LEGEND

NORTHWESTERN ALBERTA

TERTIARY AND CRETACEOUS

PALEOCENE AND UPPER CRETACEOUS

TKp — **PASKAPOO FORMATION**: grey to greenish grey, thick bedded, calcareous, cherty sandstone; grey and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds; **Scollard Member (Ksc)**: grey feldspathic sandstone, dark grey bentonitic mudstone; thick coal beds; nonmarine

CRETACEOUS

UPPER CRETACEOUS

Kwt — **WAPITI FORMATION**: grey, feldspathic, clayey sandstone; grey bentonitic mudstone and bentonite; scattered coal beds; nonmarine

Kpw — **PUSKWASKAU FORMATION**: dark grey fossiliferous shale, silty in upper part; marine

Kbh — **BAD HEART FORMATION**: fine-grained quartzose sandstone, ferruginous oolitic sandstone and mudstone; marine

Kk — **KASKAPAU FORMATION**: dark grey silty shale, thin concretionary ironstone beds; interbedded in lower part with fine grained quartzose sandstone and thin beds of ferruginous oolitic mudstone; marine

Kd — **DUNVEGAN FORMATION**: grey, fine grained, feldspathic sandstone with hard calcareous beds; laminated siltstone and grey silty shale; deltaic to marine

UPPER AND LOWER CRETACEOUS

Ksh — **SHAFTESBURY FORMATION**: dark grey fish-scale bearing shale, silty in upper part; numerous nodules and thin beds of concretionary ironstone; bentonite partings; lower part with thin silty and sandy intervals; marine

LOWER CRETACEOUS

Kp — **PEACE RIVER FORMATION**: fine grained quartzose sandstone (Cadotte Member); dark grey silty shale (Harmon Member); fine grained glauconitic sandstone, silty interbeds in lower part (Notikewin Member); shoreline complex

Kl — **LOON RIVER FORMATION**: dark grey fossiliferous silty shale and laminated siltstone; nodules and thin beds of concretionary ironstone; marine

NORTH CENTRAL ALBERTA

CRETACEOUS

UPPER CRETACEOUS

Kwt — **WAPITI FORMATION**: grey, feldspathic, clayey sandstone; grey bentonitic mudstone and bentonite; scattered coal beds; nonmarine

Ks — **SMOKY GROUP**: dark grey shale and silty shale, nodules and thin beds of concretionary ironstone; includes unnamed dark grey shale unit on Caribou Mountains and Buffalo Head Hills; marine

Kd — **DUNVEGAN FORMATION**: grey, fine grained, feldspathic sandstone with hard calcareous beds; laminated siltstone and grey silty shale; deltaic to marine

UPPER AND LOWER CRETACEOUS

Ksh — **SHAFTESBURY FORMATION**: dark grey fish-scale bearing shale, silty in upper part; numerous nodules and thin beds of concretionary ironstone; bentonite partings; lower part with thin silty and sandy intervals; marine

LOWER CRETACEOUS

Kl — **LOON RIVER FORMATION**: dark grey, fossiliferous, silty shale and laminated siltstone; nodules and thin beds of concretionary ironstone; marine

Kb — **BASAL CRETACEOUS?**: calcareous quartz sandstone (in Wood Buffalo National Park); origin uncertain

NORTHEASTERN ALBERTA

CRETACEOUS

UPPER AND LOWER CRETACEOUS

Klb — **LABICHE FORMATION**: dark grey shale and silty shale; ironstone partings and concretions; silty fish scale bearing beds in lower part; marine

LOWER CRETACEOUS

Kpl — **PELICAN FORMATION**: fine grained quartzose sandstone, silty and glauconitic in lower part; marine

Kj — **JOLI FOU FORMATION**: dark grey fossiliferous shale, silty interbeds in upper part; marine

Kac — **ALICE CREEK TONGUE, GRAND RAPIDS FORMATION**: fine grained quartzose sandstone; marine

Kg — **GRAND RAPIDS FORMATION**: fine grained quartzose and feldspathic sandstone, laminated siltstone and silty shale, thin coal beds; shoreline complex

Kc — **CLEARWATER FORMATION**: dark grey, fossiliferous, silty shale; laminated siltstone and fine-grained cherty sandstone; glauconitic sandstone (Wabiskaw Member) near base; marine

