LEGEND

QUATERNARY

Q — **QUATERNARY:** *unconsolidated glacial, glaciofluvial and glaciolacustrine deposits; fluviatile silt, sand, and gravel, and local volcanic ash, in part with cover of soil and organic deposits*

IGNEOUS ROCKS

LATE CRETACEOUS(?)

LKg — **McQUESTEN SUITE?:** *medium-grained, pegmatitic, miarolitic, leucocratic fluorite-rich, muscovite, biotite granite; granodiorite (67-63 Ma) (only in 106D/1 and 106C/4)*

MIDDLE TRIASSIC

TrG — **GALENA SUITE:** *massive, dark grey weathering, medium-grained hornblende gabbro sills and dikes intruding Earn Group (ca. 234-228 Ma)*

PALEOZOIC(?)

Pg — *dark green to black, fine to medium-grained gabbro, pyroxenite*

Pum — *bright green to black serpentinite; orange to brown weathering listwaenite, commonly contains fuschite*

MESOZOIC ROCKS

MIDDLE TO UPPER TRIASSIC

TrJl — **JONES LAKE FORMATION:** *recessive, buff to grey weathering, black sooty limestone; calcareous and non-calcareous, micaceous black shale; dark grey non-calcareous silty shale at base of sequence*

TrJs — **JONES LAKE FORMATION:** *recessive, non-calcareous grey slate and shale; recessive, buff to grey weathering calcareous black shale, micaceous, calcareous siltstone and sandstone (may include Lower Jurassic strata locally)*

PALEOZOIC PLATFORM ROCKS

ORDOVICIAN TO DEVONIAN?

ODb — **BOUVETTE FORMATION:** *resistant, generally well-bedded to massive, grey weathering variably dolomitized carbonate; locally fossiliferous; locally contains black diagenetic chert*

SILURIAN TO MIDDLE DEVONIAN

SDc — *thick-bedded to massive light grey dolostone and limestone. Dark grey fetid limestone containing "two hole" and "star" crinoids near top of unit*

SILURIAN (LLANDOVERY-WENLOCK)

Sv — *dark green to brown weathering vesicular basalt; carbonate-cemented hyaloclastic breccia; volcanic sandstone, grit and pebble to cobble conglomerate in platform carbonate hosting Rau (Tiger) deposit in 106D/1*

ORDOVICIAN TO SILURIAN?

OSs — *rusty brown weathering, medium-grained, planar laminated sandstone, siltstone*

ORDOVICIAN TO SILURIAN

OSc — *thin to medium-bedded, grey and buff weathering, silty limestone; massive, white limestone; well bedded, pale yellow and grey limestone in upper part of unit*

UPPER CAMBRIAN TO LOWER ORDOVICIAN

COc — *massive, pale grey dolostone; oncolitic dolostone; minor quartzite and sandy dolostone*

UPPER CAMBRIAN

uCT — **TAIGA FORMATION?:** *finely laminated to thinly bedded grey and black dolostone; massive to well bedded, medium grey, pinkish grey dolostone*

NEOPROTEROZOIC (EDIACARAN) TO LOWER CAMBRIAN

PCc — *massive, pale grey limestone*

PALEOZOIC OFFSHELF ROCKS

UPPER MISSISSIPPIAN TO LOWER PERMIAN

CPps — *dark grey shale interbedded with laminated quartz sandstone and thick-bedded, massive, fine-grained quartzite; buff and green phyllite; minor grey chert*

CPl — *thick-bedded, buff and grey weathering, dark grey limestone; locally interbedded with shale; basal third of unit contains abundant crinoids and fragments of other megafossils, and grit and chert-pebble conglomerate*

CPcg — *chert-pebble conglomerate, silica cemented in some places and carbonate cemented in others*

CARBONIFEROUS TO PERMIAN

CPMC — **MOUNT CHRISTIE FORMATION?:** *greenish-grey, pink and dark grey shale; light grey-green to black chert; minor sandstone, limestone*

