



Natural Resources  
Canada

Ressources naturelles  
Canada

## CANADIAN GEOSCIENCE MAP 94

GEOLOGY

# CARCAJOU CANYON (NORTHWEST)

Northwest Territories



Map Information  
Document



Canadian  
Geoscience Maps

2014

Canada

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### **Cover Illustration**

View looking west at the Canyon Fault, situated in the eastern Mackenzie Mountains. Brown and grey shale of the Neoproterozoic Tsezotene Formation is thrust over light grey evaporite of the Cambrian Saline River Formation, Northwest Territories. Photograph by K.M. Fallas. 2013-238

## **ABSTRACT**

The northwest quadrant of Carcajou Canyon map area (NTS 96-D) lies within the mountainous Canyon Ranges of the eastern Mackenzie Mountains, Northwest Territories. Well exposed siliciclastic, carbonate, and evaporite strata range from Neoproterozoic to Devonian in the Mackenzie Mountains. Cretaceous shale and sandstone is preserved only beneath the Mackenzie Plain, in the northeast corner of the map. Proterozoic and Paleozoic strata have been deformed by northwest-trending folds and contractional faults associated with Cordilleran deformation. A set of approximately north-trending minor extensional faults are preserved within Proterozoic and Cambrian strata, and were locally reactivated by Cordilleran deformation. Cryogenian igneous activity resulted in the emplacement of gabbroic sills and dykes into strata of the

Mackenzie Mountains Supergroup. Two major unconformities represent significant gaps in the local geological record, one between Proterozoic (Cryogenian) and Cambrian strata, and another between Devonian and Cretaceous strata.

## **RÉSUMÉ**

Le quadrant nord-ouest de la région cartographique de Carcajou Canyon (SNRC 96-D) se situe dans la région montagneuse des chaînons Canyon de la partie est des monts Mackenzie (Territoires du Nord-Ouest). Des strates silicoclastiques, carbonatées et évaporitiques s'étendant du Néoprotérozoïque au Dévonien affleurent abondamment dans les monts Mackenzie. Des shales et des grès du Crétacé est conservés uniquement dans le sous-sol de la plaine du Mackenzie, dans le nord-est de la carte. Les strates du Protérozoïque et du Paléozoïque ont été déformés par le jeu de failles de contraction et de plis de direction nord-ouest associés à la déformation cordillérienne. Un ensemble de failles mineures d'extension de direction approximativement nord ont été conservées dans les strates du Protérozoïque et du Cambrien et celles-ci ont été réactivées par endroits lors de la déformation cordillérienne. Une activité magmatique au Cryogénien s'est traduite par la mise en place de filons-couches et de dykes gabbroïques dans les strates du Supergroupe de Mackenzie Mountains. Deux discordances majeures témoignent de lacunes importantes dans la géologie locale, l'une se situant entre les strates du Protérozoïque (Cryogénien) et du Cambrien, l'autre entre les strates du Dévonien et du Crétacé.

## **ABOUT THE MAP**

### **General Information**

Authors: K.M. Fallas and R.B. MacNaughton

Compilation by K.M. Fallas and R.B. MacNaughton, 2011–2013

Geological field observations by K.M. Fallas, R.B. MacNaughton, R. Lemiski (Northwest Territories Geoscience Office), K. Montgomery, T. Proks, J. Powell (University of Ottawa), D. Midwinter, T. Hadlari, and C. Roots, 2006–2012, J.D. Aitken, D.G. Cook, and H.R. Balkwill, 1969

Stratigraphic sections measured by R.B. MacNaughton, E.C. Turner (Laurentian University), M. Pope (Texas A&M University), S. Leslie (James Madison University), B. Pratt (University of Saskatchewan), and T. Proks, 2010–2012, R.W. Macqueen, W.S. MacKenzie, B.S. Norford, and J.L. Usher, 1968–1969, J.D. Aitken, D.G.F. Long, and M.P. Cecile, 1977

Geomatics by K.M. Fallas, S.D. Orzeck, and N. Raska

Cartography by S.D. Orzeck

Scientific editing by E. Inglis

Joint initiative of the Geological Survey of Canada and the Northwest Territories Geoscience Office, conducted under the auspices of the Mackenzie Delta and Corridor Project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals(GEM) Program.

