

Montana Bureau of Mines and Geology
Open File No. 648

Geologic Map of the
Bozeman 30' x 60' Quadrangle,
Southwestern Montana

Compiled and mapped by Susan M. Vuke, Jeffrey D. Lonn,
Richard B. Berg, and Christopher J. Schmidt

2014

To view a full scale version of this map, [click here](#) .

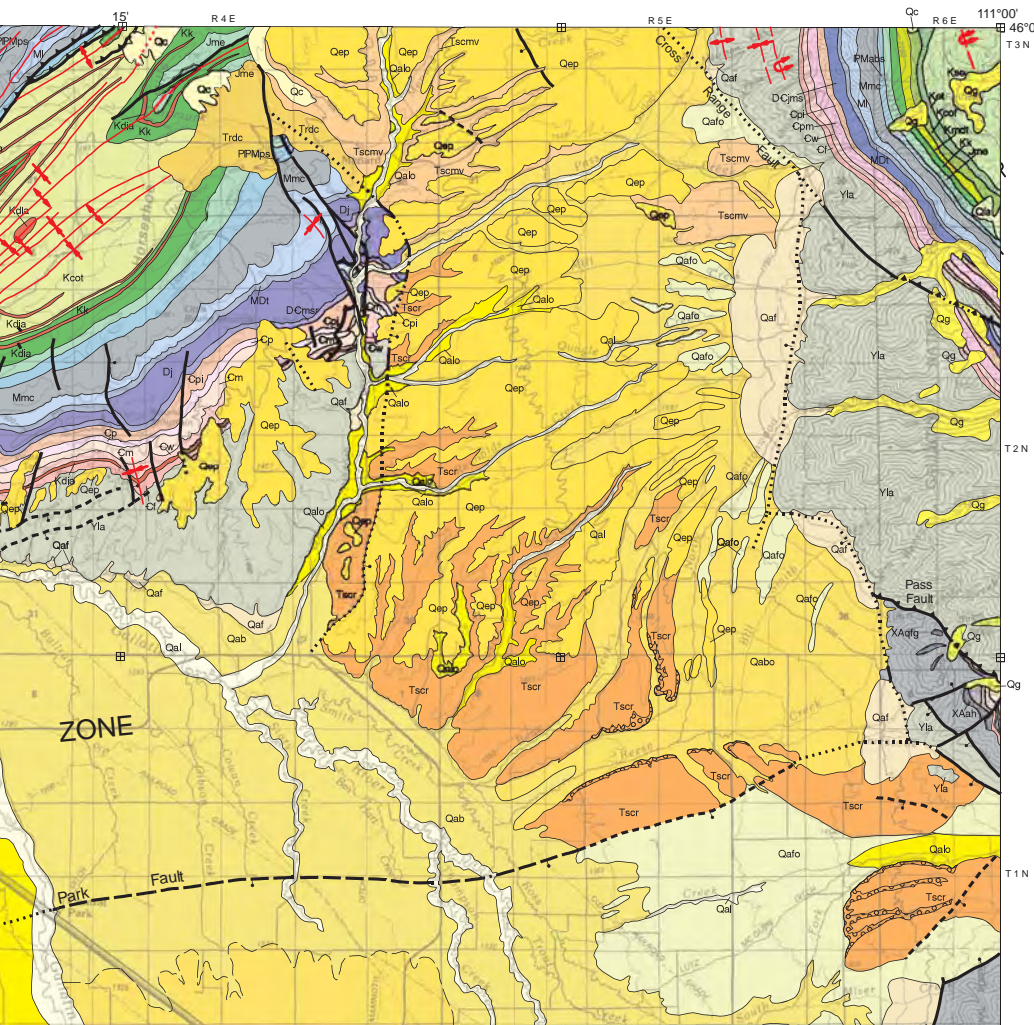
For the text files with the map information, [click here](#).

