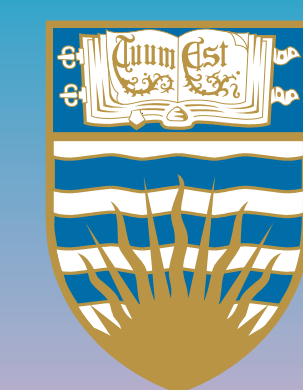


NEW BEDROCK GEOLOGICAL MAP OF PART OF WATSON LAKE AREA, SOUTHEASTERN YUKON



Donald C. Murphy
Yukon Geological Survey

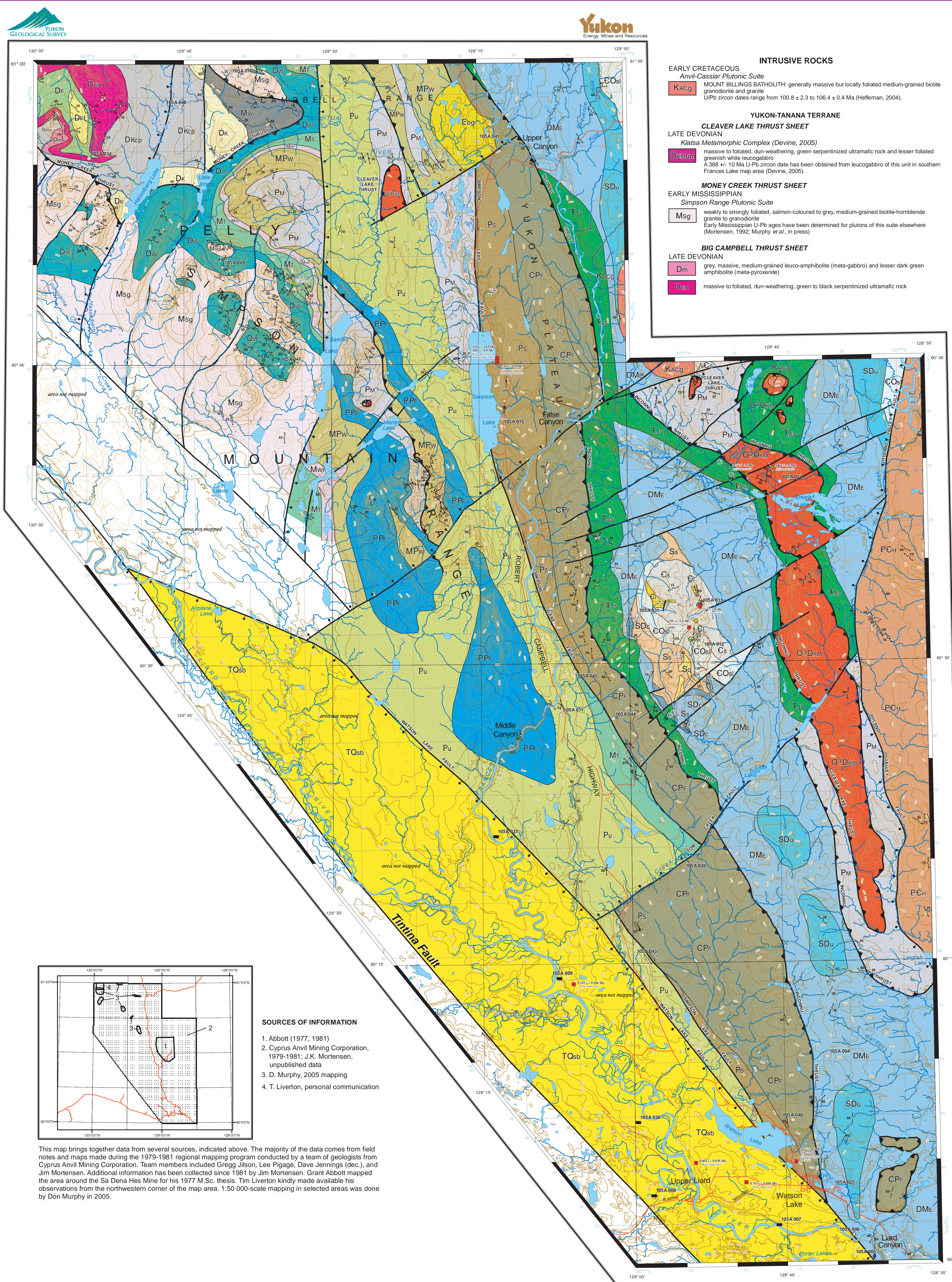


James K. Mortensen
University of British Columbia



Summary

Mesozoic and Cenozoic faulting has broken Watson Lake area into 6 geological domains. The southwestern-most domain comprises coal-bearing Tertiary sedimentary rocks deposited in a trans-tensional graben in the Tintina Fault zone. To the northeast is a domain underlain by imbricated Devonian to Permian meta-sedimentary and meta-igneous rocks of Yukon-Tanana terrane. The central part of the area, between the Simpson Lake Fault and the Inconnu Thrust Fault, comprises Upper Paleozoic chert of Slide Mountain terrane and unconformably overlying Permian conglomerate and basalt. With the exception of a klippe of Yukon-Tanana terrane, the eastern part of the map area comprises two domains of Upper Proterozoic to Upper Triassic rocks of the North American continental margin sequence. The eastern-most domain is made up of the oldest rocks in the area, sandstone, grit and slate of the Upper Proterozoic to Lower Cambrian Hyland Group. These rocks lie in the footwall of the Hyland Valley Fault, a Cretaceous normal fault.



