Natural Resources Canada | Ressources naturelles Canada

CANADIAN GEOSCIENCE MAP 129

BEDROCK GEOLOGY

POLLEY HILL

Yukon

Map Information Document

Preliminary

Celebrating 175 yrs

Geological Survey of Canada
Canadian Geoscience Maps

2017

Canada

MAP NUMBER

Natural Resources Canada, Geological Survey of Canada
Canadian Geoscience Map 129 (Preliminary)

TITLE

Bedrock geology, Polley Hill, Yukon

SCALE

1:50 000

CATALOGUE INFORMATION

Catalogue No. M183-1/129-2013E-PDF
ISBN 978-1-100-22025-3
https://doi.org/10.4095/299804

COPYRIGHT

RECOMMENDED CITATION

Lane, L.S., 2017. Bedrock geology, Polley Hill, Yukon; Geological Survey of Canada, Canadian Geoscience Map 129 (preliminary), scale 1:50 000.
https://doi.org/10.4095/299804

ABSTRACT

The Polley Hill map area lies at the transition from Eagle Plain in the west to the Richardson Mountains in the east. The map area is largely underlain by Late Devonian and Early Carboniferous strata, with Cretaceous and locally Jurassic strata lying

unconformably on the older successions. New field mapping has improved the definition and refined the extent of the map units and structures present, in spite of poor exposure and extensive tree cover that limit helicopter access. The regionally important Deception Fault is a west-directed thrust fault that carries the Imperial Formation westward over Upper Devonian, Carboniferous and Cretaceous strata. In and adjacent to the northwest part of the map area, 1970s vintage seismic reflection profiles were used to inform the surface structural geometry. A subsurface east-trending syncline that pre-dates the Cretaceous succession is observed in the seismic data and projected to the surface. This is one of the most southerly structures of the Late Devonian – Early Carboniferous Ellesmerian Orogeny that affected much of Arctic Canada.

RÉSUMÉ

La région cartographique de Polley Hill se situe à la transition de la plaine Eagle, à l'ouest, aux monts Richardson, à l'est. La région cartographique est principalement occupée par des strates du Dévonien tardif et du Carbonifère précoce, que surmontent en discordance des strates du Crétacé et, par endroits, du Jurassique. De nouveaux travaux de cartographie géologique sur le terrain nous ont permis de mieux définir et circonscrire les unités cartographiques et les structures présentes, malgré le peu d'affleurements et l'existence d'un couvert forestier étendu qui limite l'accès par hélicoptère. La faille de Deception, une importante structure régionale, est un chevauchement à vergence ouest le long duquel la Formation d'Imperial a été charriée vers l'ouest pour être déposée sur des strates du Dévonien supérieur, du Carbonifère et du Crétacé. Dans la partie nord-ouest de la carte et le secteur adjacent, d'anciens profils sismiques des années 1970 ont servi à nous renseigner sur la géométrie structurale en surface. Un synclinal d'orientation est-ouest, révélé par les données sismiques du sous-sol et tracé à la surface par projection, est antérieur à la succession du Crétacé. Cette entité structurale est l'une des manifestations les plus méridionales de l'orogenèse ellesmérienne du Dévonien tardif-Carbonifère précoce qui a touché la majeure partie de l'Arctique canadien.

LICENCE AGREEMENT

ACCORD DE LICENCE

SHEET 1 OF 1, BEDROCK GEOLOGY

GENERAL INFORMATION

Author: Larry Lane

Geology by L.S. Lane, 2009–2010; D.A. Huntley, 2012; and D.K. Norris., 1962.

Geological compilation by L.S. Lane, 2012–2014

Geology conforms to Bedrock Data Model v. 3.1

Geomatics and cartography by M. Le

Initiative of the Geological Survey of Canada, conducted under the auspices of the Yukon Sedimentary Basins project as part of Natural Resources Canada's Geo–mapping for Energy and Minerals (GEM) program

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.
Elevations in metres above mean sea level

Magnetic declination 2015, 21°00'E, decreasing 29.8'W annually.

This map is not to be used for navigational purposes.

Tittle photograph: Aerial view of open anticline at Station 10LHA166HE, exposed in the south-facing cut-bank on Rock River. Although light coloured sandstone beds near river level appear symmetric, bedding plane slip in the shale has resulted in progressive tightening and westward displacement of the fold hinge in the upper part of the fold. The bluff is approximately 20 m high. Photograph by Larry Lane. 2015-108

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map.
See map into document accompanying the downloaded data for more information about this publication.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

This publication has been scientifically reviewed, but it has not undergone a formal edit.