Km — **McMURRAY FORMATION**: thick bedded quartzose sandstone and siltstone, oil impregnated; grey silty shale interbeds in upper part; nonmarine to deltaic

SOUTHWESTERN ALBERTA

TERTIARY

PALEOCENE

Tp — **PORCUPINE HILLS FORMATION**: pale grey, thick bedded, cherty, calcareous sandstone; pale grey calcareous mudstone; nonmarine

TERTIARY AND CRETACEOUS

PALEOCENE AND UPPER CRETACEOUS

TKw — **WILLOW CREEK FORMATION**: pale grey, fine-grained calcareous sandstone, thick bedded and coarse grained in upper part; grey, green and pink bentonitic mudstone with abundant white-weathering calcareous concretions; scattered thin limestone beds; nonmarine

CRETACEOUS

UPPER CRETACEOUS

Kwb — **WHITEMUD AND BATTLE FORMATIONS**: pale green and greenish grey, white weathering, bentonitic sandstone and mudstone (Whitemud Formation); purplish black, mauve weathering, bentonitic mudstone containing siliceous tuff beds (Battle Formation); nonmarine

Ksm — **ST. MARY RIVER FORMATION**: pale green and grey, fine- to medium-grained, calcareous sandstone; grey clayey siltstone; green and grey siltstone and mudstone; thin coal beds; coquinoid limestone in basal part; nonmarine

Kbo — **BLOOD RESERVE FORMATION**: grey and greenish grey, thick bedded, feldspathic sandstone; shoreline complex

Kbp — **BEARPAW FORMATION**: dark grey blocky shale and silty shale; grey clayey sandstone; thin concretionary ironstone and bentonite beds; marine

Ko — **OLDMAN FORMATION**: pale grey, thick bedded, medium- to coarse grained, feldspathic sandstone; grey clayey siltstone; green and grey mudstone, dark grey and brown carbonaceous shale, concretionary ironstone beds; nonmarine

Kfm — **FOREMOST FORMATION**: pale grey feldspathic sandstone, grey and green siltstone; greenish grey mudstone and dark grey carbonaceous shale; concretionary ironstone beds; thin coal beds; nonmarine

Kpa — **PAKOWKI FORMATION**: dark grey shale and silty shale; minor sandstone; thin chert-pebble conglomerate or pebble bed at base; marine

Kmr — **MILK RIVER FORMATION**: pale grey, thick bedded, feldspathic sandstone with hard calcareous beds; pale to dark grey shale and silty shale; ironstone concretions; marine and nonmarine

Ka — **ALBERTA GROUP**: dark grey fissile shale and silty shale; minor grey cherty sandstone; marine

SOUTHEASTERN ALBERTA

TERTIARY

OLIGOCENE

Tc — **CYPRESS HILLS FORMATION**: conglomerate; minor calcareous sandstone; nonmarine

EOCENE

Ti — (a) dark basic dykes (minette); (b) pale greenish grey acidic porphyry

TERTIARY AND CRETACEOUS

PALEOCENE AND UPPER CRETACEOUS

TKr — **RAVENSCRAG FORMATION**: pale grey, fine grained, feldspathic sandstone, argillaceous and silty in part, grey to brownish grey clay and mudstone; lignitic coal and thin bentonite beds, minor ironstone; nonmarine

CRETACEOUS

UPPER CRETACEOUS

Kwb — **WHITEMUD AND BATTLE FORMATIONS**: pale grey, white weathering, bentonitic sandstone; green and grey, white weathering, clay and silty clay (Whitemud Formation); purplish black, mauve weathering, bentonitic mudstone containing siliceous tuff beds (Battle Formation); nonmarine

Ke — **EASTEND FORMATION**: grey, fine- to medium-grained, feldspathic, clayey sandstone; grey to dark green silty shale and siltstone, black carbonaceous shale, coal beds; shoreline complex

Kbp — **BEARPAW FORMATION**: dark grey blocky shale and silty shale; greenish glauconitic and grey clayey sandstone, thin concretionary ironstone and bentonitic beds; marine

Ko — **OLDMAN FORMATION**: pale grey, thick bedded, medium- to coarse-grained, feldspathic sandstone; grey clayey siltstone; green and grey mudstone; dark grey and brown carbonaceous shale; ironstone concretionary beds; nonmarine

Kfm — **FOREMOST FORMATION**: pale grey feldspathic sandstone, grey and green siltstone; greenish grey mudstone and dark grey carbonaceous shale; concretionary ironstone beds; thin coal beds; nonmarine

Kpa — **PAKOWKI FORMATION**: dark grey shale and silty shale; minor sandstone; thin chert-pebble conglomerate or pebble bed at base; marine

Kmr — **MILK RIVER FORMATION**: pale grey, thick bedded, feldspathic sandstone with hard calcareous beds; pale to dark grey shale and silty shale; ironstone concretions; marine and nonmarine

Ka — **ALBERTA GROUP**: dark fissile shale and silty shale; minor grey cherty sandstone; marine

CENTRAL AND EASTERN ALBERTA

TERTIARY

PLIOCENE?

