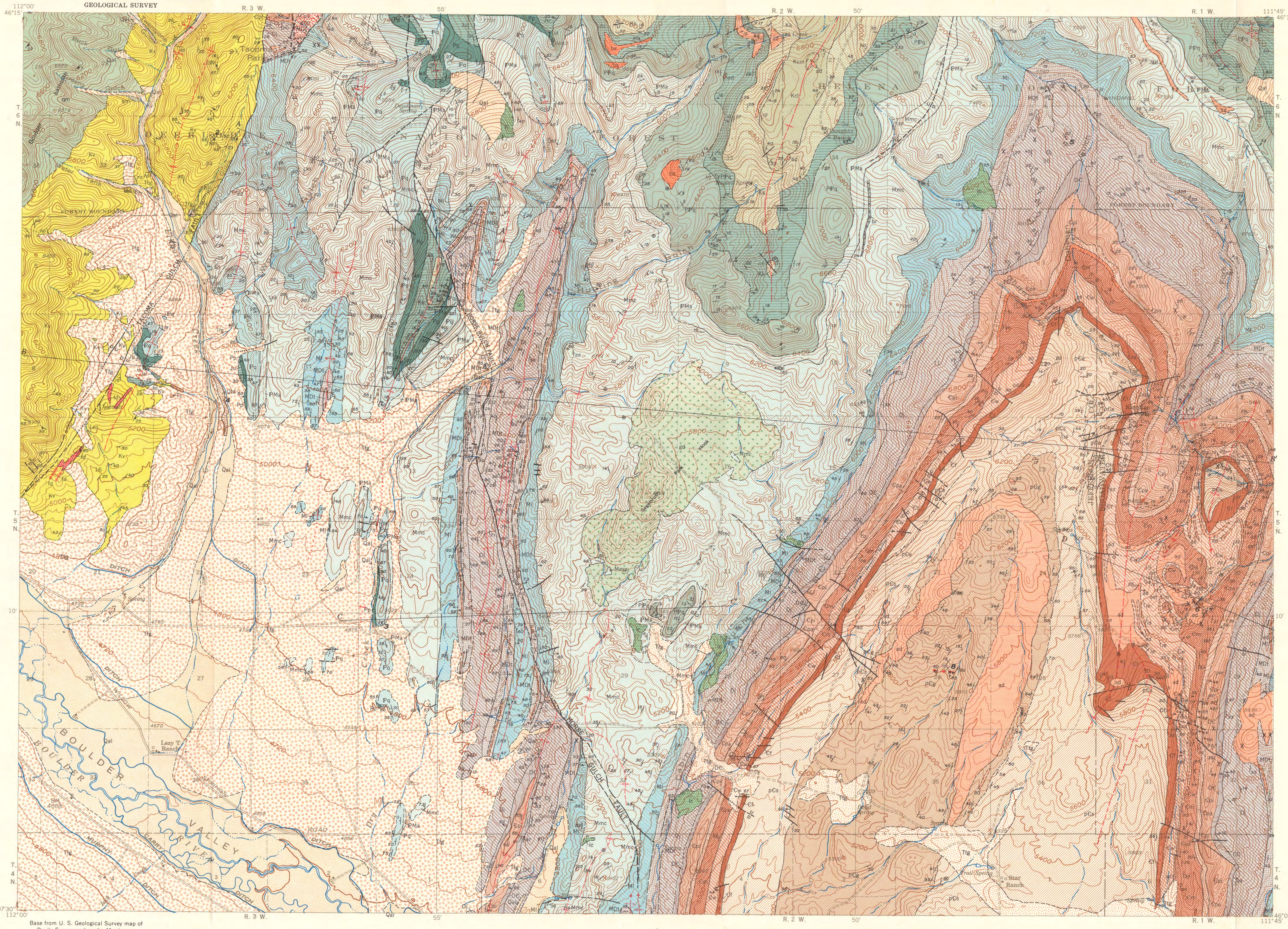
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PROFESSIONAL PAPER 292 PLATE 2



Base from U. S. Geological Survey map of Devils Fence quadrangle, Montana

EXPLANATION

QUATERNARY

Recent

Qtd
Tailings and dumps

Qal
Alluvium

TERTIARY

Pliocene (?)

Tfg
Fan gravel and pediment gravel
Unconsolidated or weakly consolidated fan deposits and gravel veneer on pediments

Oligocene and Miocene (?)