CPMCc — **MOUNT CHRISTIE FORMATION?:** *thin to medium bedded, greenish-grey to black chert; greenish-grey and grey shale*

MISSISSIPPIAN

MT — **TSICHU GROUP (KENO HILL QUARTZITE):** *light to dark grey, thick bedded to massive, vitreous quartzite; black shale*

MISSISSIPPIAN

Mc — *light to medium grey, well-bedded limestone, locally very fossiliferous; contains large crinoids*

UPPER DEVONIAN TO LOWER MISSISSIPPIAN

DME — **EARN GROUP (undivided):** *brown-weathering, dark grey to black shale, chert, minor sandstone, siltstone; minor limestone; chert-pebble conglomerate and sandstone; locally bedded barite*

DMEc — **EARN GROUP?:** *bioclastic limestone, conglomerate, common chert pebble, crinoids and coral fragments (debris flow deposit in Earn Group shale)*

DMEp — **EARN GROUP, PREVOST FORMATION?:** *dark grey to black shale, white siltstone and sandstone*

DMvm — **EARN GROUP?:** *light to dark green weathering, vesicular basalt, locally pillowed; mafic lapilli tuff, volcanic breccia and volcanic sandstone; greenstone; minor light green quartz-feldspar porphyry*

DMvf — **EARN GROUP?:** *dark grey to buff weathering, dark grey foliated aphanitic felsic volcanic rocks, foliated quartz porphyry; intermittent buff weathering limestone near top of unit near Marg deposit (Minfile 106D 009)*

MIDDLE TO UPPER DEVONIAN

DEplc — **EARN GROUP, PORTAIT LAKE FORMATION?:** *grey limestone*

DEpl — **EARN GROUP, PORTAIT LAKE FORMATION:** *brown-weathering, dark grey to black shale; grey, black and grey-green, medium-bedded chert*

MIDDLE DEVONIAN (EIFELIAN)

mDc — *light grey crinoidal limestone, contains "two-hole" and "star" crinoids*

ORDOVICIAN TO SILURIAN?

OScs — *buff weathering, medium-grained calcareous sandstone and sandy limestone/dolostone; locally gritty and very fossiliferous*

OSc — *thin to medium-bedded, grey and buff weathering, silty limestone; massive, white limestone*

ORDOVICIAN TO LOWER DEVONIAN

ODRR — **ROAD RIVER GROUP:** *black shale, locally graptolitic; black limestone*

CAMBRIAN TO ORDOVICIAN

COv — **MARMOT GROUP?:** *dark green to black volcaniclastic sandstone and cobble to boulder conglomerate; dark brownish-grey weathering basalt, locally pillowed; black, hyaloclastic breccia*

Mississippian limestone infolded with black shale of the Devonian-Mississippian Earn Group, view to the east; eastern 106C/1.

NEOPROTEROZOIC-CAMBRIAN ROCKS IN HANGING WALL OF DAWSON THRUST

LOWER TO MIDDLE CAMBRIAN

CGLvc — **GULL LAKE FORMATION?:** *brown-weathering, green volcanic sandstone, siltstone; locally gritty; conglomerate with mud chips; local orange weathering dolostone bands*

NEOPROTEROZOIC (EDIACARAN) TO LOWER CAMBRIAN

PCHn — **HYLAND GROUP, NARCHILLA FORMATION:** *maroon and green shale and siltstone, locally bioturbated; locally grey, brown shale; locally black gritty sandstone; locally green and white sandstone; yellowish-buff weathering dolomitic limestone. Note: maroon shale typical of the Narchilla Formation also occurs locally below or within dolomitic limestone of the Algae Formation*

NEOPROTEROZOIC (EDIACARAN)

