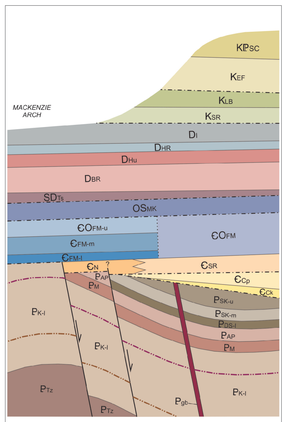


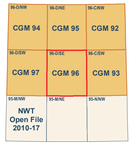
Figure 1. Schematic stratigraphic relationship diagram for southeast Carcajou Canyon map area (NTS 96-D/SE). Although normal faulting is known to affect the lower boundary of the Nainlin Formation–Saline River Formation succession, the question mark at the top end of some faults reflects uncertainty about where faulting terminates within the succession.

Abstract

The southeast quadrant of Carcajou Canyon map area (NTS 96-D) lies within the mountainous Canyon Ranges of the eastern Mackenzie Mountains, Northwest Territories. Outcrop is widespread on the higher ridges in the western portion of the map, but decreases to the northeast as ridges become lower and more vegetated toward the Mackenzie Plain. Rock types include siliciclastic, carbonate, and evaporite strata ranging from Neoproterozoic to Paleocene. Proterozoic and Paleozoic strata have been deformed by northwest- to southeast-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 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 sud-est 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). Les affleurements sont répandues sur les hautes crêtes de la partie ouest de la carte, mais deviennent plus rares vers le nord-est où les crêtes deviennent moins accentuées et davantage couvertes de végétation en se dirigeant vers la plaine du Mackenzie. La lithologie comprend des strates siliciclastiques, carbonatées et évaporitiques dont les âges s'échelonnent du Néoprotérozoïque au Paléocène. Les strates du Protérozoïque et du Paléozoïque ont été déformés par le jeu de failles de contraction et de plis de direction nord-ouest à sud-est 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 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.



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

Cover illustration
View looking east at dolostone of the Franklin Mountain Formation on the Keele River at the northern termination of the Redstone Range, Northwest Territories. Light orange-weathering dolostone of the middle member is offset by two south-side-up faults. Photograph by K.M. Fallas, 2013-239

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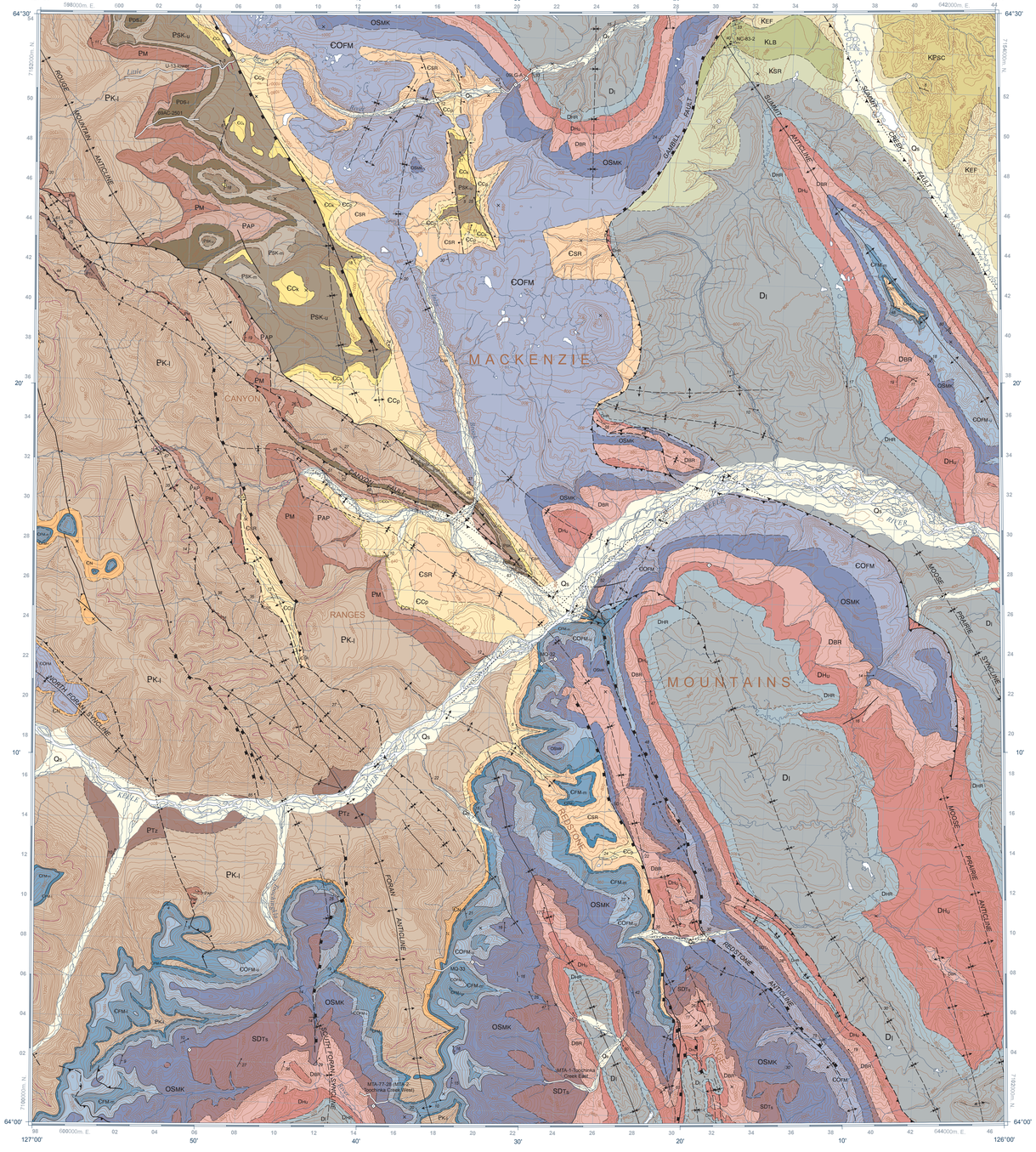
CANADIAN GEOSCIENCE MAP 96