Logistical support provided by the Polar Continental Shelf Program as part of its mandate to promote scientific research in the Canadian North. PCSP 02509, 01310, 00411, and 00912.

Map projection Universal Transverse Mercator, zone 9.  
North America Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.

Elevations are in feet above mean sea level north and east of 64°45', 127°30', the remainder are in metres

Some geographic names on this map are not official.

Mean magnetic declination 2014, 22°45'E, decreasing 29' annually. Readings vary from 22°53'E in the NW corner of the map to 22°36'E in the SE corner of the map.

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

Data may include additional features not portrayed on this map.

See documentation accompanying the data.

Additional references are included in the map information document.

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

## **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.

The spatial geological data is provided in two file formats, SHP and XML, that may be imported into Geographic Information System (GIS) software for the purposes of viewing, querying, and analysis.

## **ABOUT THE GEOLOGY**

### **Descriptive Notes**

The authors have updated and revised map unit terminology from the Operation Norman map (Aitken et al., 1974). In general, terminology for Cambrian units is that of Dixon and Stasiuk (1998) with modifications by Fallas and MacNaughton (2012), Silurian and Devonian usage follows that of Morrow (1991), and Cretaceous formation

names are those of Dixon (1999). Neoproterozoic to Ordovician units have recently undergone revision to their terminology, as outlined below.

Recent stratigraphic work in the Mackenzie Mountains has formalized the Mackenzie Mountains Supergroup and revised its formation-level nomenclature. The oldest exposed unit, previously the H1 unit of Aitken and Cook (1974), has since been defined as the Tabasco Formation (Turner and Long, 2012). No revisions have been applied to the overlying Tsezotene Formation. Within the Katherine Group, the Eduni, Tawu, Grafe River, Etagochile, and Shattered Range formations of Long and Turner (2012) correspond to the lower part of the Katherine Group as shown on the GSC maps for Carcajou Canyon (Aitken et al., 1974), and to the K1 to K5 divisions of Aitken et al. (1978) and Long et al. (2008). Delineation of these new formations depends on the ability to recognize the recessive Tawu and Etagochile formations. These formations are seldom exposed in the mapping area and so the five lower formations of the Katherine Group were grouped during mapping. The McClure and Abraham Plains formations correspond to the upper Katherine Group on the Carcajou Canyon map (Aitken et al., 1974), and to the K6 and K7 divisions of Aitken et al. (1978) and Long et al. (2008).

