiled by Deklerk, 2007)

### OPEN FILES

Pigage, L.C., 2007. Yukon Stratigraphic Correlation Chart. Open File 2007-2, \$5.