LEGEND

INTRUSIVE ROCKS

- EARLY CRETACEOUS**
Anvil-Cassiar Plutonic Suite
MOUNT BILLINGS BATHOLITH: generally massive but locally foliated medium-grained biotite granodiorite and granite
UPB zircon dates range from 100.8 ± 2.3 to 106.4 ± 0.4 Ma (Helleman, 2004).

YUKON-TANANA TERRANE

CLEAVER LAKE THRUST SHEET

LATE DEVONIAN
Klatta Metamorphic Complex (Devine, 2005)
massive to foliated, dun-weathering, green serpenitized ultramafic rock and lesser foliated greenish white leucogabbro
A 368 ± 10 Ma U-Pb zircon date has been obtained from leucogabbro of this unit in southern Francis Lake map area (Devine, 2005)

MONEY CREEK THRUST SHEET

EARLY MISSISSIPPIAN
Simpson Range Plutonic Suite
weakly to strongly foliated, salmon-colored to grey, medium-grained biotite-hornblende granite to granodiorite
Early Mississippian U-Pb ages have been determined for plutons of this suite elsewhere (Mortensen, 1992; Murphy et al., in press)

BIG CAMPBELL THRUST SHEET

LATE DEVONIAN
grey massive, medium-grained biotite-gabbro (meta-gabbro) and lesser dark green amphibole (metasyenite)
massive to foliated, dun-weathering, green to black serpenitized ultramafic rock

LAYERED ROCKS

YUKON-TANANA TERRANE

CLEAVER LAKE THRUST SHEET

UPPER ORDOVICIAN?, SILURIAN(?) OR DEVONIAN(?)
Klatta Metamorphic Complex (Devine, 2005)
orange-greasy metamorphic rocks contained as blocks within serpenitized ultramafic rocks (see DmMm)
Rock types include variably carbonaceous quartz-muscovite schist and garnet and omphacite-bearing metabasite. Dated zircon extracted from metasilicic rocks are as young as Early Ordovician. U-Pb dating on metamorphic zircon and K-Ar dating on vitreous muscovite indicate that prograde metamorphism and uplift occurred at ca. 364 Ma (Devine, 2005)

MONEY CREEK THRUST SHEET

LOWER PERMIAN
Money Creek Formation
undifferentiated medium to dark grey carbonaceous phyllite, grey and lesser green and pink chert, grey quartzite and mafic greywacke with pebbles conglomerate, chert-quartz wacke and grit

PENNSYLVANIAN-LOWER PERMIAN
Finlayson Creek Limestone
massive to blocky bedded, light to medium grey, light grey-weathering, locally crinoidal limestone
Fossils similar to Early Permian conodonts have been extracted from this unit elsewhere (Murphy et al., in press; Orchard, in press)

UPPER MISSISSIPPIAN-PENNSYLVANIAN
Pu
undifferentiated King Arctic and White Lake formations

PENNSYLVANIAN
King Arctic Formation (Devine, 2005)
undifferentiated green to pale grey, fine- to medium-grained thin arenite, quartz wacke and chert pebble conglomerate, dark grey argillite, chloritic phyllite (faint to intermediate metamorphic rocks)

UPPER MISSISSIPPIAN-LOWER PENNSYLVANIAN
White Lake Formation (Devine, 2005)
undifferentiated green and locally pink, locally magnetite-bearing chert, fine-grained lithic wacke and siltstone, and white to grey locally sandy and crinoidal limestone
massive, dark phyllite and metabasite. Local pebbles conglomerate occur near the top. Conodonts of Serapiulvina age have been extracted from this unit elsewhere (Murphy et al., in press; Orchard, in press)

UPPER MISSISSIPPIAN
Whitetail Limestone
massive to blocky bedded, light to medium grey, light grey-weathering, locally crinoidal limestone
Conodonts of Serapiulvina age have been extracted from this unit elsewhere (Murphy et al., in press; Orchard, in press)

LOWER MISSISSIPPIAN
Ticlitlue River Formation
M
variably foliated and massive, pale green, tan and maroon crystal-tuff breccia, massive micaceous quartzite and locally phyllite, meta-phyllite, local accumulations of green chert, and phyllite-clast conglomerate and grit near base
Early Mississippian U-Pb ages have been determined for this unit elsewhere (Mortensen, 1992; Murphy et al., in press)