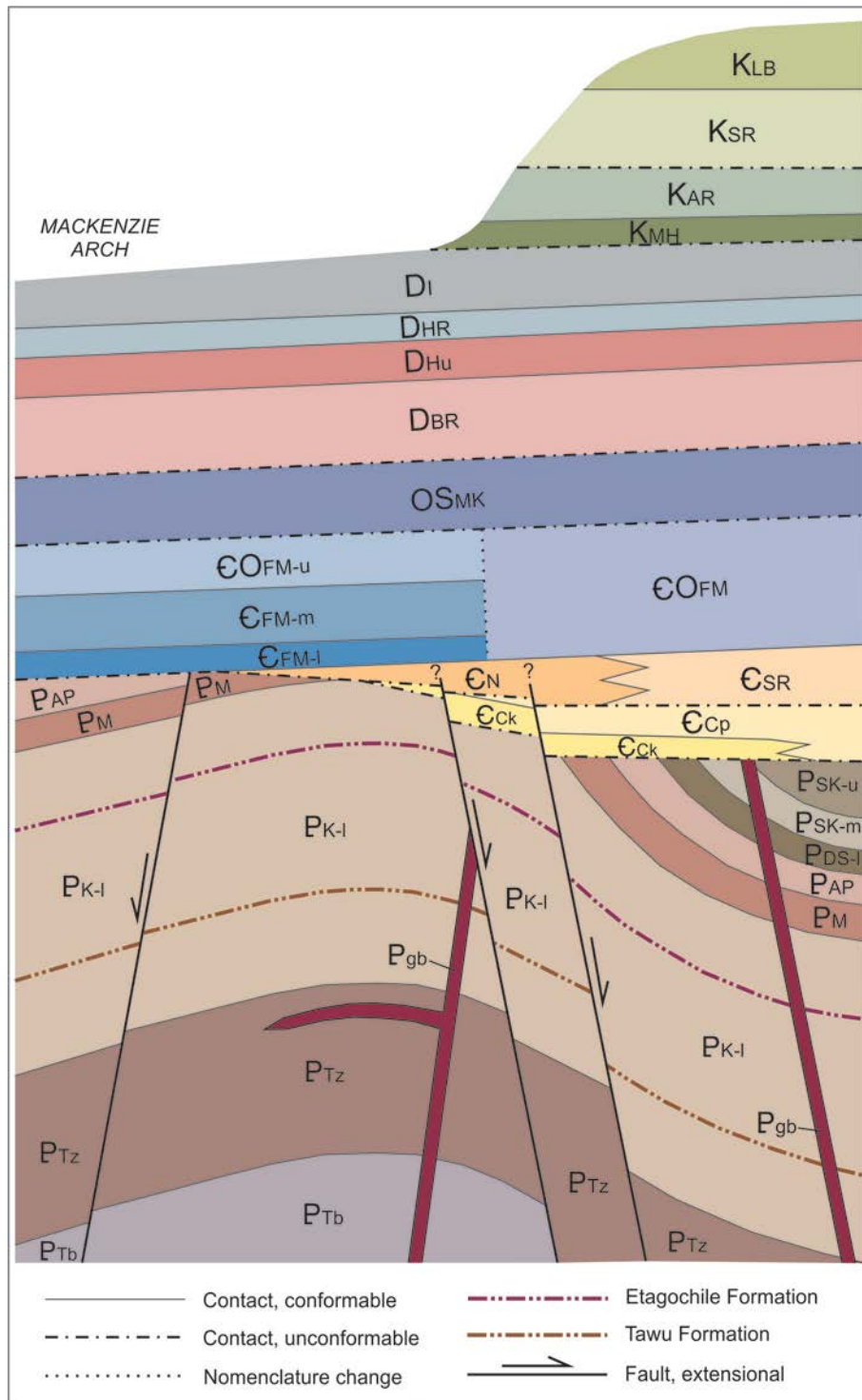
The Little Dal Group previously was mapped in this region as two units: H5, and Little Dal Formation (Aitken et al., 1974). Regionally, those two units were reorganized into seven informal units of formation scale by Aitken (1981). In the present mapping area, Aitken's terminology can be applied as follows: the lower part of H5 corresponds to the 'Mudcracked formation'; the upper part of H5 and the Little Dal Formation correspond to the 'Basinal Assemblage'. Most recently, Turner and Long (2012) have formalized the internal stratigraphy of the Little Dal Group. Their nomenclature applies as follows to the present study area: the Mudcracked formation is now the Dodo Creek Formation; the Basinal Assemblage is now the Stone Knife Formation, consisting of four informal members (1, 2, 3, and 4). In the present series of maps the Dodo Creek Formation and the lower Stone Knife Formation (equivalent to its member 1) have been combined due to similarity of weathering profile and colour. Our middle Stone Knife Formation corresponds to the lower part of member 2 (typically a bright red shale in this area), and the upper Stone Knife Formation encompasses the upper part of member 2 (carbonate-dominated).

Previous work by the Geological Survey of Canada in northwest Carcajou Canyon map area (Aitken and Cook, 1974) subdivided the Cambro-Ordovician Franklin Mountain Formation into four informal units. In ascending order they are: Basal red beds, Cyclic member, Rhythmic member, and Cherty member (Norford and Macqueen, 1975). The present work separates the Basal red beds from the Franklin Mountain Formation and applies the term Nainlin Formation to this shale- and sandstone-dominated unit (MacNaughton and Fallas, in press). Field relationships suggest the Nainlin Formation is laterally equivalent to the evaporitic Saline River Formation. For the remaining carbonate-dominated members of the Franklin Mountain Formation, the older unit names correspond, in ascending order, to informal lower, middle, and upper members. These also correspond to the units 1, 2, and 3 of the Franklin Mountain Formation described by Turner (2011).