Map Viewing Files

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

Cartographic Representations Used on Map

This map utilizes ESRI Cartographic Representations in order to customize the display of standard GSC symbols for visual clarity on the PDF of the map only. The digital data still contains the original symbol from the standard GSC symbol set. The following legend features have Cartographic Representations applied:
Traces feature class 1 trace feature called BeddingFormLine colour change to Dark Amethyst

Fold feature class 1 syncline presented in the subsurface feature colour change to Poinsettia Red
Planar feature class reposition 3 planar features away from the fossil location

DESCRIPTIVE NOTES

This map area is relatively inaccessible due to limited outcrop and extensive tree cover. In the northwest and southeast parts of the map area, 1970s vintage seismic reflection data were used to inform the compilation. In the northwest, the surface projection of a pre-Mesozoic syncline is shown there. This structure is the most southerly large fold involving Late Devonian Imperial Formation that was detached from Paleozoic strata during the latest Devonian and earliest Carboniferous Ellesmerian Orogeny. Based on seismic reflection data nearby to the west, the Ellesmerian deformation front is inferred to lie approximately 10 km to the south of the synclinal hinge (Lane, 2007, Fig. 9). Devonian strata occur at the surface in this area, however exposure is too poor to document reliably the presence of the low-amplitude frontal syncline. Outcrop traces of several sandstone ribs, observed on airphotos, are shown on the map where they exhibit a gentle southward component of dip that would be consistent with the occurrence of a frontal synclinal hinge nearby to the south. However, their orientation also is consistent with their position on the limb of the adjacent North Tuttle Syncline.

In the northeastern corner of the map, Jurassic-Early Cretaceous strata are locally preserved in broad, faulted synclines. Just beyond the map edge to the east and north, additional exposures define a large M-shaped anticline, with a broad wavy hinge area. The entire structure is cut by multiple small faults, mostly of uncertain orientation due to poor exposure. Notably, although the structure outlined by Mesozoic strata indicate little or no plunge, the underlying Devonian bedding traces, exposed in the hinge area of the structure, indicate a distinct southward plunge. This discordance may be evidence of Ellesmerian structure exposed at the surface, possibly an expression of the subsurface syncline identified farther west.

Shale, sandstone and conglomerate of the Late Devonian and Early Carboniferous Tuttle Formation are exposed in the North Tuttle Syncline in the south of the map area. Dramatic thickness and grain size variations occur over short distances in sandstone and conglomerate units. These variations are well displayed on adjacent maps to the south (Lane, 2013a, 2013b). Accordingly, the four lithological subdivisions shown do not imply any stratigraphic order. The Tuttle Formation is interpreted here as consisting of gravity flow deposits within channels cut into the underlying Imperial Formation, deposited in a deeper water marine slope setting.

The Deception Fault in this area juxtaposes the sandstone-rich middle member of the Imperial Formation in the east, against the shale-dominant upper member of the Imperial Formation, together with unconformably overlying mid-Cretaceous strata in the west. Earlier reconnaissance mapping (Norris, 1981) indicated that the fault predates Cretaceous units. However, east-trending outcrop traces of Cretaceous sandstone beds are visible on airphotos to be truncated by north-trending beds of the Imperial Formation, demonstrating that the Deception Fault post-dates deposition of the Cretaceous strata.

Nearly flat-lying Cretaceous strata in the northwest part of the map area were mapped by Norris (1981) as Whitestone River Formation, of “Early and Late Cretaceous” age; and several “Hauterivian – Albian” macrofossil localities are recorded along Eagle River immediately west of the map area. However, the Whitestone River

Formation as used by Norris (1981) includes the Parkin Formation, subsequently defined by Dixon (1992). Unlike the Whitestone River Formation, the Parkin Formation is known to contain prominent sandstone units (e.g. Jackson et al., 2011). Further, the Parkin Formation is now inferred to be Albian in age (Haggart et al., 2013). Although the definition and age of preserved Jurassic and Cretaceous units is uncertain in this area, the Cretaceous shale and sandstone succession in the northwest part of the map is provisionally identified here as Parkin Formation rather than Whitestone River.

ACKNOWLEDGMENTS

This map is a product of the Geo-mapping for Energy and Minerals (GEM) Program, 2009–2013. Helicopter observations by D.A. Huntley and K.M. Bell in 2012 in and adjacent to the map area were used to inform the compilation, as were archival notes and airphoto observations by the late D.K. Norris. The project benefitted from the support and participation of the Vuntut Gwitchin First Nation (VGFN). Field assistants in 2010 were Y. Mercredi and M. Charlie (VGFN), and A. Hayman and K.M. Bell (University of Calgary). Trans North Helicopters (Dawson, Yukon) provided helicopter support in 2010 and 2012. K.M. Fallas is thanked for a thorough critical review.