UPPER DEVONIAN
Water Creek Formation
siliceous muscovite-quartz schist or phyllite (felsic metavolcanic rock) and lesser chloritic schist or phyllite (intermediate to mafic, metamorphic rock) interstratified with carbonaceous phyllite, massive to ribbon-bedded, green, white and salmon siliceous rock (meta-chert) at top
A number of quartzite and quartzite pebble meta-conglomerate occur near the middle of the succession

BIG CAMPBELL THRUST SHEET

LOWER MISSISSIPPIAN
Wolverine Lake Group
massive to blocky bedded, light to medium grey, light grey-weathering, locally crinoidal limestone
Early Mississippian U-Pb ages have been obtained from this unit elsewhere (Mortensen, 1992; Murphy et al., in press)

UPPER DEVONIAN
Kutz Za Kuyat Formation
undifferentiated foliated leucophae muscovite-quartz schist or phyllite, massive pale siliceous muscovite-quartz schist or phyllite, locally with quartz amygdalite, talciferous and sandy quartz-augen schist or phyllite (meta-porphyr), interbeds of carbonaceous phyllite are common
carbonaceous phyllite and grey quartzite

Fire Lake Formation
Df
massive to blocky bedded, argillaceous-chlorite phyllite or schist, locally with biotite and argillaceous phyllite, lesser carbonaceous phyllite

DHf
tan muscovite-quartz phyllite or schist (felsic metavolcanic rock) and potassium leucophae muscovite-quartz augen phyllite or schist (metaporphyr); locally rusty and pyritic

SLIDE MOUNTAIN TERRANE

UPPER MIDDLE-UPPER PERMIAN

Simpson Lake Group
Ps
red-brown to olive green matrix and framework-supported polymictic conglomerate, pale green sandstone, dark grey siltstone and shale, basalt and felsic volcanic rocks
conglomerate clasts include orthopyroxite basalt, andesite, mafic dioritic phyllite, quartz-mica phyllite, siliceous carbonaceous phyllite, calcarenite, white quartz, chert, serpenitized, bleached and exfoliated (Mortensen et al., 1999; Murphy et al., in press). Middle to late Permian U-Pb zircon ages have been determined for felsic volcanic rocks of this unit (Mortensen et al., 1999)

CARBONIFEROUS (AND OLDER?) PERMIAN

Forty Creek Group
Cp
variably foliated, matrix green and grey, ribbon-bedded to massive chert, medium to dark grey and lesser green and pink schist or phyllite, quartzotoluidinic sandstone, grit and conglomerate and chert-quartz sandstone, grit and conglomerate

NORTH AMERICAN CONTINENTAL MARGIN SEQUENCE

MIDDLE-UPPER TRIASSIC

Jones Lake Formation (Gordy and Anderson, 1993)
Jk
dark brown and grey-weathering, greenish-brown to grey, dental mica-bearing calcareous shale, siltstone, sandstone and siltstone

UPPER DEVONIAN-LOWER MISSISSIPPIAN

Eam Group
Eam
dark grey, black and rusty-weathering non-calcareous shale, siltstone, quartz and chert wacke, and minor chert-pebble conglomerate (Abbott, 1977, 1981)

SILURIAN-DEVONIAN
SDu
undifferentiated dolomite, dolomitic siltstone, dolomitic quartzite and quartzite

UPPER SILURIAN(?) LOWER DEVONIAN

SDc
dark grey, silty, massive to block-bedded, buff-weathering sandy dolomite, dolomitic quartzite (Abbott, 1977, 1981)
Unit may be part equivalent to McNamee Formation of Gabrielle (1998)

SILURIAN
Ss
thinly laminated, brown, grey, and buff-weathering calcareous or dolomitic siltstone, siltstone, calcarenite (Abbott, 1977, 1981)
May be in part equivalent to Sandberg Formation of Gabrielle (1998)

Sq
massive, massive, blue-grey orthoquartzite occurring as lenses within dolomitic siltstone of unit near its base (Abbott, 1977, 1981)
Unit may be in part equivalent to McNamee Formation of Gabrielle (1998)

UPPER CAMBRIAN-LOWER ORDOVICIAN

COu
undifferentiated finely laminated or rubric, calcareous grey and brown phyllite and siltstone, siltstone, calcarenite (Abbott, 1977, 1981)
Unit is transitional lithologically between fine-equivalent Rabbottella and Keelika formations of Silvery Beach and Cassiar Platform, respectively (J.G. Abbott, personal communication, 2005)

LOWER CAMBRIAN

Cl
massive blue-grey, Archeophyllite-bearing limestone occurring as lenses within unit Cs (Abbott, 1977, 1981)

Cs
siltstone, greenish-grey phyllite, brown and grey micaceous and/or calcareous phyllite, black quartzite phyllite, minor granitoid (Abbott, 1977, 1981)