Although the Devonian Hare Indian and Canol formations (Aitken and Cook, 1974) can be distinguished in some well-exposed sections, at the map scale these recessive, shale-dominated units are combined and the name Horn River Group is applied.

For detailed information on surficial deposits, here shown as 'Quaternary sediment', see Duk-Rodkin and Hughes (2002).

The names Carcajou Lake Fault, Canyon anticline, MacDougal syncline, Rouge Mountain anticline, McDermott anticline, and Mirror Lake anticline have been introduced to facilitate future discussion of these structural features. The names Canyon Fault, MacDougal anticline, Stony anticline, Stony syncline, Foran syncline, and McDermott syncline have been incorporated from the older Carcajou Canyon map (Aitken et al., 1974). The name Katherine Fault has not been included from previous work based on the current interpretation that it is a continuation of the Canyon Fault. Cordilleran deformation in this map area is dominated by broad folds with subordinate thrust faults; however, the strike length and stratigraphic separation on the Canyon Fault indicates it is a significant fault in the region. The northeastern margin of the Mackenzie Mountains is abrupt in this map area, coinciding with the disappearance of Proterozoic strata at surface. Evidence of detachment within Cambrian evaporate units of the Saline River Formation to the northeast of Mackenzie Mountains suggests that Proterozoic strata are not involved in Cordilleran structures to the northeast, under the Mackenzie Plain.



**Figure 1.** Schematic stratigraphic relationship diagram for northwest Carcajou Canyon map area (NTS 96-D/NW). Although normal faulting is known to affect the lower boundary of the Nainlin Formation–Saline River Formation succession, the question



mark at the top end of some faults reflects uncertainty about where faulting terminates within the succession

## Acknowledgments

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### **Coordinate System**

Projection: Universal Transverse Mercator  
Units: metres  
Zone: 9  
Horizontal Datum: NAD83  
Vertical Datum: mean sea level

### **Bounding Coordinates**

Western longitude: 128°00'00" W  
Eastern longitude: 127°00'00" W  
Northern latitude: 65°00'00" N  
Southern latitude: 64°30'00" N

### **Data Model Information**

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.

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4. Droits de propriété intellectuelle signifie tout droit de propriété intellectuelle reconnu par la loi, y compris tout droit de propriété intellectuelle protégé par une législation telle que celle qui régit, sans être limitée à, les droits d'auteur et les brevets.

#### 2.0 CESSION D'UNE LICENCE

1. 2.1 Sous réserve des modalités du présent Accord, le Canada octroie au Détenteur de licence une licence non exclusive, sans frais ni redevances exigibles, et le droit d'exercer tous les Droits de propriété intellectuelle sur les Données. Ceci comprend le droit d'utiliser, incorporer, accorder des licences d'utilisation (avec droit subséquent d'accorder des licences d'utilisation), modifier, améliorer, développer et distribuer les Données; et de fabriquer ou distribuer des Produits dérivés.
2. Les Droits de propriété intellectuelle découlant de toute modification, amélioration, développement ou traduction des Données, ou de la fabrication de Produits dérivés, effectués par ou pour le Détenteur de licence seront détenus par le Détenteur de licence ou tout substitut identifié par le Détenteur de licence.



### **3.0 PROTECTION ET IDENTIFICATION DE LA SOURCE**

1. L'utilisation des Données ne constitue en aucune façon une reconnaissance par le Canada d'un Produit dérivé. Le Détenteur doit identifier la source de données, de la façon suivante, lorsque toute partie des Données est redistribuée ou comprise dans un Produit dérivé :  
© Le ministère des Ressources naturelles Canada. Tous droits réservés.