PHa — **HYLAND GROUP, ALGAE FORMATION:** *light grey to yellowish-buff weathering dolomitic limestone and dolostone, variably dolomitized and variably silty/sandy; locally fine-grained, dolomitic sandstone; commonly graded and cross-bedded; local occurrence of Ediacaran fossils; minor grey and/or maroon shale; local debris flow units: generally limestone pebble to cobble breccia and conglomerate; some polymictic breccia, locally boulder-size*

PHy — **HYLAND GROUP, YUSEZYU FORMATION:** *brownish-grey sandstone and grit (pebbly sandstone), calcareous near top of unit; brown, grey, olive green and locally maroon shale and siltstone; locally quartz pebble conglomerate*

NEOPROTEROZOIC-CAMBRIAN ROCKS IN FOOTWALL OF DAWSON THRUST

CAMBRIAN

Csh — *recessive, dark grey, black to brown weathering, thin bedded silty limestone*

Cs — *moderately resistant, thin bedded, blue-grey siltstone and sandstone; brown weathering, dark grey-green bioturbated, weakly laminated siltstone and arkose; local limestone near base of unit*

NEOPROTEROZOIC (EDIACARAN) TO LOWER CAMBRIAN

PCHnq — **HYLAND GROUP, NARCHILLA FORMATION?:** *buff weathering, locally calcareous quartzite*

PCHn — **HYLAND GROUP, NARCHILLA FORMATION:** *maroon and green shale and siltstone, locally bioturbated; locally grey, brown shale; locally green and white sandstone; yellowish-buff weathering dolomitic limestone.*

NEOPROTEROZOIC (EDIACARAN)

PHa — **HYLAND GROUP, ALGAE FORMATION:** *light grey to yellowish-buff weathering dolomitic limestone and dolostone, variably dolomitized and variably silty/sandy; locally fine-grained, dolomitic sandstone; commonly graded and cross-bedded; minor grey and/or maroon shale; local debris flow units: generally limestone pebble to cobble breccia and conglomerate; some polymictic breccia, locally boulder-size*

PSs — **"STENBRATEN ASSEMBLAGE", UPPER:** *"upper mixed clastic sequence" - brown-weathering, grey shale and siltstone; minor sandstone and grit; rhythmically bedded, brown-weathering, grey limestone and shale; calcareous shale; thinly-bedded, grey limestone (possibly correlative with Blueflower formation of Windermere Supergroup?)*

PSl — **"STENBRATEN ASSEMBLAGE":** *brown-weathering, platy siliceous limestone*

PSq — **"STENBRATEN ASSEMBLAGE":** *grey, medium-bedded quartzite*

PSc — **"STENBRATEN ASSEMBLAGE", LOWER:** *"carbonate marker" - grey, buff, tan, and orange-weathering dolostone, dolomitic sandstone and limestone, commonly planar and/or cross laminated; calcareous shale and siltstone; maroon shale; carbonate-clast diamictite and conglomerate; pink-weathering siltstone at base of unit (possibly correlative with Gametrail formation of Windermere Supergroup?)*

PNu — **"NADALEEN ASSEMBLAGE", UPPER:** *orange-weathering, greenish-brown rhythmically bedded fine-grained sandstone, siltstone, mudstone; polymicitc diamictite, conglomerate (carbonate and quartzite pebble to cobble); maroon and green fine-grained sandstone-siltstone-mudstone*

PNl — **"NADALEEN ASSEMBLAGE", LOWER:** *brownish-grey siltstone, mudstone, limestone; rhythmically, thin to medium-bedded mudstone and limestone; local pink-grey quartz sandstone and quartzite; calcareous grit and sandstone (possibly equivalent to Sheepbed formation of Windermere Supergroup?)*

PNbl — **"NADALEEN ASSEMBLAGE", LOWER:** *black crystalline limestone*

PNq — **"NADALEEN ASSEMBLAGE", LOWER:** *pink-grey, quartz arenite and grit; quartzite*

