CANADIAN GEOSCIENCE MAP 292 Descriptive Notes (continued) **Descriptive Notes** INTRODUCTION The Late Cretaceous Carmacks Group (unit uKC: ca. 70–69 Ma), is present in the very northeast corner of the map Rhyolite Creek complex (units PRC1, PRC2) Bedrock exposure in this partially glaciated terrain (Duk-Rodkin, 1999) forms broad upland ridges that are dominated by area. It comprises an intermediate to mafic volcanic and volcaniclastic lower sequence, and a more mafic, flow-Felsic rocks; tan to cream rhyolite to rhyodacite dykes, flows, extensive frost-shattered felsenmeer. Outcrops are rare in the heavily forested valleys, but are locally found along dominated upper sequence. PRC1 sills, crystal and ash tuff; smoky quartz±feldspar porphyritic; stream cuts. Bedrock geology of Mount Nansen-Nisling River area consists primarily of metamorphosed and poly-The Paleogene Rhyolite Creek complex (unit PRC; ca. 59-56 Ma: N. Joyce, unpublished data; J. Crowley, locally flow-banded. unpublished data) constitute small erosional remnants of felsic and intermediate volcanic and hypabyssal rocks deformed Paleozoic basement intruded and overlapped by relatively little-deformed Mesozoic and Cenozoic successions. The present work has benefitted from observations outlined in Tempelman-Kluit (1974), Carlson (1987). dominantly in the southwest part of the area, sparsely dotted occurrences across the remainder of the area. The felsic Intermediate to mafic rocks; grey green to mauve andesitic to Ryan et al. (2013a; 2013b), Israel et al. (2011), Israel and Westberg (2011), and Klocking et al. (in press). Extension of PRC2 dacite tuff breccia, massive flows, dykes and sills; rocks are predominant and comprise smoky quartz±feldspar porphyritic, and locally flow-banded tan to cream rhyolite to geological elements beneath cover is greatly aided by aeromagnetic data (e.g. Hayward et al., 2012). rhyodacite dykes, flows, sills, crystal and ash tuff. Intermediate to mafic rocks are less abundant and comprise grey plagioclase-hornblende porphyritic. green to mauve plagioclase-hornblende porphyritic andesitic to dacite tuff breccia, massive flows, dykes and sills. Two Ruby Range suite: fine to medium grained, unfoliated light GEOLOGICAL FRAMEWORK samples from this suite in the map area yielded ages between 57–58 Ma (W. McClelland, unpublished data). grey to pinkish biotite±hornblende granodiorite; with Yukon-Tanana Terrane The Ruby Range suite (unit PR) is characterized by fine to medium grained, unfoliated light grey to pinkish distinctive smoky grey quartz; coeval with Rhyolite Creek The west side of the map area is dominantly underlain by polydeformed and metamorphosed Yukon-Tanana terrane biotite±hornblende granodiorite with typical smoky grey quartz and is coeval with the Rhyolite Creek complex. volcanic plutonic complex; more hypabyssal in appearance (YTT), made up mainly of the pre-Devonian Snowcap assemblage. The Snowcap assemblage is characterized by here than where more extensively exposed through the Ruby STRUCTURAL GEOLOGY amphibolite facies quartzite, micaceous quartzite and psammitic quartz-muscovite-biotite (± garnet) schist (unit PDS1) Range to the southwest. The structural geology of the map area is typical of the Yukon-Tanana terrane in western Yukon and is characterized by and rare, decametre-thick lenses of marble (unit PDS2). Common massive amphibolite and lesser garnet amphibolite UPPER CRETACEOUS (unit PDS3) are interpreted as metamorphosed mafic sills and dykes. at least two phases of isoclinal folding and development of transposition foliation. The main foliation observed in these More prominent and extensive occurrences of amphibolite across the map are correlated to the Devonorocks developed at upper greenschist-amphibolite facies conditions and may represent a second generation fabric. This Carmacks Group: dominantly upper Carmacks Group, locally Mississippian Finlayson assemblage (unit DMF1). This unit is characterized by strongly foliated and compositionally ncludes lower Carmacks Group: dark green to dun basalt, regionally pervasive foliation is present in Permian and older rocks, and may have developed in the Late Permian (e.g. basaltic andesite, trachy-andesite and andesite flows, sills, layered amphibolite and garnet amphibolite. It locally interdigitates with the Snowcap assemblage and can be difficult to Berman et al., 2007). This dominant foliation is itself deformed locally by less pervasive open F3 and F4 folds. The and tuff-breccia: clinopyroxene-, orthopyroxene-, olivinecontrast in deformation character between the Stikine suite, the Long Lakes Suite and the Mississippian to Permian distinguish from unit PDs3. These rock types are typically spatially associated with the Simpson Range suite (see and/or hornblende-porphyrition following). We interpret a metafelsite (unit DMF3) spatially associated with amphibolite as derived from a Finlayson rocks indicates that the main foliation in the Paleozoic rocks is pre-Late Triassic, and a weak to moderate foliation in the Stikine suite which is lacking in the Long Lake suite indicates a regional deformation also occurred in the Late Triassic to LATE CRETACEOUS A large domain in the central part of the area is dominated by a monotonous sequence of grey to black, early Jurassic time. A significant difference in the character of the main foliation in the map area is that it is dominantly Casino suite: porphyry, dominantly dacite, to quartz carbonaceous quartzite, psammite and phyllite that we correlate with the Stevenson Ridge schist (unit MSRS; see Ryan northeast-trending, in significant obliquity to the main foliation across much of western Yukon with is typically northwestmonzonite, to rhyodacite with lesser rhyolite; fine to medium et al., 2014). The unit is interpreted as Late Devonian to Early Mississippian because it is intruded by the Mississippian trending. We interpret this as a consequence of Mesozoic folding of the late Paleozoic fabric. grained: alkali feldspar-, plagioclase-, biotite and Northwest trending faults that are prominent in the aeromagnetic data (see Figure 1). These structures offset the Simpson Range suite. The unit is distinguished from the Snowcap assemblage by its carbonaceous composition, though guartz-porphyritic. More rhyolitic near Mount Nansen, with carbonaceous horizons do occur in unit PDS1. Elsewhere in YTT, similar carbonaceous metasedimentary rocks are margin of the 190–180 Ma Aishihik batholith, and also appear to help