Th — **HAND HILLS FORMATION**: conglomerate, gravel, sandstone, minor shale, marl (Hand Hills and Wintering Hills); nonmarine

TERTIARY AND CRETACEOUS

PALEOCENE AND UPPER CRETACEOUS

TKp — **PASKAPOO FORMATION**: grey to greenish grey, thick bedded, calcareous, cherty sandstone; grey and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds; **Scollard Member (Ksc)**: grey feldspathic sandstone, dark grey bentonitic mudstone; thick coal beds; nonmarine

CRETACEOUS

UPPER CRETACEOUS

Kwb — **WHITEMUD AND BATTLE FORMATIONS**: pale grey, white-weathering, bentonitic sandstone and mudstone (Whitemud Formation); purplish black, mauve weathering, bentonitic mudstone containing siliceous tuff beds (Battle Formation); nonmarine

Khc — **HORSESHOE CANYON FORMATION**: grey, feldspathic, clayey sandstone; grey bentonitic mudstone and carbonaceous shale; concretionary ironstone beds, scattered coal and bentonite beds of variable thickness, minor limestone beds; mainly nonmarine

Kbp — **BEARPAW FORMATION**: dark grey blocky shale and silty shale; greenish glauconitic and grey clayey sandstone; thin concretionary ironstone and bentonite beds; marine

Kbr — **BELLY RIVER FORMATION**: grey to greenish grey, thick bedded, feldspathic sandstone; grey clayey siltstone, grey and green mudstone; concretionary ironstone beds; nonmarine

Klp — **LEA PARK FORMATION**: dark grey shale; pale grey, glauconitic, silty shale with ironstone concretions; marine

NORTHERN ALBERTA

DEVONIAN

UPPER DEVONIAN

Dg — **GROSMONT FORMATION**: grey, fine-grained, granular, partly vuggy dolomite; marine

Dmk — **MIKKWA FORMATION**: dark grey and brownish grey to olive green, purplish red mottled, fine-grained limestone, dolomitic limestone and shale; marine

Di — **IRETON FORMATION**: greenish grey shale, calcareous shale and siltstone; marine

Dw — **WATERWAYS FORMATION**: grey and greenish grey shale and argillaceous limestone interbedded with grey and greyish brown, fine-grained to coarse clastic limestone; marine

Dc — **CARIBOU MEMBER, SLAVE POINT FORMATION**: grey and brown fine- to medium-grained limestone and dolomitic limestone; minor shale, gypsum; marine

MIDDLE DEVONIAN

Dn — **NYARLING FORMATION**: white and grey gypsum, argillaceous and dolomitic gypsum; some fine-grained limestone and dolomitic limestone; anhydrite, minor dolomite and salt, greenish shale and limestone in subsurface; evaporitic

Dm — **MIDDLE DEVONIAN** (undivided): brown and buff, massive, porous dolomite; brown to grey thin-bedded dolomite, dolomitic limestone; minor anhydrite and gypsum (Methy Formation); gypsum, anhydrite, grey-green silty and dolomitic shale, minor dolomite (McLean River Formation and leached Prairie Evaporite Formation); marine to evaporitic

PROTEROZOIC

Pa — **ATHABASCA FORMATION**: white, grey and red, medium- to coarse grained sandstone, flat-bedded to strongly crossbedded; local conglomerate and shale beds

ARCHEAN

Am — **METASEDIMENTARY ROCKS**: black and grey quartzite and impure quartzite, biotite schist, phyllite; minor sericite and hornblende schist, phyllonite, amphibolite; variable amounts of pegmatite and granite

Agg — **GRANITE GNEISS**: predominantly biotite and hornblende granite gneiss; minor amphibolite, schist, foliated granite and pegmatite