PNc — **"NADALEEN ASSEMBLAGE", LOWER:** *grey limestone*

PNd — **"NADALEEN ASSEMBLAGE", LOWER:** *diamictite, conglomerate (debris flow deposit); clasts of carbonate and quartzite, pebble to boulder, locally megaclasts up to 100 m long in carbonate matrix; matrix locally sandy; grey limestone*

PNw — **"NADALEEN ASSEMBLAGE", BASAL:** *black, grey, and greenish quartz wacke, quartz-pebble conglomerate, siltstone, mudstone*

OTHER PROTEROZOIC UNITS NORTH OF KATHLEEN LAKES FAULT

NEOPROTEROZOIC (CRYOGENIAN)

Pcg — **RAPITAN GROUP?:** *green and orange weathering, polymictic cobble conglomerate; clasts include: dolostone, limestone, shale and chert; fine to coarse-grained sandstone, siltstone*

PRc — **RAPITAN GROUP?:** *dark grey weathering limestone with discontinuous diagenetic black chert*

PRs — **RAPITAN GROUP?:** *red-brown to purple weathering, medium to thick-bedded, medium-grained wacke, siltstone, carbonate, grit*

NEOPROTEROZOIC (TONIAN)

PP — **PINGUICULA GROUP?:** *chocolate to orange-brown weathering, cryptalgal laminated, medium to thick-bedded dolostone; rusty-brown weathering, olive-green siltstone and shale; lesser maroon, buff and black shale*

PALEOPROTEROZOIC

mPGL — **GILLESPIE LAKE GROUP?:** *thinly laminated to thinly bedded, orange weathering, greenish-grey silty limestone, dolostone, and calcareous silty shale*

SYMBOLS

geologic contacts (defined, approximate, inferred, covered).....

fault; movement not known (defined, approximate, inferred, covered).....

thrust fault (defined, approximate, inferred, covered).....

normal fault (defined, approximate, inferred, covered).....

anticline (upright, overturned).....

syncline (upright, overturned).....

bedding (S_0; inclined, upright, overturned, vertical)..... 34 12 54

penetrative pressure-solution cleavage (S_1; inclined, vertical)..... 75

spaced cleavage (S_2; inclined, vertical)..... 83

intersection lineation (S_0^S_1) (vergence: m, s, z, unknown)..... 23 12 6 10

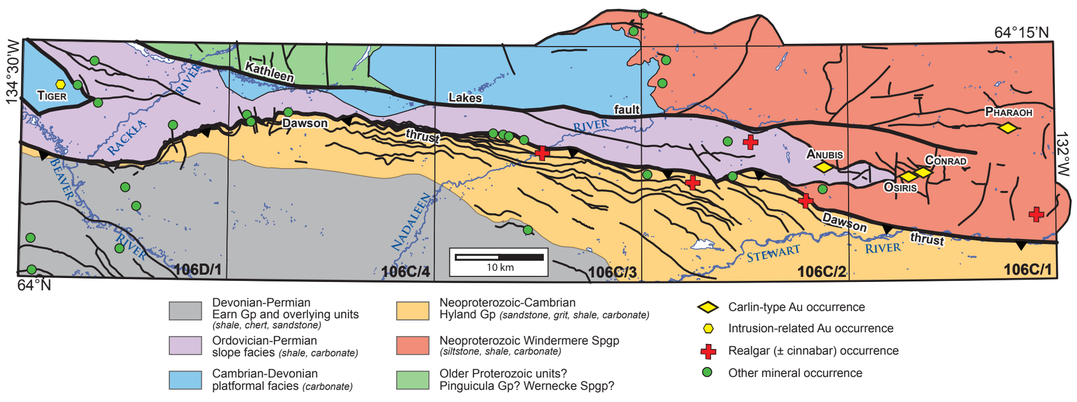
fold axis (vergence: m, s, z, unknown)..... 23 10 7 40

mineral lineation..... 10

field station.....

apparent dip of bedding in cross section.....

apparent dip of cleavage in cross section.....