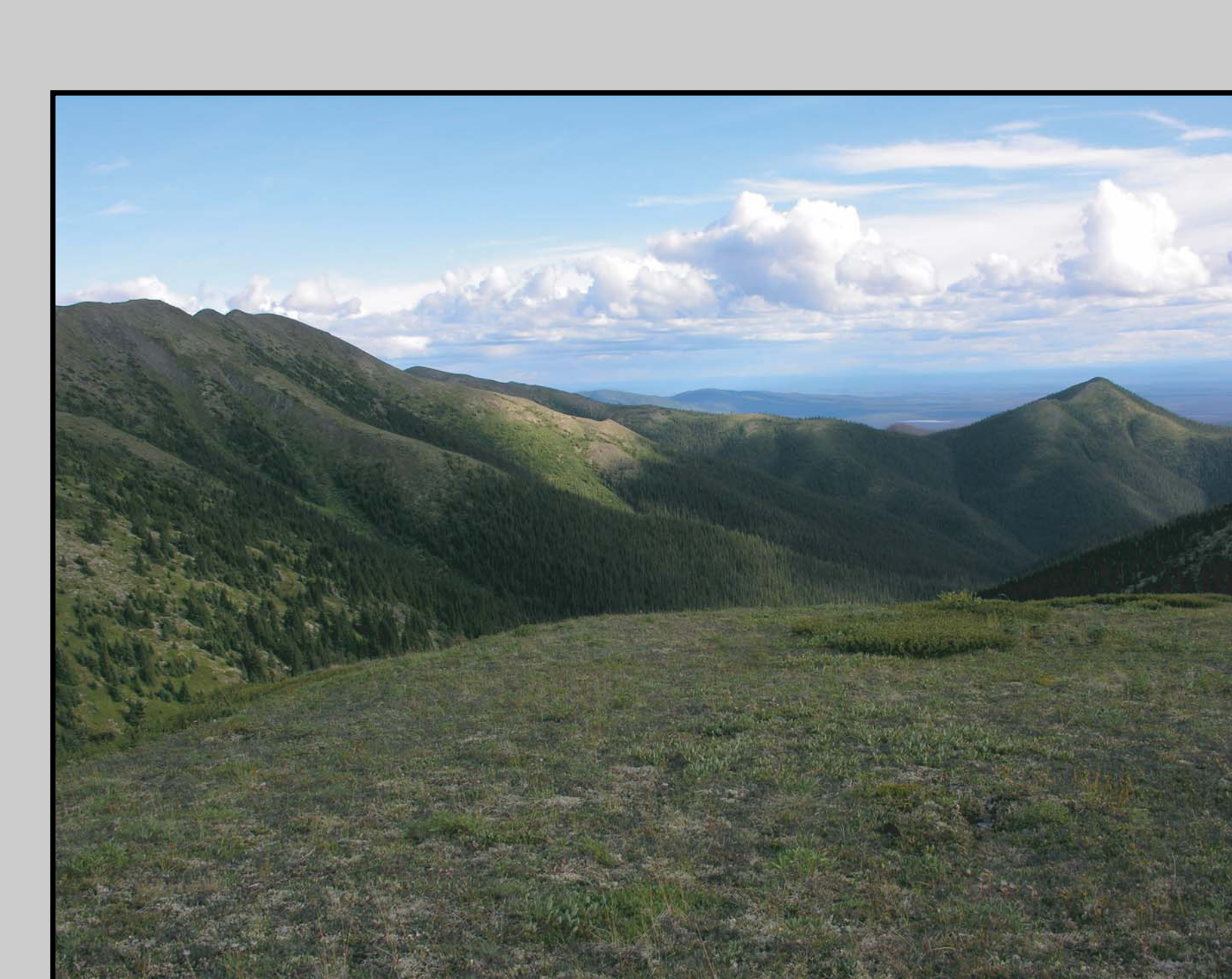
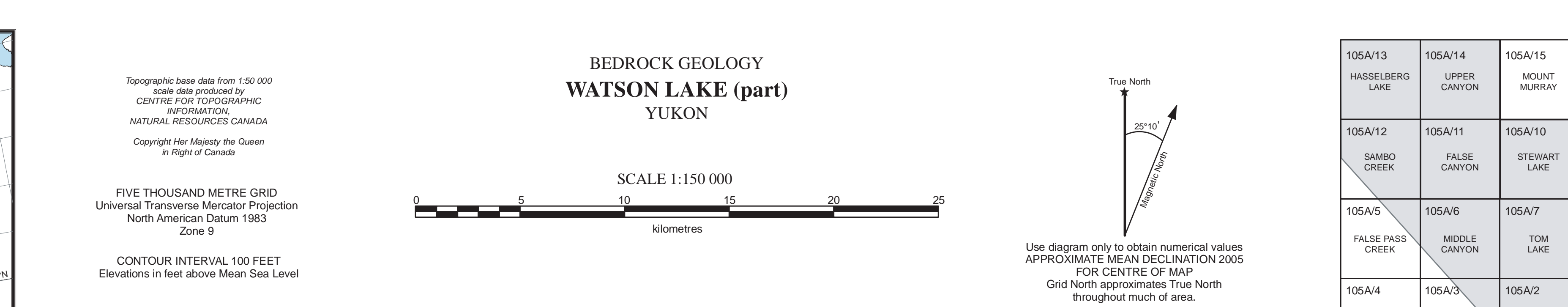
UPPER PROTEROZOIC-LOWER CAMBRIAN