GEOLOGY

CARCAJOU CANYON (SOUTHEAST)

Northwest Territories

1:100 000



QUATERNARY

Q_S — **Quaternary sediment:** mud, sand, and gravel: unconsolidated.

LATE CRETACEOUS TO PALEOCENE

KPSC — **Summit Creek Formation:** sandstone: lithic arenite, very friable; interbedded with conglomerate: polymict, granules to cobbles, poorly cemented; minor shale: carbonaceous; coal; and ash tuff. Unit locally contains plant remains, and dinosaur fossils in the lower part of the unit.

LATE CRETACEOUS

KEF — **East Fork Formation:** mudstone and shale: locally silty or carbonaceous, dark brown to dark grey or black, soft and crumbly, contains sideritic concretions; interbedded with minor sandstone: lithic wacke, grey to brown, very thin- to thin-bedded, friable, laminated, ripple marks, rip-up clasts, and minor trace fossils; and pebble conglomerate: locally occurs at base of unit.

KLB — **Little Bear Formation:** sandstone: lithic wacke to quartz arenite and chert arenite, mottled grey, greenish-grey, brown, or rusty, thin- to thick-bedded, typically friable and porous, crossbedded, laminated, ripple marks, graded bedding, locally bioturbated; interbedded with mudstone and shale: somewhat silty, dark grey to brown or black, crumbly and soft, minor sideritic concretions; and minor coal.

KSR — **Slater River Formation:** shale and mudstone: dark brown to dark grey, black, or rusty-brown, soft, crumbly, and fissile, sideritic concretions common, rare fish scales; minor bentonite and ash tuff: white to yellow, pale green, or orange-brown; and minor sandstone: lithic wacke, brown, grey, or rusty, very thin- to thin-bedded, crosslaminated, and bioturbated.

DEVONIAN

DI — **Imperial Formation:** shale: locally silty, dark grey to greenish-grey, fissile; interbedded with siltstone: locally micaceous or calcareous, greenish-grey to purplish-brown, laminated, bioturbated, and sandstone: lithic wacke to quartz arenite, micaceous, locally calcareous or glauconitic, grey to greenish-grey or brown, very thin- to medium-bedded, laminated and crosslaminated, abundant and diverse trace fossils; and minor limestone: bioclastic, grey to brown or orange, diverse fossil assemblage.

DHR — **Hare River Group (Hare Indian and Canol formations):** shale: carbonaceous or petroliferous, calcareous to siliceous, locally silty, dark grey or black, weathers grey, black, brown, or rusty: locally fossiliferous; minor limestone: dark grey with tentaculitids, interbedded with shale at base of unit.

DH_U — **Hume Formation:** limestone: wackestone to grainstone, floatstone, medium to dark grey or brownish-grey, typically weathers light grey, thin- to very thick-bedded, parallel to irregular or nodular bedded, fossiliferous with abundant and diverse assemblage. Unit is thicker bedded and cliff-forming in upper part.