Tc
Conglomerate
Underlies unconsolidated fan gravel in the valley of Elkhorn Creek; contains cobbles of weathered quartz monzonite

Ttg
Tuff and gravel
Light-colored rhyolitic tuff with a few interbeds of stream gravel

MAJOR ANGULAR UNCONFORMITY AND EROSION INTERVAL

FOLDING AND FAULTING

CRETACEOUS

Upper Cretaceous

Kv, Kvl
Elkhorn Mountains volcanics
Dark-greenish-gray, grayish-green, greenish-black, dull-reddish-gray, and dull-purplish-gray pyroclastic rocks of andesitic composition, streaky welded tuff of probable quartz latitic composition, a few thin massive lava flows, and water-laid tuffs; and, in Tacoma Gulch, a lens of impure limestone, Kvl; may include a few sills

UNCONFORMITY

Lower and Upper Cretaceous

Kcm, Kcl
Colorado formation
Upper black shale unit not mapped. Middle siliceous mudstone and sandstone unit, Kcm, is intertongued marine and nonmarine sandstone, mudstone, and siliceous mudstone, in part of volcanic origin. Lower black shale unit, Kcl, is a basal tan-weathering quartz sandstone, drab and olive-gray blocky siltstone, very dark gray to black shale, and an upper dark-gray carbonaceous, limonitic speckled to mottled sandstone

EROSIONAL UNCONFORMITY

Lower Cretaceous

Kk
Kootenai formation
Comprises three units. Upper unit is 10 to 25 ft of gastropod-bearing limestone overlain by a few feet to 80 ft of drab mudstone; middle unit is red and green mudstone and shale with concretions and lentils of limestone; lower unit is crossbedded "pepper-and-salt" sandstone and interbedded shale and mudstone

JURASSIC

Upper Jurassic

Ju
Morrison and Swift formations
Morrison formation: varicolored nonmarine shale, mudstone, and siltstone, with thin beds of limestone and sandstone, and near the top a unit of black shale. Upper hundred feet locally contains thick, lenticular "pepper-and-salt" sandstone and grades into overlying Kootenai formation
Swift formation: grayish-brown punky calcareous marine sandstone, 20 to 35 ft thick, with a basal chert-pebble conglomerate

EROSIONAL UNCONFORMITY

PERMIAN

Pp, PPq
Phosphoria formation
Brown and gray chert and sandstone, in part phosphatic; may locally contain one or two thin beds of phosphate rock, Pp. In places mapped with the Quadrant formation, PPq

CARBONIFEROUS

PENNSYLVANIAN

Pq
Quadrant formation
Light-colored quartzitic sandstone and interbedded light-gray sugary-textured sandy dolomite

PMa
Amsden formation
Red to grayish-red mudstone, shale, and subordinate amounts of carbonate rock with interbeds of gray, brown, or yellow argillaceous sandstone in upper and lower parts; middle part of medium- to dark-gray thick-bedded dolomite

EROSIONAL UNCONFORMITY(?)

MISSISSIPPIAN

Madison group

br, Mmc
Mission Canyon limestone
Medium-gray to light-gray medium-grained thickly and indistinctly bedded limestone, with a few thin siliceous layers in lower 200 ft and sparse gray chert nodules and lentils in upper half. A breccia unit, br, about 200 ft below top of formation has been mapped locally

Ml
Lodgepole limestone
Upper part of medium-gray fine- to medium-grained limestone in distinct beds as much as 3 ft thick alternating with zones of much thinner beds containing rare mudstone partings; lower part of medium-gray limestone in beds 1 in. to 1 ft thick with partings and interbeds of yellow to red calcareous mudstone; grades into Mission Canyon limestone through a 150- to 200-ft zone

DEVONIAN AND MISSISSIPPIAN

Upper Devonian and Mississippian

MDt, li
Three Forks shale
Predominantly greenish-gray and brown shale with subordinate amounts of interbedded sandstone and limestone. Dolomitic siltstone at top. Locally a 10- to 25-ft fossiliferous limestone unit, li, has been mapped

DEVONIAN

Upper Devonian

Dj
Jefferson dolomite
Dark-gray granular-weathering fetid well-bedded dolomite with subordinate amounts of dark-gray limestone and light-gray dolomite

EROSIONAL — UNCONFORMITY

Upper Cambrian and Upper Devonian

D€
Maywood and Red Lion formations undifferentiated
Varicolored, generally in shades of red and yellowish-brown, argillaceous, dolomitic, and calcareous rocks; poorly exposed