### **4.0 GARANTIE, EXCLUSION ET INDEMNISATION**

1. Le Canada ne fait aucune représentation ou garantie, expresse ou tacite, découlant de la loi ou d'autres sources, en ce qui concerne entre autres l'exactitude, l'utilité, la nouveauté, la validité, l'étendue, l'intégralité ou l'actualité des Données et rejette expressément toute garantie implicite de qualité loyale et marchande ou l'à propos à une fin particulière des Données. Le Canada n'assure ni ne garantit la compatibilité du site qui contient les Données avec les versions antérieures, actuelles et futures de n'importe quel fureteur.
2. Le Canada ne peut être tenu responsable par le Détenteur de licence en ce qui a trait à toute réclamation, revendication ou action en justice, quelle qu'en soit la cause, concernant toute perte ou tout préjudice ou dommage ou frais, direct ou indirect, qui pourrait résulter de la possession ou de l'utilisation des Données par le Détenteur de licence.
3. Le Détenteur de licence tiendra le Canada et ses représentants, employés, agents et exécutants, indemnes et à couvert à l'égard de toute réclamation, revendication ou action en justice, quelle qu'en soit la cause, alléguant toute perte, tout frais, toute dépense, tout dommage ou toute blessure (y compris toute blessure mortelle) qui pourrait résulter de la possession ou de l'utilisation des Données par le Détenteur de licence.
4. Le Détenteur de licence devra accorder des licences d'utilisation à toute personne ou partie qui obtient les Données ou des Produits dérivés au moyen d'un accord de licence, et cet accord devra imposer à ces personnes ou parties les mêmes modalités que celles qui sont énoncées dans la section 4.0 de cet Accord.
5. L'obligation du Détenteur de licence d'indemniser le Canada selon cet Accord ne peut affecter ni empêcher le Canada d'exercer tout autre droit selon la loi.

### **5.0 DURÉE**

1. Cet Accord entre en vigueur à partir de la date et de l'heure d'acceptation des modalités de l'Accord (Heure de l'Est) et restera en vigueur pour une période d'un (1) an, en vertu de la sous-section 5.2 et de la section 6.0 qui suivent.
2. À la fin du premier terme, cet Accord sera automatiquement renouvelé pour des termes successifs d'un (1) an, en vertu de la section 6.0 qui suit.

### **6.0 RÉSILIATION**

1. 6.1 Nonobstant la section 5.0, cet Accord peut être résilié :
  - i. automatiquement et sans préavis, si le Détenteur de licence manque à ses engagements ou obligations selon cet Accord;
  - ii. par un préavis écrit de résiliation émis par le Détenteur de licence, en tout temps, et cette résiliation prendra effet trente (30) jours suivant la réception d'un tel préavis par le Canada; ou
  - iii. par consentement mutuel des parties.

2. Lors de la résiliation de cet Accord, pour quelque raison que ce soit, les obligations qui incombent au Détenteur de licence en vertu de la section 4.0 continueront de s'appliquer et les droits du Détenteur de licence en vertu de la section 2.0 cesseront immédiatement.
3. Lors de la résiliation de cet Accord, pour quelque raison que ce soit, le Détenteur de licence devra immédiatement effacer ou détruire toutes les Données obtenues en vertu de cet Accord, ou à l'intérieur d'un délai raisonnable lorsque les Données sont nécessaires pour terminer la livraison de Produits dérivés commandés avant la résiliation de cet Accord.

## **7.0 GÉNÉRAL**

### **1. Lois d'application**

Le présent Accord est régi et interprété en vertu des lois en vigueur dans la province de l'Ontario. Les parties acceptent de tomber sous la juridiction de la Cour supérieure de la Province de l'Ontario.

### **2. Totalité de l'Accord**

Le présent Accord constitue l'intégralité de l'entente conclue entre les parties relativement à l'objet du présent Accord. Toute modification à cet Accord ne peut être que par écrit, doit porter la signature de chaque partie et exprimer clairement l'intention de modifier cet Accord.

### **3. Solution des litiges**

Si un litige survient à propos de cet Accord, les parties tenteront de le résoudre par des négociations de bonne foi.