[Digital data link](#)

Note— This map was originally published at a scale of 1:100,000 but the page sizes have been modified to fit average printer capabilities (8½ x 14; legal size paper). There is a an eighth inch overlap on these pages. A full sized colored print of this map can be ordered from the **MBMG Publication Sales Office, 1300 West Park Street, Butte, MT, 59701-8997.**

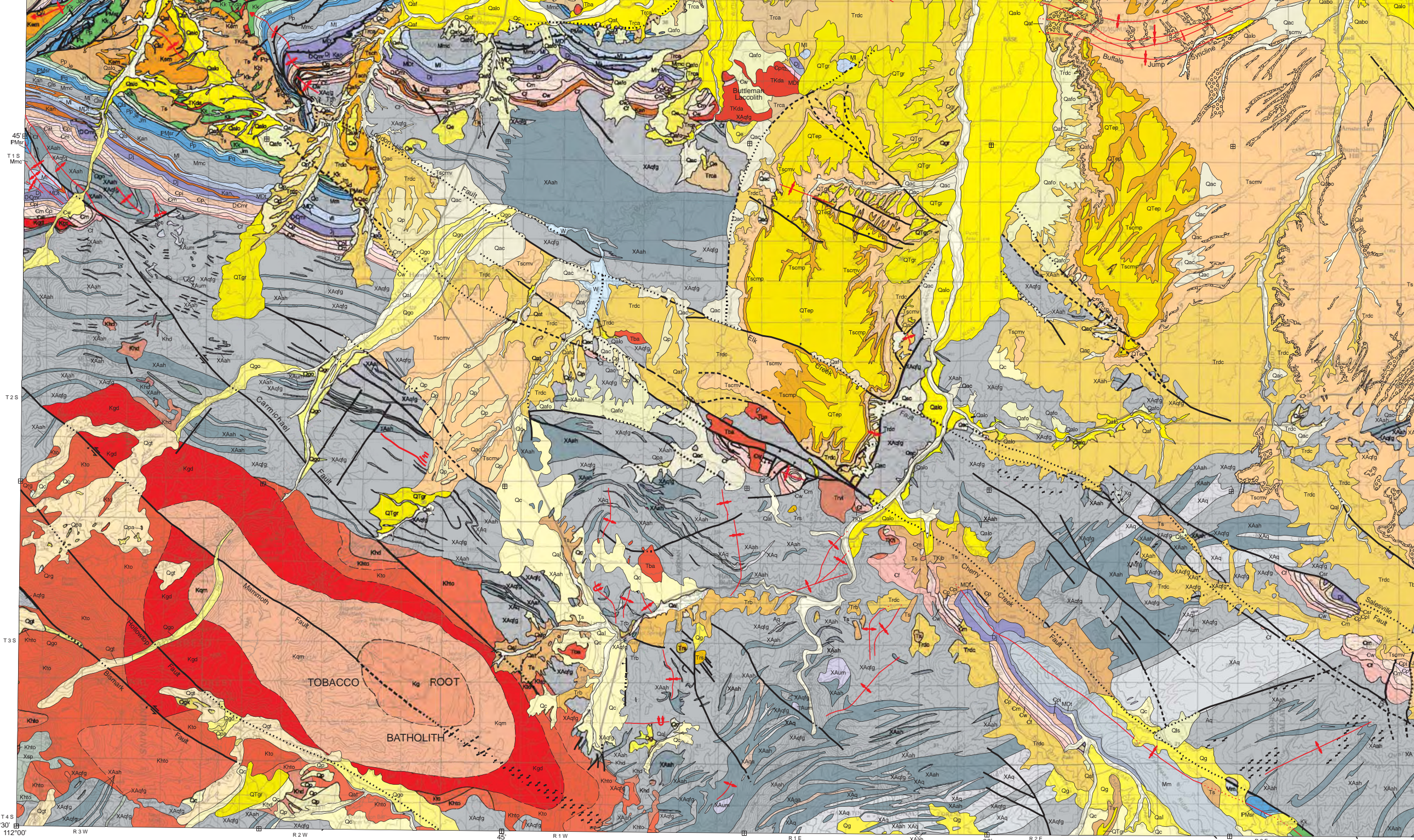
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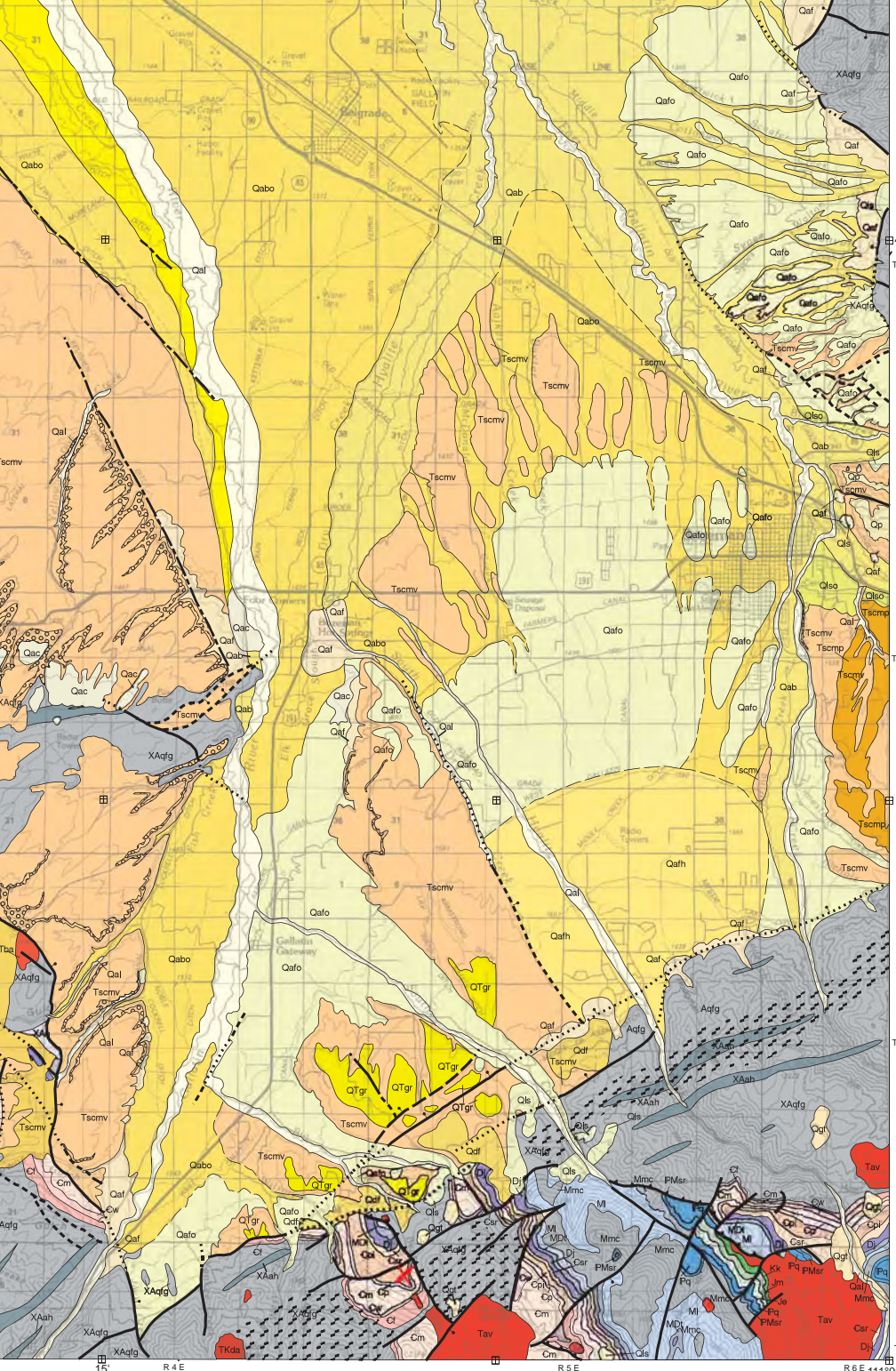
MAP UNITS