control the distribution of the Mount Nansen group, blebby white to smoky quartz phenocrysts. More hypabyssal grouped in the Finlayson assemblage. The interstratification of light grey to beige marble (unit DMF2) and general indicating that these faults are mid-Cretaceous or younger. These structures appear to be overlain by the Paleogene than volcanic in appearance. Limonite and carbonate altered proximity to the DMF1 possibly supports a similar interpretation here. in the vicinity of Mount Nansen. Rhyolite Creek complex. At Mount Nansen, the complex interplay between the northwest-trending faults and east-Much of the eastern half of the map area is dominated by the Early Mississippian Simpson Range suite (unit MSR) northwest trending faults appears to expose different levels of the mid-Cretaceous rocks such that Mount Nansen Group MIDDLE CRETACEOUS constrained by a single preliminary age of ca. 356 Ma (W. McClelland, unpublished data). The Simpson Range suite is may be exposed in grabens, and the Dawson Range phase granodiorite in horsts. The only occurrences of the Stikine Mount Nansen Group: massive aphyric and feldspar-phyric characterized by highly foliated to gneissic hornblende-biotite and biotite granodiorite to intermediate orthogneiss, and is plutonic suite in this area may be confined to one or more of the horsts. andesite to dacite breccias, flows and tuff; massive heterolithic In other parts of western Yukon, the presence of lenses or slivers of peridotite has helped to delineate crustal scale commonly K-feldspar augen textured. quartz and feldspar-phyric felsic lapilli tuff; flow banded The Snowcap and Finlayson assemblages are intruded by sporadic K-feldspar porphyritic to porphyroclastic augen structural breaks (e.g. Ryan et al., 2013a). The preservation of high temperature tectonite fabric in the Schist Creek quartz-phyric rhyolite. granite that we correlate with the Permian Sulphur Creek suite (unit PS), one of which yielded a preliminary age of ca. complex suggests that mantle and/or lower crust were juxtaposed with siliciclastic rocks of the Snowcap assemblage 264 Ma (D. Kellett, unpublished data). along a major detachment fault (cf. Canil et al., 2003). This detachment was likely reactivated as a thrust fault emplacing Whitehorse suite (units mKW1, mKW2) Mafic-ultramafic complexes Schist Creek complex within or on top of the Snowcap assemblage during Permian to Jurassic deformation. The Schist Maloney Creek phase: grey to beige biotite-hornblende The Schist Creek complex occurs in the northwest part of the map area and is dominated by serpentinite, peridotite with Creek complex lies along a distinct lineament (greater than 100 km long) on the regional geology map, that offsets units onzogranite to granodiorite; medium- to coarse-grained as young as Carmacks Group. We interpret that this may reflect reactivation of a fundamental basement structure. minor metagabbro. The complex appears juxtaposed with the Snowcap assemblage by faults. The serpentinite has a haracteristically smoky quartz bearing. Locally can be In the region between Mackintosh Creek and the Nisling river (south part of map area) a couple lenses of predominantly harzburgitic protolith, indicated by high-temperature deformed orthopyroxene porphyroclasts and aligned confused with Ruby Range granodiorite (unit PR). olivine suggesting that it originated as lithospheric mantle (Dubman, 2016). The serpentinite is intruded by plagioclase serpentinite, and an unexposed magnetically high anomaly that we interpret as an ultramafic sliver, occur at the contact Dawson Range phase: white to beige hornblende-biotite porphyritic metagabbro dykes that yield late Permian ages (W. McClelland, unpublished data). Other minor lenses (10 to between Stevenson Ridge schist and the Snowcap assemblage. It is probable that this marks a structural break granodiorite, lesser granite, tonalite, guartz diorite, and diorite; between these two units there. olocky hornblende-phyric, medium- to coarse-grained; unfoliated to weakly foliated. The main mineral occurrences in the map area are porphyry to epithermal style that are concentrated around Mount **EARLY JURASSIC** Nansen, and appear to be most strongly linked to the late Cretaceous Casino suite (e.g. Klaza, Cyprus; see Hart and Long Lake suite (units EJL1, EJL2) Langdon, 1998; Mortensen et al., 2016). A number of Casino suite plugs and hypabyssal intrusions are newly White to beige hornblende-biotite granodiorite, monzogranite, recognized on the current map suggesting further potential for mineralization. Correlatives of the Long Lakes suite are quartz monzonite, and quartz monzodiorite; commonly very host to Cu-Au-Mo porphyry mineralization along strike in British Columbia, however, the porphyry potential of this suite in pink on the weathered surface; generally massive to weakly Yukon is not well understood. The presence of hypabyssal phases of this suite in the map area indicates that the crustal foliated. Notably less foliated than unit LTs. Locally depth appropriate for porphyry mineralization is exposed, however porphyry potential remains unknown. The Long Lake equigranular but commonly alkali-feldspar porphyritic. Locally suite is demonstrably younger than the early Jurassic Minto suite, as such Minto style mineralization (Topham et al., heterogeneous compositional layering was noted at or near its 2016) within the Long Lake suite is unlikely. northwest margin. Late-phase granitic pegmatite and aplitic No definitive syngenetic occurrences are recognized in this map area, although felsic and amphibolite rock types dikes are prominent in the plutons and in the country rocks. within the Finlayson assemblage rocks of YTT have VMS potential regionally (Colpron et al., 2006). Pink to beige quartz porphyritic hypabyssal hornblende-biotite granodiorite to rhyodacite: generally deeply weathered. Easy to confuse with Casino suite or Rhyolite Creek complex. preserved mid-Cretaceous aphyric and feldspar-phyric andesite to dacite breccias, flows and tuffaceous rocks of the LATE TRIASSIC Mount Nansen Group (unit mKN). Heterolithic quartz and feldspar-phyric felsic lapilli tuff, and rare flow-banded quartz-**Stikine suite:** white to beige hornblende-biotite granodiorite, phyric rhyolite are less abundant. The group has yielded U/Pb ages ranging between 110 and 105 Ma (Klocking et al., diorite, and quartz monzodiorite; weakly to moderatley foliated, commonly alkali-feldspar porphyritic. Dated at 211 Ma