REFERENCES

Brideaux, W.W., 1974. Palynologic analysis of eight samples from various locations in Yukon Territory and Alaska, collected by D.K. Norris in 1973 and submitted for analysis in February, 1974. (NTS 106L, 116I, 116P, 117C); Geological Survey of Canada, Paleontological Report 2 (Gen.) WWB 1974, 2 p.

Dixon, J., 1992. Stratigraphy of Mesozoic strata, Eagle Plain area, northern Yukon; Geological Survey of Canada, Bulletin 408, 58 p. https://doi.org/10.4095/133639

Dolby, G., 2011. Palynological analysis of core, cuttings and outcrop samples from the GEM Yukon Basins Project; well sections: Chance J-19, Ellen C-24, N. Hope N-53, S. Tuttle N-05, Porcupine I-33, Blackstone D-77, Beavercrow B-16; Outcrops: 10 LHA, 09 LHA, 2008 LHA, 2006 LHA, MJ, 2009 KWJ, 10 TLA, 09 TLA; Geological Survey of Canada, Paleontological Report MISC-1-DOLBY-2011, 43 p.

Haggart, J.W., Bell, K.M., Schröder-Adams, C.J., Campbell, C.J., Mahoney, J.B., and Jackson, K.W., 2013. New biostratigraphic data from Cretaceous strata of the Eagle Plain region, northern Yukon: Reassessment of age, regional stratigraphic relationships, and depositional controls; Bulletin of Canadian Petroleum Geology, v. 61, p. 101–132.

Jackson, K., McQuilkin, M., Pedersen, P.K., Lane, L.S., and Meyer, R., 2011. Preliminary observations on stratigraphy and hydrocarbon potential of middle to Upper Cretaceous strata, Eagle Plain basin, northern Yukon; *In*: Yukon Exploration and Geology 2010, K.E. MacFarlane, L.H. Weston, and C. Relf (ed.), Yukon Geological Survey, p. 125–134.

Lane, L.S., 2007. Devonian - Carboniferous Paleogeography and Orogenesis, northern Yukon and adjacent Arctic Alaska; Canadian Journal of Earth Sciences, v. 44, No. 5, p. 679–694.

Lane, L.S., 2013a. Geology, Corbett Hill, Yukon; Geological Survey of Canada, Canadian Geoscience Map 70 (preliminary), scale 1:50 000. https://doi.org/10.4095/290065

Lane, L.S., 2013b. Geology, Mount Joyal, Yukon; Geological Survey of Canada, Canadian Geoscience Map 73 (2nd edition, preliminary), scale 1:50 000. https://doi.org/10.4095/29273

Norris, D.K., 1981. Geology, Eagle River, Yukon Territory; Geological Survey of Canada, Map 1523A, scale 1:250 000. https://doi.org/10.4095/109352

Additional Information

The Additional Information folder of this product's digital download contains figures and tables that appear in the map surround as well as additional geological information not depicted on the map, nor this document, nor the geodatabase.
-PDF of each figure/table that appears in the CGM surround.

Author Contact

Questions, suggestions, and comments regarding the geological information contained in the data sets should be addressed to:
L.S. Lane
Geological Survey of Canada
3303 33 Street NW
Calgary AB
T2L 2A7
Larry.Lane@canada.ca

Coordinate System

Projection: Universal Transverse Mercator
Units: metres
Zone: 8
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 137°00'00"W
Eastern longitude: 136°30'00"W
Northern latitude: 67°00'00"N
Southern latitude: 66°45'00"N

Software Version

Data has been originally compiled and formatted for use with ArcGIS™ desktop version 10.2.2 developed by ESRI®.

DATA MODEL INFORMATION

Bedrock (Calgary)
Surface bedrock data are organized into feature classes and themes consistent with logical groupings of geological features. All field observation point data are related through the Station_ID property of the Station theme. These feature attribute names and definitions are identical in the shapefiles and the XML files.

Consult PDFs in Data folder for complete description of the feature classes, feature attributes, and attribute domains.

The Bedrock Data Model and the Bedrock Domains documents are intended to describe all bedrock features which may be compiled at the 1:50 000 scale. Therefore, some of the feature classes and feature attributes described in these documents may not be present.