 Qal	Alluvium	 Tan	Andesite	 Pq	Quadrant Formation
 Qc	Colluvium	 Tvi	Rhyolite, vitric	 Pmsr	Snowcrest Range Group
 Qls	Landslide deposit	 Tav	Absaroka Volcanics	 Mm	Madison Group, undivided
 Qpa	Paludal deposit	 Tba	Basalt	 Mmc	Mission Canyon Limestone
 Qdf	Debris flow deposit	 TKa	Andesite	 MI	Lodgepole Limestone
 Qe	Eolian deposit	 TKI	Latite	 MDt	Three Forks Formation
 Qac	Alluvium and colluvium, undivided	 TKda	Dacite	 DCjms	Jefferson, Maywood, and Snowy Range Fms., undivided
 Qgr	Gravel deposit	 TKfi	Felsic intrusive rocks	 Dj	Jefferson Formation
 Qaf	Alluvial fan deposit	 TKjb	Jasperoid breccia	 DCmr	Maywood and Red Lion Fms., undivided
 Qab	Braid-plain alluvium	 Ki	Intrusive rock, undivided	 DCmsr	Maywood and Snowy Range Fms., undivided
 Qat	Alluvial terrace deposit	 Kem	Elkhorn Mountains Volcanics	 Csr	Snowy Range Formation
 Qath	Hyalite alluvial fan	 Kan	Andesite	 Cpi	Pilgrim Limestone
 Qafo	Alluvial fan deposit, older	 Kdia	Diabase	 Cpm	Park and Meagher Formations, undivided
 Qabo	Braid plain alluvium, older	 Kg	Granite	 Cp	Park Shale
 Qalo	Alluvium, older	 Kgd	Granodiorite	 Cm	Meagher Limestone
 Qlso	Landslide deposit, older	 Khd	Hornblende diorite	 Cw	Wolsey Shale
 Qep	Eolian and pediment deposits	 Knto	Hornblende tonalite	 Cf	Flathead Formation
 Qm	Mantle	 Kto	Tonalite	 Yg	Greyson Formation
 Qp	Pediment deposit	 Kqm	Quartz monzonite	 Yn	Newland Formation
 Qg	Glacial deposit, undivided	 Ksk	Skarn	 Yla	LaHood Formation, undivided
 Qgk	Glacial kame deposit	 Kmod	Monzonite and diorite	 Ylaf	LaHood Formation, alluvial-fan and fan-delta facies
 Qgt	Glacial till	 Kse	Sedan Formation	 Ylsh	LaHood Formation, shelf facies
 Qgo	Glacial outwash deposit	 Ket	Eagle and Telegraph Creek Fms., undivided	 Ylsl	LaHood Formation, slope facies
 Qrg	Rock glacier deposit	 Kcot	Cody through Thermopolis Fms., undivided	 Ylsc	LaHood Formation, submarine-canyon facies, undivided
 QTaf	Alluvial fan deposit	 Kcof	Cody and Frontier Fms., undivided	 Ylis	LaHood Formation, inner submarine-fan facies
 QTafy	Alluvial fan deposit, younger	 Kbl	Blackleaf Formation	 Ylms	LaHood Formation, middle submarine-fan facies
 QTafo	Alluvial fan deposit, older	 Kmdt	Muddy and Thermopolis Fms., undivided	 Ylos	LaHood Formation, outer submarine-fan facies
 QTat	Alluvial-terrace deposit	 Kt	Thermopolis Formation	 Ylbp	LaHood Formation, basin-plain facies
 QTep	Eolian, paleosol, and pediment deposits	 Kk	Kootenai Formation	 Xsp	Spuhler Peak metamorphic suite