100 m wide) of serpentinite, talc-tremolite schist and listwaenite may be related to the Schist Creek complex . The Stikine plutonic suite (unit LTs) is only exposed in the area in the vicinity of Mount Nansen, and is characterized by weakly to moderately foliated white to beige hornblende-biotite granodiorite, diorite, and quartz monzodiorite; it is commonly alkali-feldspar porphyritic. A sample dated by Mortensen et al. (2003) yielded an age of 211 Ma. Younger Mesozoic rocks in the area lack evidence of regional polyphase deformation and metamorphism. The eastern side of the map area is dominated by the Aishihik batholith, which is composed of massive to weakly

foliated white to beige hornblende-biotite granodiorite, monzogranite, quartz monzonite, and quartz monzodiorite of the Long Lake suite (unit EJL1). The Long Lake suite rocks are commonly very pink on the weathered surface. They are locally equigranular but commonly alkali-feldspar porphyritic. There is localized compositional layering at or near the northwest margin of the batholith. Hypabyssal phases of the suite (unit EJL2) are characterized by small, deeply weathered occurrences of pink to beige quartz porphyritic hornblende-biotite granodiorite to rhyodacite. This phase is similar to the younger Casino suite or Rhyolite Creek complex (see below). Late-phase granitic pegmatite and aplitic dikes are prominent in the plutons and in the country rocks. The Long Lake suite has a well-constrained age range of between 190 and 180 Ma (Joyce et al., 2016). Mesozoic-Cenozoic successor rocks Middle Cretaceous to Eocene successor magmatic rocks are common in the area. Mount Nansen is underlain by a well-