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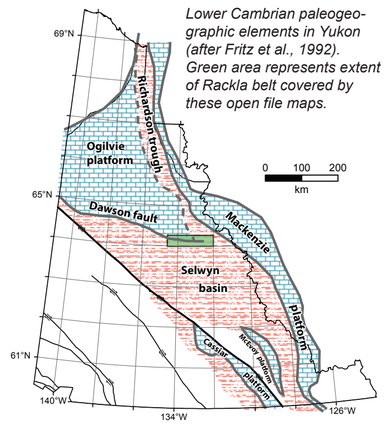
GEOLOGICAL NOTES



Lower Cambrian paleogeographic elements in Yukon (after Fritz et al., 1992). Green area represents extent of Rackla belt covered by these open file maps.

The Rackla belt of east-central Yukon straddles the northern edge of Selwyn basin, where Neoproterozoic to Triassic rocks of the basin are juxtaposed against Paleozoic and older slope and shelf rocks of the Ogilvie platform along the Dawson thrust zone. The area is host to a variety of mineral occurrences, including significant recent discoveries of Carlin-type gold mineralization.

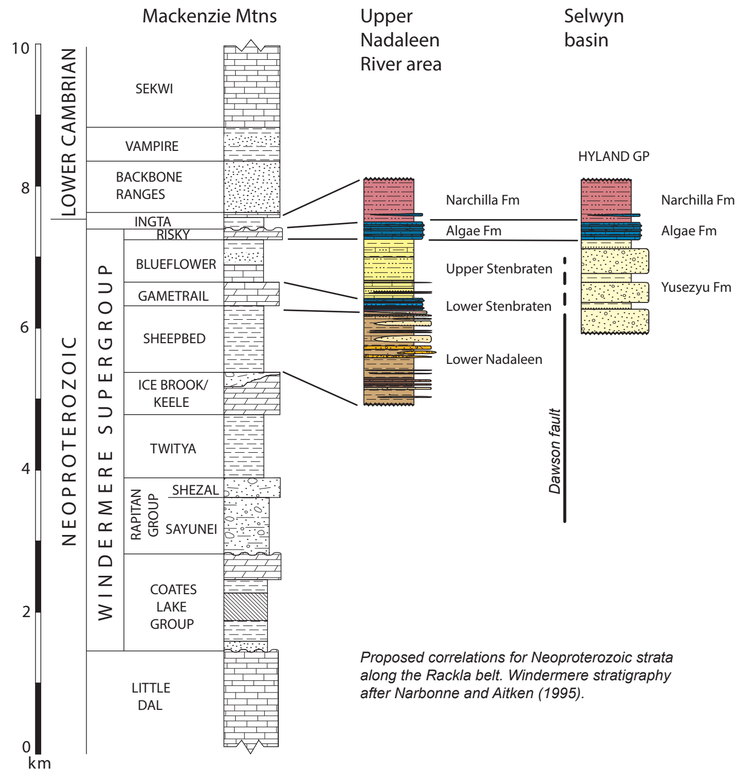
The geology of the Rackla belt can be divided into 5 stratigraphic and facies domains. The southern part of the area, in the hanging wall of the Dawson thrust, is underlain by typical Selwyn basin stratigraphy. The oldest units belong to the Neoproterozoic to Lower Cambrian Hyland Group, including thick sections of coarse sandstone and shale (Yusezyu Fm), and abundant carbonate turbidite, local debris flow units (Algae Fm), and maroon shale (Narchilla Fm). These rocks are unconformably overlain by shale, chert, and sandstone of the Earn Group, which are in turn overlain by Carboniferous to Triassic strata. In the western part of the Rackla belt, strata of the Earn Group locally contain significant occurrences of volcanic rocks, including host rocks to the Marg deposit (Cu-Pb-Zn-Ag-Au VMS, 3.96 MT, in 106D/1; Minfile 106D 009). In the same region, Earn Group strata are locally extensively intruded by Triassic gabbro sills.