Base from U.S. Geological Survey
 Bozeman 30'x60' topographic quadrangle
 Map date: 1992



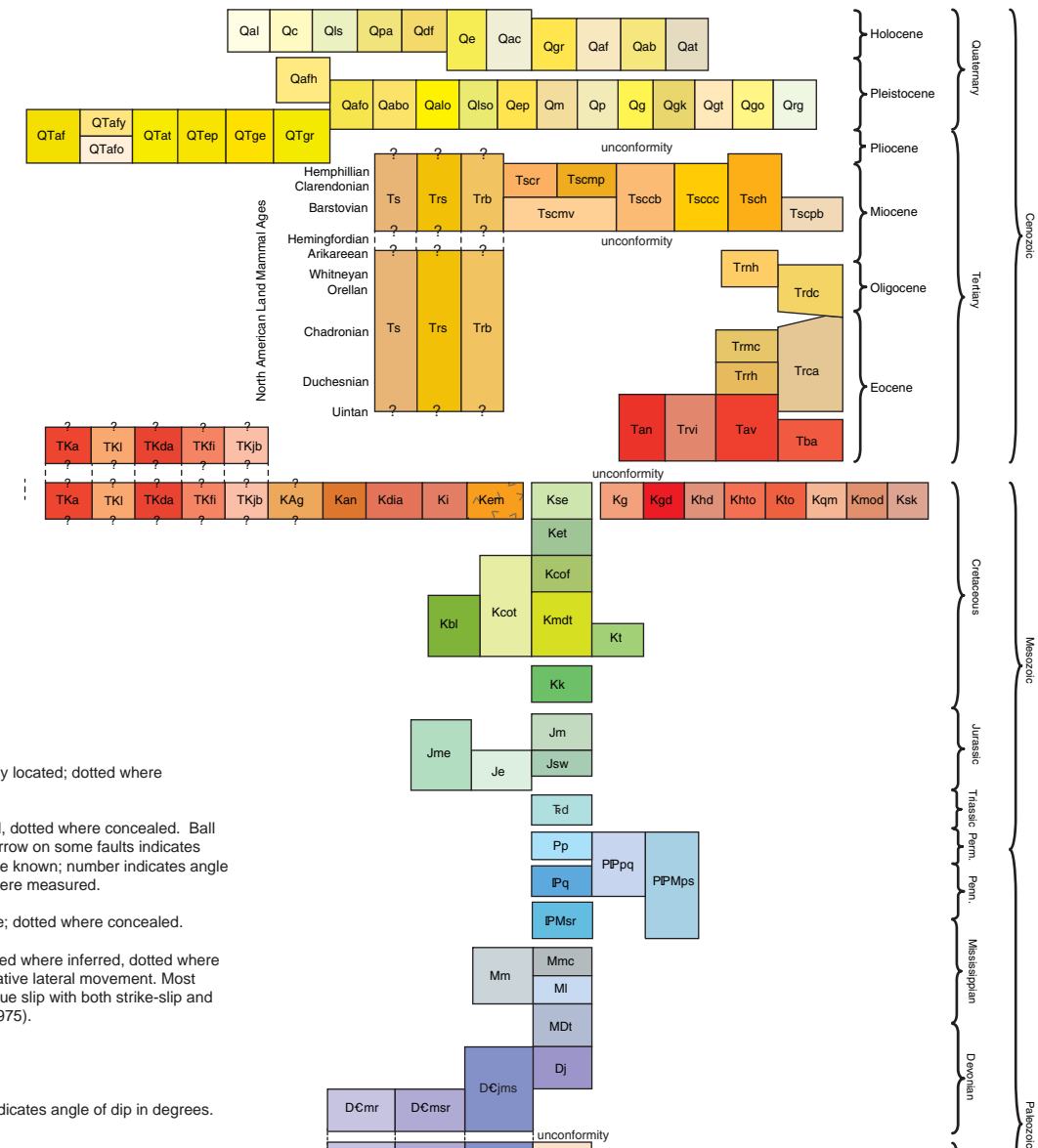


- QTge** Coarse gravel and eolian deposits
- QTdf** Debris-flow deposit
- QTgr** Gravel
- Ts** Sediment or sedimentary rocks, undivided
- Trs** Rhyolite sediment
- Trb** Red Bluff Formation
- Tscr** Reese Creek member
- Tsccb** Clarkston Basin member
- Tscmp** Madison Plateau member
- Tsccc** Cottonwood Canyon member
- Tsch** Harrison member
- Tscmv** Madison Valley member
- Tscpb** Parrot Bench member
- Trmh** Negro Hollow member
- Trdc** Dunbar Creek Member
- Trca** Climbing Arrow Member
- Trmc** Miligan Creek Member
- Trrh** Red Hill member

- Jme** Morrison Formation and Ellis Group, undivided
- Jm** Morrison Formation
- Je** Ellis Group, undivided
- Jsw** Swift Formation
- Td** Dinwoody Formation
- PPMps** Phosphoria and Quadrant Fms, and Snowcrest Range Group
- PPpq** Phosphoria and Quadrant Formations, undivided
- Pp** Phosphoria Formation

- Xg** Granite
- XAah** Amphibolite and hornblende gneiss
- XAif** Banded iron formation
- XAq** Quartzite
- XAqa** Quartzite and amphibolite
- XAqfg** Quartzofeldspathic gneiss
- Xaum** Ultramafic rock
- W** Water

CORRELATION OF MAP UNITS



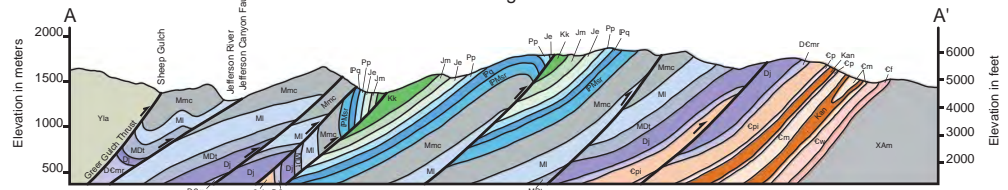
MAP SYMBOLS

- Contact—Dashed where approximately located; dotted where concealed.
- Fault, normal—Dashed where inferred, dotted where concealed. Ball and bar on downthrown side. Arrow on some faults indicates direction of fault plane dip where measured; number indicates angle of fault plane dip in degrees where measured.
- Fault, thrust—Sawteeth on upper plate; dotted where concealed.
- Fault, strike-slip or oblique slip—Dashed where inferred, dotted where concealed. Arrows indicate relative lateral movement. Most faults with this symbol are oblique slip with both strike-slip and reverse movement (Schmidt, 1975).
- Linear feature, possible fault
- Strike and dip of bedding—Number indicates angle of dip in degrees.
- Vertical bed