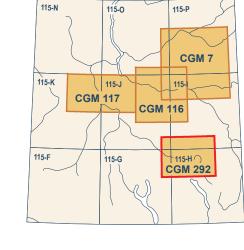
2016) making it comagmatic the Whitehorse plutonic suite. The Middle Cretaceous Whitehorse plutonic suite is represented by two distinct phases in the map area. The voluminous Dawson Range phase (unit mKw2) is exposed around Mount Nansen, and is composed of white to beige, hornblende-biotite granodiorite and lesser granite, tonalite, quartz diorite, and diorite (108–105 Ma: Mortensen et al., 2003, 2016). It is characteristically blocky hornblende-phyric and medium- to coarse-grained, and weakly foliated to unfoliated. The western side of the map hosts the easternmost occurrences of the Maloney Creek phase (unit mKW1) of the Whitehorse suite, and comprises grey to beige biotite-hornblende monzogranite to granodiorite. It is medium- to

The late Cretaceous Casino suite (unit LKC) is represented in the area by small scattered occurrences of porphyritic dacite to rhyolite. It is generally fine to medium grained; alkali feldspar-, plagioclase-, biotite and guartz-porphyritic. More rhyolitic occurrences near Mount Nansen exhibit blebby white to smoky quartz phenocrysts, is more hypabyssal than volcanic in appearance, and is limonite and carbonate altered. The Casino suite typically ranges in age from ca.73 to 78 Ma (e.g. Selby and Creaser, 2001; Bennett et al., 2010; Mortensen et al., 2016).

The Mount Nansen-Nisling River area is underlain La région cartographique de Mount Nansen-Nisling terrane, and Triassic to Paleogene successor rocks Rocks to the east are dominated by the Mississippian Simpson Range suite that is intruded by the voluminous Early Jurassic Long Lakes suite. The western geology assemblage and Stevenson Ridge schist, and lesser inlayson assemblage metavolcanic and metasedimetary rocks. Permian Sulphur Creek suite forms sparse intrusions of K-feldspar augen granite. The northern geology is dominated by the mid-Cretaceous Whitehorse plutonic suite and Mount Nansen Group volcanic rocks, that locally host Cu-Au porphyry and Au mineralization. Late Cretaceous Casino suite hypabyssal rocks are present sparsely across much of the area with and have known porphyry and epithermal mineral potential (e.g. Klaza). Paleogene volcanic and hypabyssal rocks are sporadically across the map, and are more prevalent to

of ca. 105 Ma (W. McClelland, unpublished data).