DBR — **Bear Rock Formation:** limestone breccia: variably dolomitic and petroliferous, angular clasts range from granule- to boulder-sized, greyish-brown to grey, weathers light grey, vuggy, massive and rubbly with rare bedded intervals of laminated carbonate, tends to form hoodoos.

SILURIAN TO DEVONIAN

Delorme Group (Tsetso Formation)

SDTS — **Tsetso Formation:** dolostone: dolomudstone to dolograinstone, locally calcareous or quartzose (sandy), cream to light grey, weathers light grey to yellow or light orange, thin- to thick-bedded, parallel-bedded, laminated, stromatolitic; interbedded locally with sandstone: quartz arenite, silty, light brown, thin- to medium-bedded, laminated, and crossbedded.

ORDOVICIAN TO SILURIAN

OSMK — **Mount Kindle Formation:** dolostone: dolowackestone to dolopackstone and dolofloatstone, siliceous and cherty, light to dark grey or brownish-grey fresh and weathered surfaces, thin- to very thick-bedded, vuggy, recrystallized, bioturbated, and fossiliferous: silicified corals, orthoconic cephalopods, and stromatoporoids); interbedded with dolomudstone: light grey or cream, laminated, unfossiliferous.

CAMBRIAN TO ORDOVICIAN

COFM — **Franklin Mountain Formation:** *dolostone*: dolomudstone to dolograinstone, locally calcareous or cherty, grey, cream, or light brown, weathers light grey, yellowish-grey, or orange, very thin- to thick-bedded, typically recrystallized, locally vuggy, stromatolitic, bioturbated, oolitic, crossbedded, or intraclast-bearing; minor shale: greenish-grey or red, flasle, and laminated; and sandstone: lithic wacke to quartz arenite, dolomitic, cream to orange, red, or brown, weathers light orange to red, very thin- to medium-bedded, crossbedded, ripple marks, and bioturbated. Shale and sandstone found in basal part of unit. Alternation, at 1–2 m intervals, of ooid dolograinstone with dolomudstone produces a locally prominent striped appearance in the middle part of the unit.

COFM-U — **Franklin Mountain Formation, upper member:** dolostone: crystalline dolostone, commonly cherty and siliceous, cream to beige or grey, weathers white to light grey, very thin- to thick-bedded, vuggy and nodular, locally stromatolitic, bioturbated, intraclast-bearing, or oolitic.

CAMBRIAN

CFMM — **Franklin Mountain Formation, middle member:** dolostone: dolomudstone to dolograinstone, rarely calcareous or cherty, light grey to cream or beige, weathers light yellowish-grey to orange-brown, thin- to thick-bedded, typically recrystallized obliterating primary textures, locally vuggy, stromatolitic or thrombolitic, bioturbated, oolitic, crossbedded, or intraclast-bearing; rare shale partings. Alternation, at 1–2 m intervals, of ooid dolograinstone with dolomudstone produces a locally prominent striped appearance.

CFMM-L — **Franklin Mountain Formation, lower member:** dolostone: locally calcareous, silty, or sandy, detrital chert or quartz grains, grey to greenish-grey or brown, weathers pale yellow to grey or orange-brown, thin- to medium-bedded, parallel-laminated, crossbedded, locally includes intraclast rudstone, locally stromatolitic or bioturbated; interbedded with sandstone: quartz arenite, dolomitic and silty, crossbedded.

CN — **Nainlin Formation:** shale: light green, brick red, or grey, fissile, mud cracks; interbedded with sandstone: quartz wacke to quartz arenite, locally dolomitic, rarely conglomeratic, cream to pink, red, or brown, variable weathering colour, very thin- to medium-bedded, parallel-bedded or crossbedded, salt casts, ripple marks, sporadic horizontal or vertical burrows; minor conglomerate: found at base or within unit.

CSR — **Saline River Formation:** evaporite: gypsum, anhydrite, or halite, white and grey to pink or red, very thin- to thin-bedded, bedding typically disturbed and chaotic, dominates middle part of unit; shale: silty, grey, red, or green, fissile, minor salt casts, desiccation cracks, and horizontal burrows; minor dolostone: dolomudstone to dolograinstone, grey to yellow, green, or orange, locally intraclast-bearing, oolitic, stromatolitic; and sandstone: lithic wacke to quartz arenite, calcareous or dolomitic, can be conglomeratic, varicoloured, parallel- and crosslaminated, ripple marks, rip-up clasts, and possible trace fossils.