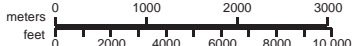
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Cross Section A-A'
 Enlarged 2x



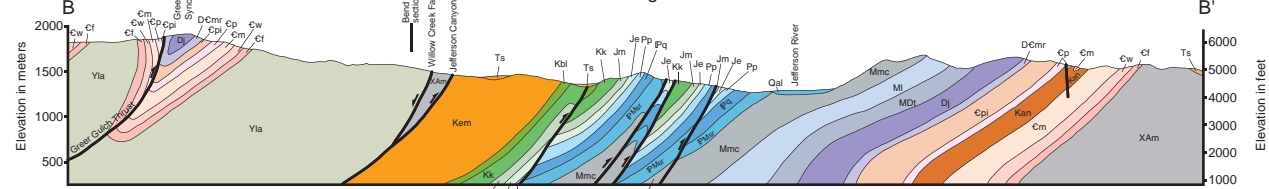
No vertical exaggeration
 Datum mean sea level
 Thin surficial deposits not shown
 Modified from Schmidt, 1975



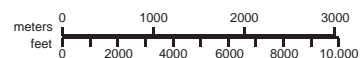
SCALE: 1:50,000

More detail is shown on cross sections A-A' and B-B' than on map.

Cross Section B-B'
 Enlarged 2x



No vertical exaggeration
 Datum mean sea level
 Thin surficial deposits not shown
 Modified from Schmidt, 1975



SCALE: 1:50,000

Explanation for Cross Sections

Geologic Units

Qal Alluvium. Includes Qal and Qalo on map.
 Qep Eolian and pediment deposits

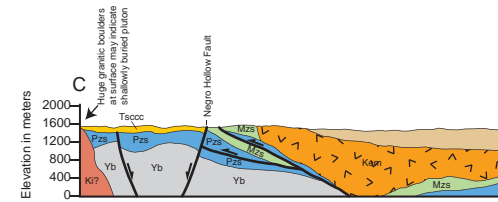
Sixmile Creek Formation
 Tscmp Madison Plateau member
 Tscmv Madison Valley member
 Tscoc Cottonwood Canyon member

Renova Formation
 Trdc Dunbar Creek Member
 Trca Climbing Arrow Member

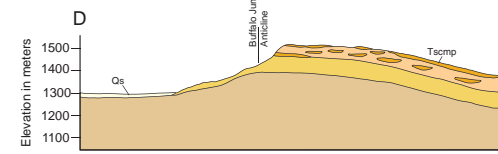
Kem Elkhorn Mountains Volcanics
 Ki Intrusive rock
 Mzs Mesozoic sedimentary rocks, undivided
 Pzs Paleozoic sedimentary rocks, undivided
 Yb Belt Supergroup (LaHood Formation and others)
 XAm Metamorphic rock

Fault, arrow shows sense of relative movement

Coarse-grained deposits (pebble-size clasts and larger) on cross section D—D'



No vertical exaggeration
 Datum mean sea level
 Thin surficial deposits not shown
 Robinson (1963), Davis and others (1965),
 Richard (1966), and Zietz (1960).

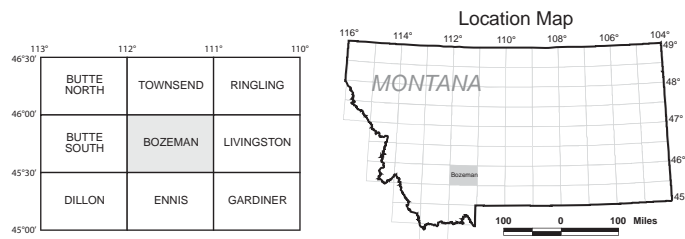


Vertical exaggeration 1.5x
 Datum mean sea level
 Thin surficial deposits not shown