CAMBRIAN

Upper Cambrian

€pi
Pilgrim dolomite
Comprises three units. Upper unit is light-gray thick-bedded dolomite commonly mottled medium-gray near base. Middle unit is light- to medium-gray crystalline limestone irregularly ribboned with yellowish-gray silty dolomite. Lower unit is mottled light- and dark-gray dolomite with sparse intraformational conglomerate; locally, basal 8 to 10 ft is bluish-gray limestone

€pa
Park shale
Olive-gray, gray, and light-brown shale with minor amounts of argillaceous limestone, siltstone, and sandstone

Middle Cambrian

€m
Meagher limestone
Comprises three units. Upper and lower units are medium-gray limestone irregularly ribboned or mottled with yellowish-orange, yellowish-brown, and yellowish-gray dolomite. Middle unit is thickly and indistinctly bedded medium-gray limestone, commonly with oolitic beds

€w
Wolsey shale
Upper half is interbedded gray argillaceous limestone and greenish- and yellowish-gray calcareous mudstone and shale. Lower half is greenish-gray and drab shale with some interbeds of sandstone and limestone; many beds are micaceous, some are glauconitic

€f
Flathead quartzite
White to pale shades of gray, pink, brown, and purple medium- to thick-bedded homogenous even-grained quartz sandstone; most beds are cemented to vitreous quartzite; thin, discontinuous sparse pebble zones in lower part; crossbedding common

UNCONFORMITY

PRECAMBRIAN

Upper Precambrian

Belt series

p€e
Empire shale
Gray, greenish-gray, and brown, siliceous mudstone or argillite with interbeds of quartzite sandstone and shale. Intertongues with Spokane shale

p€s
Spokane shale
Grayish-red mudstone, shale, and sandstone, with a few thin beds of limestone near base

p€g
Greyson shale
Gray and brown mudstone or shale alternating with sandstone or quartzite. Base not exposed. Grades into Spokane shale

INTRUSIVE ROCKS

YOUNGER INTRUSIVE ROCKS

CRETACEOUS AND TERTIARY(?)

Upper Cretaceous and Lower Tertiary(?)

fd
Light-colored felsite dikes of uncertain age

gd
Granodiorite and quartz diorite
In Sagebrush Park stock

qm
Quartz monzonite and related rocks
Light-gray to medium-gray biotite-hornblende quartz monzonite and granodiorite of the Boulder batholith; in places near the border of the batholith grades into a darker and generally somewhat finer grained facies

ic
Composite or hybrid intrusives
Small plutons containing diverse and unusual rocks including olivine-rich and quartz-rich types

gdp
Granodiorite porphyry
Medium-gray granodiorite or quartz monzonite porphyry with conspicuous phenocrysts of plagioclase and euhedral to rounded quartz grains in an aphanitic groundmass; in part microbrecciated and seamed with cryptocrystalline silica

OLDER INTRUSIVE ROCKS

CRETACEOUS

Upper Cretaceous

ba
Basalt and related rocks
Dark-gray to greenish-black fine- to medium-grained rocks, mainly as sills

ad
Andesite porphyry, diorite porphyry, and related rocks
Greenish-gray to dark-gray porphyritic rocks with phenocrysts of plagioclase and hornblende or augite; mainly as sills

hl
Hornblende lamprophyre
Very fine grained gray rock with conspicuous hornblende phenocrysts

Contact, showing dip
Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate

Vertical contact

Overturned contact

Fault, showing dip
Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate. Dotted where concealed, queried where doubtful. U, upthrown side; D, downthrown side

Preintrusion fault
Forming boundary along margin of intrusive body; dashed where approximately located

Anticline
Showing crestline and plunge of axis. Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate. Dotted where concealed; queried where doubtful

Syncline
Showing position of trough and plunge of axis. Dashed where approximately located; length of dashes indicates degree of accuracy; long dash most accurate. Dotted where concealed; queried where doubtful