des roches successives du Trias au Paléogène. À l'est, les roches appartiennent en prédominance à la suite de Simpson Range du Mississippien, dans lesquelles s'est mise en place la volumineuse suite de Long Lakes du Jurassique précoce. À l'ouest, la géologie es caractérisée par la prédominance de roches métasédimentaires de l'assemblage de Snowcap et du schiste de Stevenson Ridge ainsi que par la présence, en moindres quantités, de roches métavolcaniques et métasédimentaires de l'assemblage de Finlayson. La suite de Sulphur Creek du Permien se présente sous forme d'intrusions éparses de granite œillé à feldspath potassique. La géologie de la partie nord est caractérisée par la prédominance de roches de la suite plutonique de Whitehorse et de roches volcaniques du Groupe de Mount Nansen du Crétacé moven. lesquelles renferment par endroits des minéralisations de Cu-Au porphyriques et de Au. Des roches ypabyssales de la suite de Casino du Crétacé tardif sont dispersées un peu partout dans la région et présentent un potentiel connu de minéralisations épithermales (p. ex. Klaza). Des roches volcaniques et hypabyssales du Paléogène sont disséminées dans l'ensemble de la carte, mais sont plus répandues dans le sud-ouest de la région.



National Topographic System reference and index to adjoining published Geological Survey of Canada maps