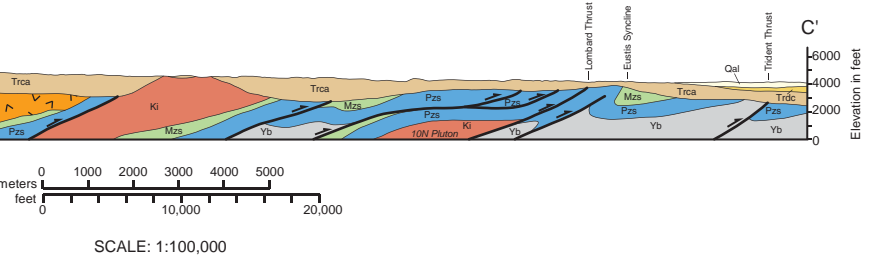


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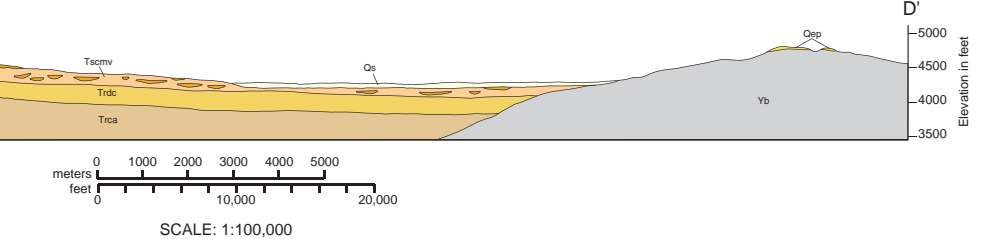
GIS production: Ken Sandau and Paul Thale, MBMG. Map layout: Susan Smith, MBMG.



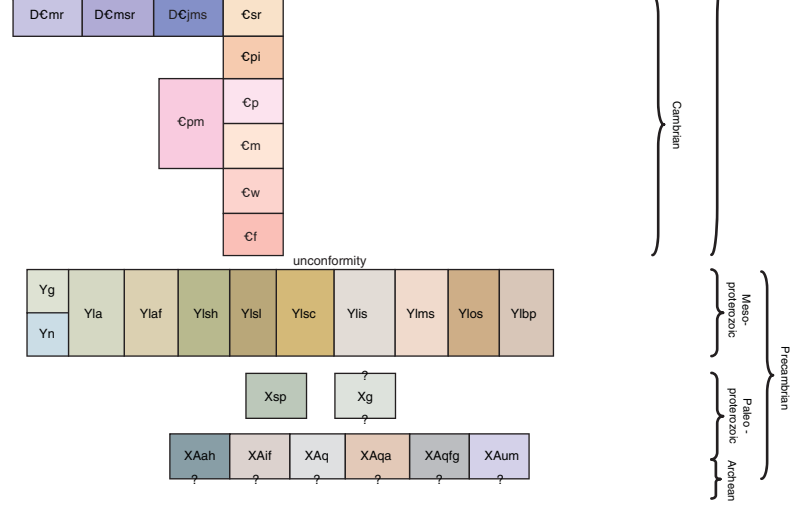
Cross Section C-C'



Cross Section D-D'



- Vertical bed
- Overturned bed—Number indicates angle of dip in degrees.
- Strike and dip of foliation—Number indicates angle of dip in degrees.
- Vertical foliation
- Strike and dip of joint plane—Number indicates angle of dip in degrees.
- Vertical joint plane
- Strike and dip of foliation, showing lineation—Direction and plunge of lineation indicated by arrow and associated value.
- Syncline—Showing trace of axial plane and direction of plunge; dotted where concealed. Plunge arrow omitted where not plunging, or plunge direction unknown. Synform in Archean rocks where top of beds is unknown.
- Anticline—Showing trace of axial plane and direction of plunge; dotted where concealed. Plunge arrow omitted where not plunging or plunge direction unknown. Antiform in Archean rocks where top of beds is unknown.
- Monocline: synclinal bend—Showing trace of axial plane. Dotted where concealed; short arrow on more steeply dipping limb.
- Monocline: anticlinal bend—Showing trace of axial plane. Dotted where concealed; short arrow on more steeply dipping limb.
- Overturned syncline—Showing trace of axial plane. Dotted where concealed.
- Overturned anticline—Showing trace of axial plane. Dotted where concealed.
- Shear zone, mylonitic in Gallatin Range
- Tectonic breccia
- Conglomerate and gravel lenses in Tscmv, Tscr, and Trdc



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For a more detailed description of the map units and symbols, please refer to the text accompanying this map.