Overturned anticline

Strike and dip of beds

Strike of vertical beds

Horizontal beds

Strike and dip of cleavage

Strike and dip of joints

Vertical vein, approximately located

Vein, approximately located, showing dip

Vertical shaft

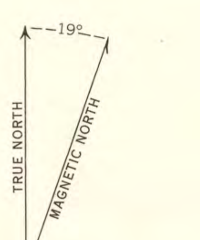
Adit

Prospect pit

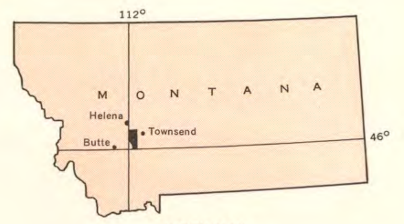
Mine

LIST OF MINES IDENTIFIED BY NUMBER

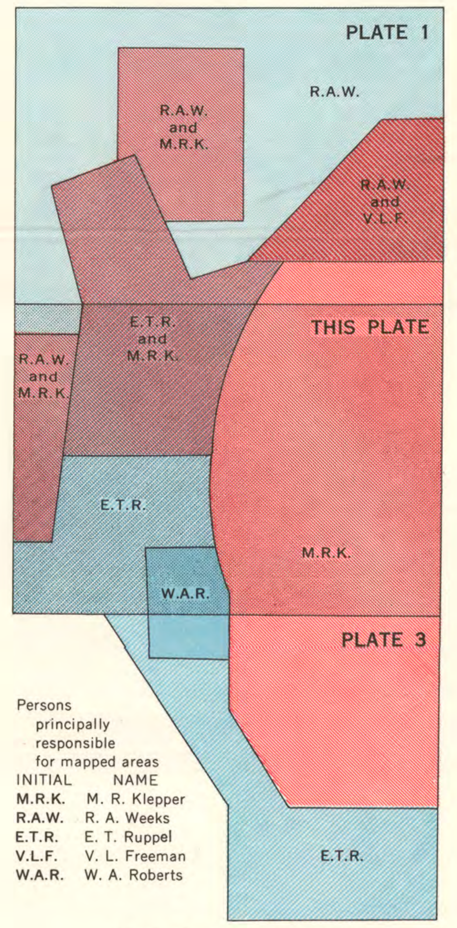
1. Elkhorn Queen
2. Tacoma
3. Passover
4. Elkhorn Creek placer
5. Spar
6. Rothfus iron
7. Parker group (Silver Belle, Ned, Globe)
8. Katiedid



APPROXIMATE MEAN DECLINATION 1950



INDEX MAP



Persons principally responsible for mapped areas

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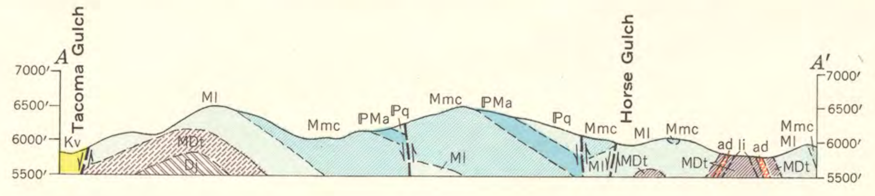
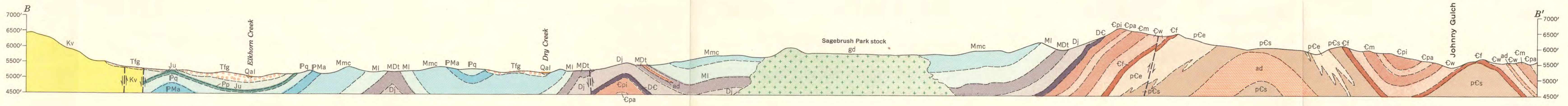
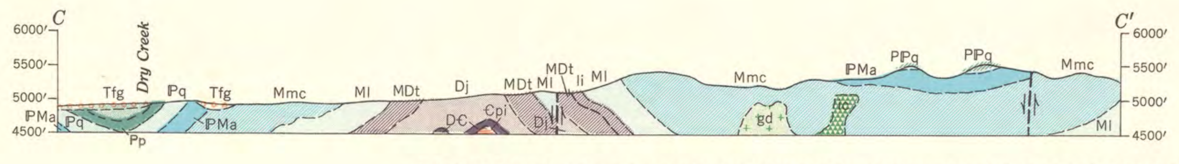
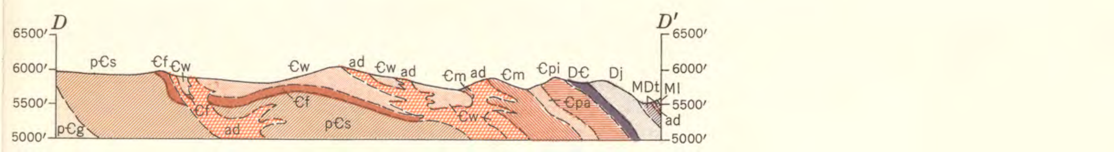
INDEX TO AREA MAPPED









GEOLOGIC MAP AND SECTIONS, NORTH HALF OF DEVILS FENCE QUADRANGLE, MONTANA

Scale 1:31,250

1 0 2 Miles

Contour interval 40 feet
Datum is mean sea level

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
M R 4433