CCP — **Mount Cap Formation:** shale: locally silty or dolomitic, dark grey to brown or black, fissile, may contain horizontal burrows, trilobites, and brachiopods, dominates upper part of unit; limestone or dolostone: mudstone to wackestone and bioclastic, locally silty, medium to dark grey, weathers orange-brown, parallel to nodular bedded, intraclast-bearing, stromatolitic, bioturbated, few trilobites or brachiopods; and sandstone: quartz wacke to quartz arenite, calcareous and glauconitic, grey to greenish-grey, brown, or orange, very thin- to thick-bedded, trace fossils abundant.

CCK — **Mount Clark Formation:** sandstone: quartz arenite, locally glauconitic, very fine- to coarse-grained, can be conglomeratic at base of unit, white to tan or grey, weathers white to grey or brown, very thin- to thick-bedded, parallel-bedded to crossbedded, horizontal and vertical burrows locally abundant, but of low diversity; minor shale or siltstone: grey.

NEOPROTEROZOIC (Tonian to Cryogenian)

P_{GB} — **Gabbro and diabase:** fine- to medium-grained, dark grey to dark green, weathers brown to grey or black, homogeneous texture, occurs as both dykes and sills in Proterozoic strata.

Mackenzie Mountains Supergroup (Tsezotene Formation, Katherine Group, and Little Dal Group)

Little Dal Group (Dodo Creek and Stone Knife formations)

PSK_{-U} — **Stone Knife Formation, upper part:** lime mudstone or dolomudstone: locally argillaceous, light to dark grey, weathers orange, yellowish-grey, and beige, very thin- to thick-bedded, typically parallel-bedded and laminated, some crosslamination, locally stromatolitic, may include molar-tooth structure; minor shale: dark grey, weathers grey or brown, fissile, occurs as partings or very thin interbeds with limestone.

PSK_{-M} — **Stone Knife Formation, middle part:** shale: variably calcareous, brick red or light green fresh and weathered surfaces, fissile, abundant concretions: lime mudstone: grey or greenish-grey, weathers light greenish-grey, very thin-bedded, nodular, interbedded with shale.

PDS_{-U} — **Dodo Creek and lower Stone Knife formations:** Dodo Creek Formation: shale and siltstone: dark grey, lesser red or green, synaeresis cracks common; interbedded with sandstone: quartz arenite, slightly micaceous, cream, grey, brown, or red, thin- to medium-bedded, parallel-bedded and crosslaminated; and dolomudstone: locally calcareous, dark grey, weathers grey or orange, thin- to medium-bedded, locally intraclast-bearing. Overlain by lower part of Stone Knife Formation: limestone: lime mudstone to dolomudstone, medium to dark grey, weathers lighter shades of grey, beige, or orange, parallel-laminated, intraclast-bearing, molar-tooth structure, and locally stromatolitic; interbedded with minor shale: dark grey to black. Unit includes a noticeable orange oncolite at base of unit and a locally prominent light grey stromatolite bioherm at top of unit. Combined unit is semirecessive.

Katherine Group (Eduni, Tawu, Grafe River, Etagochile, Shattered Range, McClure, and Abraham Plains formations)

PAP — **Abraham Plains Formation:** sandstone: quartz arenite, hematitic, cream to brown, light grey, orange, pink, or maroon, thin- to very thick-bedded, well cemented, parallel-bedded and crossbedded, crosslaminated, ripple marks, rip-up clasts; interbedded with minor conglomerate: granule to pebble, white to orange-brown, pink, red, or purple, massive to crossbedded, and siltstone: locally shaly or micaceous, maroon or green, very thin-bedded, and crosslaminated.

PM — **McClure Formation:** shale: locally dolomitic or silty, grey, rusty-brown, green, and maroon, fissile, desiccation cracks; interbedded with dolostone: commonly cherty, silty, or sandy, medium gray, weathers to orange or orange-brown, very thin- to thick-bedded, typically stromatolitic, pisolitic, oolitic, intraclast-bearing, and parallel- or crosslaminated; and sandstone: lithic wacke to quartz arenite, can be micaceous, hematitic, or dolomitic, cream to brown, grey, red, or purple, very thin- to medium-bedded, crosslaminated, ripple marks, rip-up clasts, sole marks, and desiccation cracks.

PK_{-L} — **Katherine Group, lower part:** Eduni, Tawu, Grafe River, Etagochile, and Shattered Range formations: sandstone: quartz arenite, locally hematitic or micaceous, locally conglomeratic, white to light grey, pink, brown, or orange, very thin- to very thick-bedded, well cemented, parallel- and crossbedded, ripple marks, rip-up clasts, and desiccation cracks; interbedded with minor shale: silty, greenish-grey to pink or red, fissile, desiccation cracks; and dolomudstone: may be calcareous, grey to orange or red, medium-bedded, parallel-laminated, and intraclast-bearing. Shale and carbonate dominate in the Tawu and Etagochile formations.