Ag — **GRANITE**: pink to grey, massive to foliated, biotite, hornblende and leucocratic granite; local granite pegmatite

Ap — **PORPHYROBLASTIC GRANITE**: foliated to massive, white, grey and pink, biotite granite and gneissic granite, quartz diorite, with feldspar porphyroblasts; variable amounts of metasedimentary rocks and granite gneiss

NORTHERN ALBERTA

DEVONIAN

UPPER DEVONIAN

Dh — **HAY RIVER FORMATION**: greenish grey calcareous shale, argillaceous siltstone and argillaceous limestone; marine

Dc — **CARIBOU MEMBER, SLAVE POINT FORMATION**: grey and brown fine- to medium-grained limestone and dolomitic limestone; minor shale, gypsum; marine

MIDDLE DEVONIAN

Dfv — **FORT VERMILION MEMBER, SLAVE POINT FORMATION**: white and grey gypsum, argillaceous and dolomitic gypsum; minor anhydrite; some fine-grained limestone, dolomitic limestone and green shale; evaporitic

Dmg — **MUSKEG FORMATION**: white and grey gypsum, anhydrite; minor dolomite, salt and shale; evaporitic

Dk — **KEG RIVER FORMATION**: grey and brown fine- to medium-grained limestone, thin- to thick bedded, locally richly fossiliferous and coarse grained; grey medium-grained dolomite, locally vuggy (upper member)—fine-grained brown dolomite and laminated dolomite, locally vuggy; minor limestone; unit locally much brecciated and recemented (lower member); marine

Dch — **CHINCHAGA FORMATION**: white and grey gypsum, argillaceous and dolomitic gypsum and anhydrite; some dolomite, dolomitic limestone, red and green shale; some salt in subsurface; evaporitic

Df — **FITZGERALD FORMATION**: grey and brown fine- to medium-grained dolomite to sandy dolomite and dolomitic limestone, locally vuggy; grading down into sandstone, arkose and breccia (La Loche Formation); marine

ARCHEAN

A — **UNDIVIDED GRANITIC PLUTONIC ROCKS**: biotite granite, porphyroblastic and porphyritic granite; some granite gneiss and metasedimentary rocks

ROCKY MOUNTAINS AND FOOTHILLS

TERTIARY AND CRETACEOUS

PALEOCENE AND UPPER CRETACEOUS

TKb — **BRAZEAU FORMATION**: greenish grey, thick-bedded, chloritic and feldspathic sandstone and blocky grey mudstone; some tuff and thin coal beds; nonmarine

CRETACEOUS

Ka — **ALBERTA GROUP**: dark grey, fissile, silty shale; some thin-bedded, fine- to medium-grained, cherty sandstone (Blackstone Formation)—thick-bedded, well-sorted, quartzose sandstone; dark grey shale and carbonaceous shale; siltstone and thin coal beds (Cardium Formation)—dark grey fissile shale and siltstone; thin-bedded, fine grained, glauconitic sandstone, thin beds of concretionary ironstone (Wapiabi Formation). Note: north of Athabasca River areas designated as Ka include Smoky Group, Dunvegan and Shaftesbury Formations (stratigraphic equivalents of Alberta Group)

MESOZOIC

Mz — **LOWER CRETACEOUS, JURASSIC AND TRIASSIC**: dark grey to black siltstone, dolomitic siltstone and limestone; silty dolomite, limestone, breccia and gypsum (Triassic)—dark grey to black fissile shale and siltstone; black cherty and phosphatic dolomite and limestone; green glauconitic shale and sandstone (Jurassic)—thick-bedded, fine- to coarse grained, cherty sandstone interbedded with dark grey shale, siltstone and coal (Nikanassin and Kootenay Formations)—grey, siliceous, calcareous sandstone; green chloritic and feldspathic sandstone; dark grey carbonaceous and calcareous shale; grey, green, and red shale and silty shale; some conglomerate; coal in central and northern Foothills; trachytic tuff, agglomerate in southern Foothills (Blairmore Group)

PALEOZOIC

Pzu — **UPPER PALEOZOIC**: grey argillaceous limestone and dolomite, in part cherty and stromatoporoidal, in part coarsely biostromal; black nodular and calcareous shale; grey to brown aphanitic to finely crystalline limestone, dolomite mottled limestone, and dolomite; black bituminous shale (Upper Devonian)—dark grey fissile shale, siltstone, argillaceous limestone and cherty limestone; medium- to coarse-grained crinoidal limestone, cherty and dolomitic limestone; dolomite, cherty dolomite, anhydrite, red shale and sandstone (Mississippian)—thin- and thick bedded quartzose sandstone, phosphatic quartzose siltstone, silty and cherty dolomite, chert and cherty carbonate (Pennsylvanian-Permian)