Hyland Group
Hyl
undifferentiated quartzotoluidinic grit and sandstone, slate, massive siliceous limestone, mafic and green slate

SOURCES OF INFORMATION

- Abbott (1977, 1981)
- Cypus Anvil Mining Corporation, 1979-1981; J.K. Mortensen, unpublished data
- D. Murphy, 2005 mapping
- T. Liverton, personal communication

This map brings together data from several sources, indicated above. The majority of the data comes from field notes and maps made during the 1979-1981 regional mapping program conducted by a team of geologists from Cypus Anvil Mining Corporation. Team members included Gregg Allison, Lee Pigeau, Dave Jennings (dec.), and Jim Mortensen. Additional information has been collected since 1981 by Jim Mortensen. Grant Abbott mapped the area around the Sa Denia Hes Mine for his 1977 M.Sc. thesis. Tim Liverton kindly made available his observations from the northwestern corner of the map area. 1:50 000-scale mapping in selected areas was done by Don Murphy in 2005.



Southward view across Peninsular strata showing the poorly exposed Liard Plain and the Cassiar Mountains in the distance

MINERAL OCCURRENCES

Yukon MINFILE (Dobson and Traynor, 2005)

MINFILE #	NAME	STATUS	COMMODITY	DEPOSIT TYPE
105A 004	Windfall	unknown		unknown
105A 005	Watson	drilled prospect	Zn, Pb, Ag	vein
105A 006	Naso	drilled prospect	Ag, Pb, Zn	vein
105A 007	Carol	drilled prospect	coal	coal
105A 008	Albert	drilled prospect	coal	coal
105A 009	Sawmill	showing	coal	coal
105A 010	Carriage	anomaly		unknown
105A 011	Sa Denia Hes	underground past	Ag, Zn, Pb	skarn
105A 012	North Hill	producer		skarn
105A 013	Rico, North Hill, Mt. Handerson, Sa Denia Hes	underground past	Pb, Ag, Zn	skarn
105A 014	Rough	unknown		unknown
105A 015	Simpson, Simpson	unknown		unknown
105A 016	Leisz	unknown		unknown
105A 025	Mymryk	unknown		unknown
105A 031	Pian	unknown		unknown
105A 034	Howard	unknown		unknown
105A 037	Dods	prospect	coal	coal
105A 038	Shell	anomaly		unknown
105A 040	Shall	anomaly		unknown
105A 041	Pug	unknown		unknown
105A 043	Glimmer	anomaly		unknown
105A 044	Highway	anomaly		unknown
105A 045	Jewel	unknown		unknown
105A 047	Sambro, Simpson	prospect	Ag, Pb, Cu,	skarn
105A 048	Itch	anomaly	Zn	skarn
105A 049	Little Jimmy	showing		unknown
				volcanogenic massive sulphide

FOSSILS

Map Number	GSC Number	Material	Map Unit	Age Range	Reference
1	C-068289	pollen	TqB	Late Eocene	Poulton et al. (2003)
2	C-068701	conodonts	TqB	Middle Triassic (Ladrian)	Orchard (in press)
3	C-068702	conodonts	TqB	Middle Triassic (Ladrian)	Orchard (in press)
4	O-075640	conodonts	TqB?	Ordovician-Silurian	Poulton et al. (2003)
5	C-068368	conodonts	TqB?	Late Devonian	M.J. Orchard (unpub.)
6	C-303414	conodonts	Ps	Permian	Orchard (in press)
7	C-303415	conodonts	Ps	probably Permian	Orchard (in press)
8	C-102798	conodonts	PPf	Late Carboniferous (Bashkirian)	Orchard (in press)
9	C-026571	conodonts	DMe	probably Devonian	Poulton et al. (2003)
10	C-068357	conodonts	DMe	Middle to Late Devonian	M.J. Orchard (unpub.)
11	C-026569	conodonts	SDc	Early Devonian	Poulton et al. (2003)
12	C-026570	conodonts	SDc	Early Devonian	Poulton et al. (2003)
13	C-116326	conodonts	SDc	Early-early Middle Devonian	M.J. Orchard (unpub.)
14	C-026576	graptolites	Ss	late Emsian-early Eifelian (Landroveroy or Wienlock)	Abbott (1977)
15	C-026579	graptolites	Ss	Ordoevian-Early Devonian	Abbott (1977)
16	C-026578	archoeyathids	Cl	Early Cambrian	Abbott (1977)
17	C-026572	archoeyathids	Cl	Early Cambrian	Abbott (1977)
18	C-026573	archoeyathids	Cl	Early Cambrian	Abbott (1977)
19	C-026574	archoeyathids	Cl	Early Cambrian	Abbott (1977)
20	C-026575	archoeyathids	Cl	Early Cambrian	Abbott (1977)
21	C-089874	archoeyathids	Cl	Early Cambrian	Poulton et al. (2003)