PTZ — **Tsezotene Formation:** shale: micaceous, silty in places, grey, maroon, or green, fissile; minor desiccation cracks; interbedded with sandstone: lithic wacke to quartz arenite, micaceous, locally conglomeratic, varicoloured, typically weathers brown or orange-brown, thin- to thick-bedded, parallel-bedded, crossbedded, and crosslaminated; rip-up clasts, ripple marks; minor dolostone: dolomudstone to dolograinstone, calcareous, grey to greenish-grey, weathers beige to orange-brown, thin- to thick-bedded, laminated, minor salt casts and ooids.

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.

The names Summit Creek Fault, Rouge Mountain anticline, and Redstone anticline have been introduced to facilitate future discussion of these structural features. The names Canyon Fault, Gambill Fault, Summit anticline, Moose Prairie syncline, Foran anticline, and Foran syncline, have been incorporated from the older Carcajou Canyon map (Aitken et al., 1974). The name Moose Prairie anticline has been extended from the Dahadinni River map area (Douglas, 1974) through southwest Fort Norman (Fallas and MacLean, 2013).

Cordilleran deformation in this map area has generated folds and contractional faults along variable trends. The western portion is dominated by a major culmination exposing Neoproterozoic Tsezotene Formation and Katherine Group in the core, at the convergence of the Canyon Fault, Foran anticline, and Tawu anticline (Aitken et al., 1974). Pre-Cordilleran extensional faults, cutting Neoproterozoic and Cambrian strata, are exposed in the core of the culmination, and may be locally reactivated by Cordilleran deformation. This culmination generally coincides with the crest of the Mackenzie Arch (see Fig. 1). On the southeast flank of the culmination are a series of south-plunging anticlines and synclines that continue into the Wrigley Lake map area (Gabrielse et al., 1973). Younger Cambrian to Paleocene strata are exposed in the northeast portion of the map, where the Mackenzie Mountains descend into the Mackenzie Plain. Structurally, the Gambill Fault dominates this region, associated with structural trends that deviate from the dominant northwest-southeast Cordilleran trend where the fault turns from a northwest-trending thrust fault into a northeast-trending reverse fault. Surface exposures also indicate that the level of detachment for the Cordilleran structures moves from deep in the Mackenzie Mountains Supergroup up into the Saline River Formation in the vicinity of the Gambill Fault.

Geological contact

- Defined
- Approximate
- Inferred
- Concealed

Marker bed, Etagochile Formation

Marker bed, Tawu Formation

Distinctive lithology, sandstone

Drift contact

- Approximate

Fault, motion undefined

- Defined
- Approximate
- Inferred
- Concealed

Normal fault, symbol on hanging-wall side

- Defined
- Approximate
- Inferred
- Concealed

Reverse fault, symbol on hanging-wall side

- Defined
- Approximate
- Concealed

Thrust fault, symbol on hanging-wall side

- Defined
- Approximate
- Concealed

Anticline, upright

- Defined
- Approximate
- Inferred
- Concealed

Syncline, upright

- Defined
- Approximate
- Concealed

Inclined anticline, upright, shorter arrow on steeper limb

- Defined
- Approximate
- Inferred
- Concealed

Syncline, overturned

- Approximate
- Concealed

Monocline, anticlinal bend, shorter arrow on steeper limb

- Defined

- Visited outcrop, no measurements
- Outcrop observed remotely from ground or air

Bedding strike and dip, inclined, upright

- 75 — Evidence for younging direction known
- 65 — Evidence for younging direction known, estimated measurement
- 30 — No evidence for younging direction
- 15 — No evidence for younging direction, estimated measurement

Bedding strike and dip, inclined, overturned

- 75 — Evidence for younging direction known

- Fossil locality
- MO-33 — Measured stratigraphic section with name of section

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. 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: HS, and Little Dal Formation (Aitken et al. 1974). Regionally, those two units were recognized and 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 HS corresponds to the 'Mudcracked formation'; the upper part of HS 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 southeast 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 Nonlin 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.

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CANADIAN GEOSCIENCE MAP 96

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CANADIAN GEOSCIENCE MAP 96

GEOLOGY

CARCAJOU CANYON (SOUTHEAST)

Northwest Territories

1:100 000

2 0 2 4 6 8 km

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.

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Map projection Universal Tranverse 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 metres above mean sea level

Some geographic names on this map are not official.

Mean magnetic declination 2014, 22°27'E, decreasing 29' annually. Readings vary from 22°36'E in the NW corner of the map to 22°18'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.

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