Pzl — **LOWER PALEOZOIC**: thick-bedded, grey, pink and purple quartzite and quartzose sandstone, with shale and quartzose limestone lentils (Gog Group)—pale grey thick-bedded dolomite and limestone; dark grey, fine-grained, thick- to thin-bedded limestone and dolomite; maroon, buff and green, calcareous and siliceous shales; local intraformational conglomerates (Middle and Upper Cambrian)—grey to grey green limestone, shaly limestone and shale, local intraformational conglomerate; pale grey to pale brown, medium-bedded, siliceous dolomite; clean white quartzite (Ordovician)—pale grey and yellowish grey, medium bedded, fine grained dolomite (Silurian)

PROTEROZOIC

Pm — **MIETTE GROUP**: grey, pink and green argillite, argillaceous sandstone, grit, conglomerate; minor dolomite, limestone and shale

Pp — **PURCELL GROUP**: varicolored laminated and stromatolitic limestone and dolomite, conglomerate with quartzite and dolomite pebbles (Waterton and Altyn Formations)—red and green argillite and quartzite, channel filled and ripple marked (Appekunny and Grinnell Formations)—dark grey limestone and dolomite, stromatolitic and oolitic, interbedded with dolomitic and calcareous shale and siltstone (Siyeh Formation)—dark green to purple amygdaloidal basalt (Purcell Formation)—argillaceous and silty dolomite; green, grey, purple and red argillite and quartzite (Kintla Formation)

Major contorted bedrock area

Faulted area, geology uncertain

Geology compiled by R. Green, 1970

Geological cartography by F. L. Copeland, 1971

Base map cartography by Technical Division, Alberta Department of Lands and Forests

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Copies of this map may be obtained from the Research Council of Alberta, Edmonton, Canada.

NOTES

1. *Legend.* As a single-column legend would be inadequate to show stratigraphic interrelationships in the Plains, this region has been arbitrarily divided into six areas for Mesozoic strata; parentheses are used to indicate gross rock unit correlations. The double column legend for Precambrian and Paleozoic rocks of northern Alberta also indicates general stratigraphic correlations.

2. *Rock unit boundaries.* As drift thicknesses are incompletely known over much of Alberta, essentially all rock unit boundaries have been projected to the land surface. The major exception is the Athabasca River region around Fort McMurray and northward to the Firebag River, where economic considerations require that subcrop boundaries of the Athabasca Oil Sands and overlying rock units be shown as precisely as possible. As the 1972 geological map of Saskatchewan shows rock unit boundaries projected to the bedrock surface, a number of apparent discrepancies appear along the Alberta-Saskatchewan provincial boundary.

All formational boundaries are shown as solid lines; a broken line indicates the upper limit of the Scollard Member of the Paskapoo Formation. Lateral transitions, facies changes, or arbitrary cutoffs are indicated by changes in color and/or in name.

In the Rocky Mountains and Foothills major grouping of rock units was necessary to formulate a reproducible map; the complexity of the geology also requires that no faults be indicated, although many rock unit boundaries are fault contacts.

3. *Bedrock disturbance.* Near-surface bedrock on the Plains is extensively disturbed and contorted by glacial action, in places to depths of several hundred feet. Although disturbance is widely recognized, only defined areas with over 100 feet of disturbed bedrock are indicated on the map.

4. *Sources of data.* Geology of the Plains region is based on published information (to 1970) of the Geological Survey of Canada and Research Council of Alberta, supplemented by unpublished data of the Research Council of Alberta.

Chevron Standard Limited generously supplied the geological compilation for most of the Foothills and Rocky Mountains. Geology for parts of the Rocky Mountains main ranges was obtained from Geological Survey of Canada.

5. *Brazeau Formation.* This rock unit encompasses all nonmarine post-Alberta Group strata in the central and northern Foothills and adjacent Plains regions. South of the Bow River, this designation is applied to Brazeau-equivalent strata of the Foothills: Belly River, St. Mary River, Paskapoo, Willow Creek and the marine Bearpaw Formations.