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RECOMMENDED CITATION

MORTENSEN, J.K. and MURPHY, D.C. (comp.), 2005. Bedrock geological map of part of Watson Lake area (all or part of NTS 105A/2, 3, 5, 6, 7, 10, 11, 12, 13, 14), southeastern Yukon, (1:150 000 scale). Yukon Geological Survey, Open File 2005-10

Digital cartography and drafting by Donald Murphy, with the assistance of Chyn Bruce and Amy Stuart, all of Yukon Geological Survey.

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Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

Paper copies of this map, the accompanying report and Yukon MINFILE may be purchased from Geoscience Information and Sales, c/o Whitehorse Mining Recorder, Energy, Mines and Resources, Yukon Government, Room 102 - 300 Main St., Whitehorse, Yukon, Y1A 2B5. Ph. 867-667-5200, Fax. 867-667-5150. Email: geosales@gn.gc.ca

A digital PDF (Portable Document File) file of this map may be downloaded free of charge from the Yukon Geological Survey website: <http://www.geology.gov.yk.ca>.

Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Open File 2005-10
Bedrock geological map of part of Watson Lake area (all or part of NTS 105A/2, 3, 5, 6, 7, 10, 11, 12, 13, 14), southeastern Yukon, (1:150 000 scale)

compiled by
James K. Mortensen and Donald C. Murphy

Mineral Potential, Watson Lake Area

VMS Potential, Yukon-Tanana Terrane

Favourable Stratigraphy

Upper Devonian and Lower Mississippian rock of Yukon-Tanana terrane host several volcanogenic massive sulphide (VMS) deposits in Finlayson Lake area north and west of Watson Lake. As the same formations (Fire Lake, Kudz Ze Kayah and Wolverine Lake in the footwall of the Money Creek Thrust, and Waters Creek in the hanging wall) underlie the northwest corner of the Watson Lake area, this area is considered to be prospective for VMS deposits.

Yukon MINFILE occurrence 105A 048 (Itch) is within a poorly exposed carbonaceous phyllite-dominant member of the Kudz Ze Kayah formation. Felsic metavolcanic rocks overlying this member have yet to be examined.

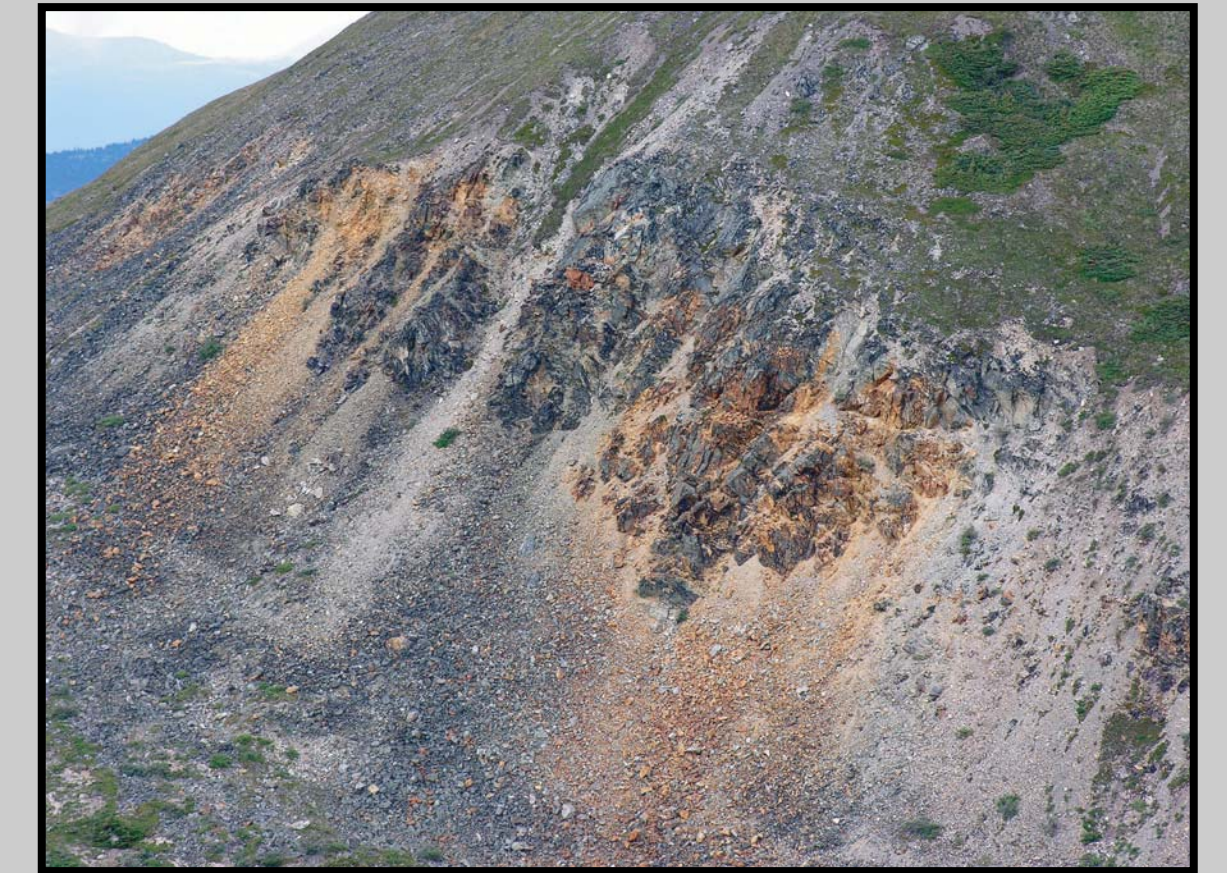
Yukon MINFILE occurrences 105A 047 (Sambo) and 049 (Little Jimmy) occur in felsic and intermediate metavolcanic rocks of the Waters Creek formation. Polymetallic mineralisation typical of Kuroko-style VMS deposits were discovered at both occurrences. The Waters Creek formation may underlie an unmapped, poorly exposed part of Watson Lake area between Hasselberg and Sambo creeks.