Stratigraphy in the footwall (north) of the Dawson thrust zone is, for the most part, correlative with that of Selwyn basin to the south, but generally of very different facies. Neoproterozoic rocks are predominant in the eastern part of the Rackla belt, near the headwater of the Nadaleen River, and host most of the Carlin-type gold mineralization discovered to date (Osiris, Isis, Conrad, and Pharoah zones; 106C/1). They generally consist of fine-grained siliciclastic and carbonate rocks, including two prominent carbonate marker horizons and locally abundant debris flow deposits. The lower carbonate marker divides this sequence into two informal successions, the Nadaleen and Stenbraten assemblages. Occurrences of Ediacaran fossils in this sequence confirm its late Neoproterozoic age and suggest correlation with the upper part of the Windermere Supergroup in the Mackenzie Mountains (Sheepbed-Gametrail-Blueflower-Risky?). The upper carbonate marker is overlain by maroon shale; this carbonate/shale sequence is identical to the upper part of the Hyland Group (Algae and Narchilla formations), thereby providing a stratigraphic tie across the Dawson fault, and broad correlations between Windermere and Hyland strata (see correlation diagram below).

Paleozoic rocks north of the Dawson thrust are generally divided into shelf and offshelf facies by the Kathleen Lakes fault, an enigmatic structure that parallels the Dawson thrust to the north along the length of the Rackla belt. North of the Kathleen Lakes fault, predominantly well-bedded carbonate shelf rocks of Cambrian to Devonian age overlie the Neoproterozoic stratigraphy of the upper Nadaleen River area in the east (106C/1-2), and older Proterozoic rocks of the Wernecke Supergroup and Pinguicula and Rapitan(?) groups in the west (106C/4 and 106D/1). Platformal carbonate rocks also occur locally south of the Kathleen Lakes fault in 106C/4 and 106D/1. The Tiger Au deposit (798,000 oz Au, indicated and inferred resource) is hosted in Silurian-Devonian carbonate intercalated with basalt that occur in a window (or horst) in the northwest corner of 106D/1; it is probably related to the nearby 63 Ma Rackla pluton (Kingston *et al.*, 2010; Thiessen *et al.*, 2012).

Paleozoic rocks between the Kathleen Lakes and Dawson faults consist predominantly of offshelf carbonate and shale of Cambrian to Permian age; they commonly include mixed siliciclastic, bioclastic, and debris flow deposits. This offshelf belt of Paleozoic rocks terminates abruptly to the east across a series of north-trending faults that bound stratigraphic and structural panels in the vicinity of known Carlin-type mineralization. Recent discovery of high-grade gold mineralization at the Anubis zone (eastern 106C/2) occurs in Middle Devonian carbonate near the east end of the Paleozoic offshelf belt.

Significant changes in thickness of Neoproterozoic strata across north-trending faults in the upper Nadaleen River area suggest that these structures are in part syn-sedimentary faults that were likely reactivated in Paleozoic and younger time. Similarly, changes in Neoproterozoic-Paleozoic stratigraphy across the Dawson and Kathleen Lakes faults indicate a compound history for these structures possibly beginning in the Neoproterozoic, with reactivation during the Paleozoic and again during development of Mesozoic (Cretaceous?) fold-and-thrust structures along the Rackla belt. Displacement along both the Kathleen Lakes and Dawson faults appears to decrease eastward.



Proposed correlations for Neoproterozoic strata along the Rackla belt. Windermere stratigraphy after Narbonne and Aitken (1995).

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Digital cartography and drafting by Maurice Colpron, Yukon Geological Survey.

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Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Open File 2013-13

Geological map of the Rackla belt, east-central Yukon (NTS 106C/1-4, 106D/1) (1:50 000 scale)

Legend

by

Maurice Colpron, David Moynihan, Steve Israel, and Grant Abbott