Catalogue No. M183-1/292-2016E-PDF ISBN 978-0-660-05530-5 doi:10.4095/298835

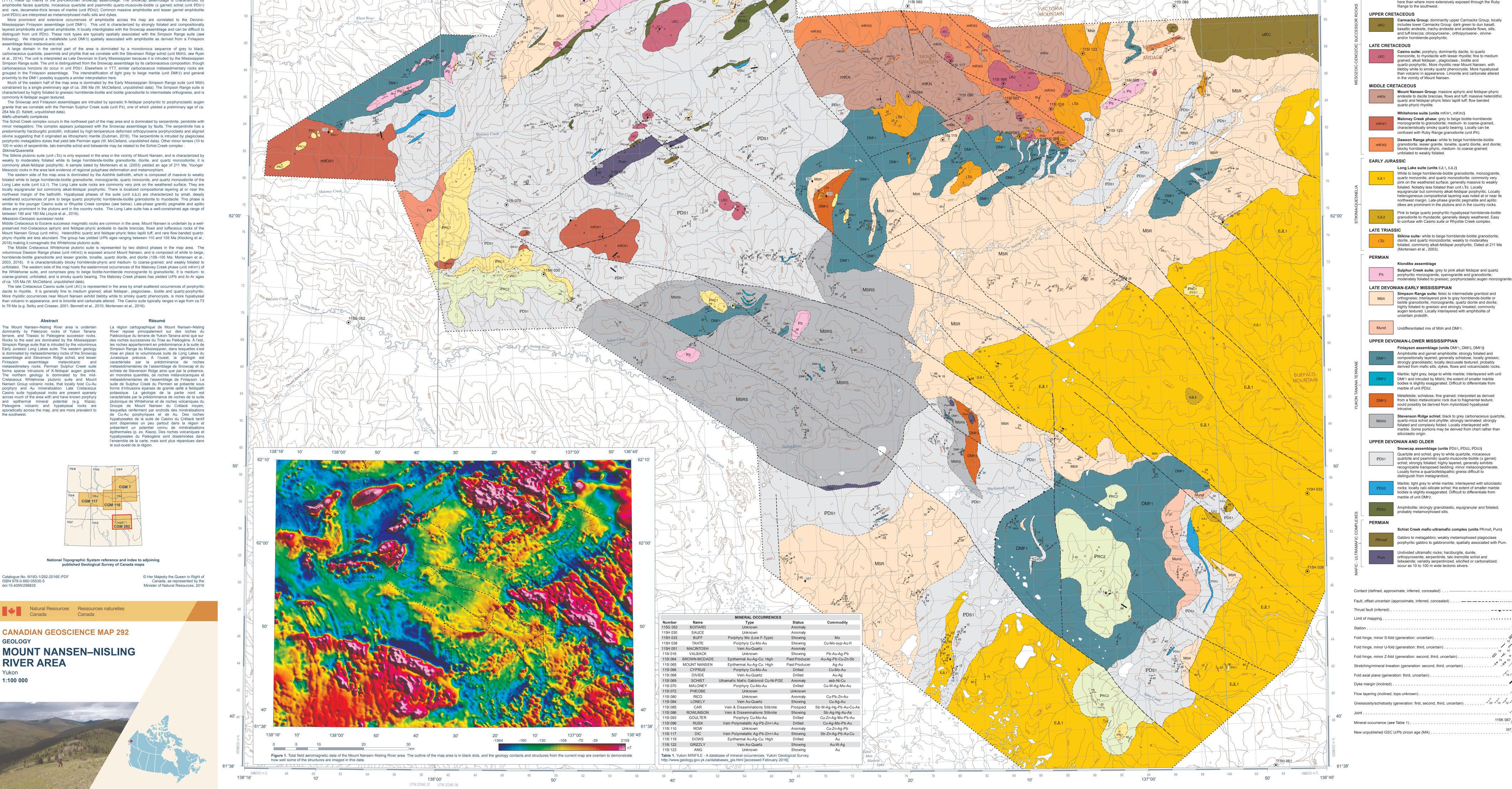
Canada

Canada, as represented by the Minister of Natural Resources, 2016

CANADIAN GEOSCIENCE MAP 292

Natural Resources Ressources naturelles

MOUNT NANSEN-NISLING



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Dawn Kellett, Meghan Moher, Yannick Morneau, and Rita Dubman contributed to the bedrock mapping in the Mount Nansen – Nisling River area. Geochronological support was provided by Dawn Kellett and Nancy Joyce of GSC-Ottawa and Bill McClelland of the University of Iowa. We thank Jeff Bond and Steve Israel of the Yukon Geological Survey for collaboration during field work, and Maurice Colpron and Patrick Sack for sharing data on the Aishihik batholith. Patrick Englehardt, Mark Coleman, and Rockhaven Resources are thanked for sharing knowledge of the Mount Nansen area. We thank the owners of the Charlotte Camp for allowing its use as our field base camp at Mount Nansen. We thank Nathan Hayward for helping interpret regional aeromagnetic data, and for helping create the inset figure. Trans North Helicopters and pilots Bob Skinner and Ian Pitchforth provided excellent flight services for the project. We thank Alex Zagorevski for a thoughtful review of the map.

> Geology, Mount Nansen-Nisling River area, Yukon; Geological Survey of Canada, Canadian Geoscience Map 292 (preliminary), scale 1:100 000. doi:10.4095/298835

Geological Survey of Canada Canadian Geoscience Maps

Preliminary

Authors: J.J. Ryan, E.E. Westberg, S.P. Williams, and J.B. Chapman Geology by J.J. Ryan, E.E. Westberg, J.B. Chapman, M. Moher, and Y. Morneau, 2015 Geological compilation by J.J. Ryan and E.E. Westberg, 2015 Geology conforms to Bedrock Data Model v. 4.0.0

Initiative of the Geological Survey of Canada, conducted under the auspices of the Cordillerar Project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program with support from the Yukon Geological Survey Map projection Universal Transverse Mercator, zone 8. North American Datum 1983 Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications. Geomatics and cartography by S.P. Williams and Elevations in feet above mean sea level

Preliminary

Preliminary

GEOLOGY MOUNT NANSEN-NISLING RIVER AREA Yukon

CANADIAN GEOSCIENCE MAP 292

Mean magnetic declination 2016, 20°18'E, decreasing 22.1' annually. Readings vary from 20°29'E in the NE corner to 20°06'E in the SW corner of the map. This map is not to be used for navigational purpose Title photograph: Sparsely vegetated ridgelines looking westward to the Nisling Range, Nisling River area, Yukon. Photograph by J.J. Ryan. 2016-056

Preliminary

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CANADIAN GEOSCIENCE MAP 292 MOUNT NANSEN-NISLING RIVER AREA