Tuchitua River Formation - A New VMS Target?

The lower part of the Tuchitua River Formation is locally marked by a laterally discontinuous cobble to boulder conglomerate facies that underlies pistachio-green silicified and pyritic rhyolite. Conglomerate may mark local graben structures whose bounding structures controlled subsequent volcanism and alteration.



Boulder conglomerate at base of Tuchitua River formation



View to east of altered pyritic rhyolite overlying conglomerate (outcrop location: 468652E, 6742655N, NAD83)

Other VMS Targets?

Mafic to intermediate and lesser felsic metavolcanic rocks also occur within the generally poorly exposed Pennsylvanian White Lake and King Arctic formations. These formations underlie much of the central part of the map area west of the Simpson Lake fault. Yukon MINFILE occurrences 105A 011, 015, 043, and 044, are within these rocks.

Other Deposit Types?



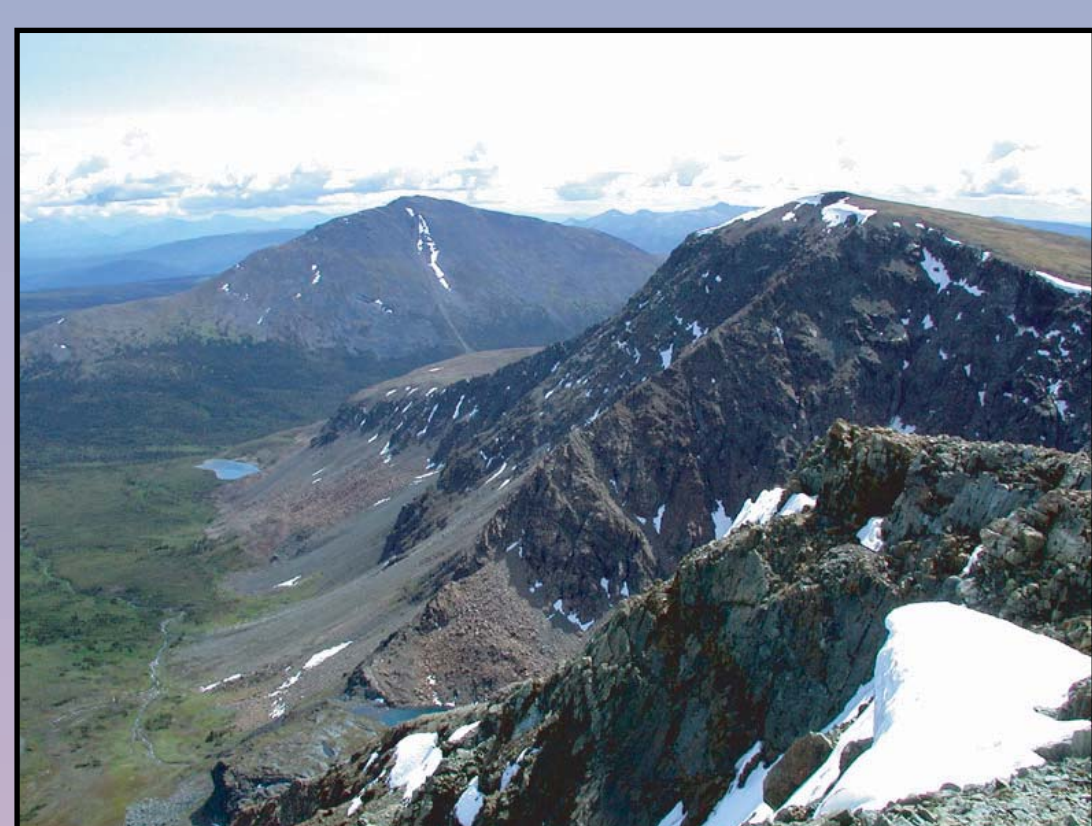
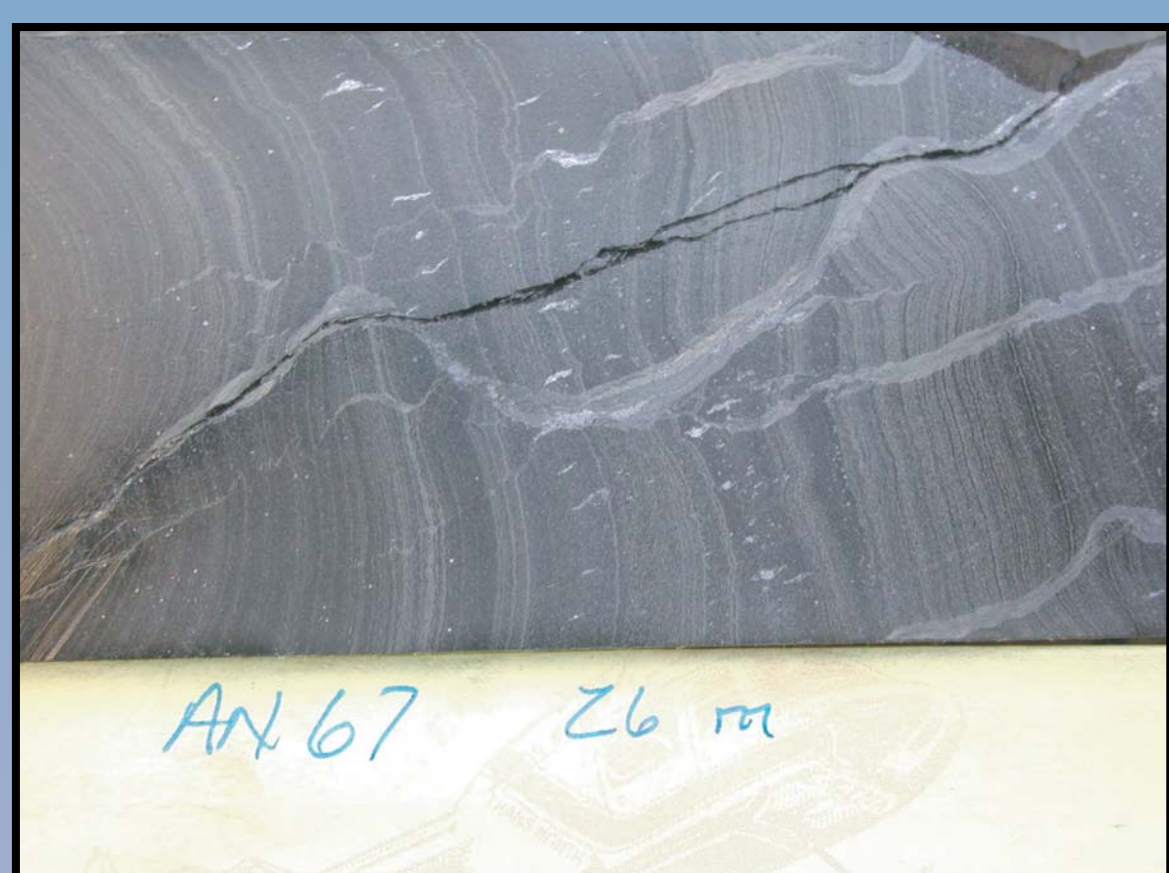
INTRUSION-RELATED: Mississippian granite and quartz monzonite of the Simpson Range Plutonic Suite; mid-Cretaceous granite

SEDEX: carbonaceous shale/phyllite and chert-pebble conglomerate-bearing units in Yukon-Tanana terrane (Money Creek formation), Slide Mountain terrane (Fortin Creek group) and North American continental margin sequence (Earn Group)

EMERALDS: mafic metavolcanic and ultramafic metaplutonic rocks in Fire Lake formation in northwest corner of area; Cretaceous granite just outside area to west

EPITHERMAL: potential for Grew Creek-like epithermal deposits in poorly exposed Tertiary graben along the Tintina Fault

COAL: several occurrences in Tertiary graben along the Tintina Fault



Thanks Dejan
(and Amber too, but I don't have a picture...)