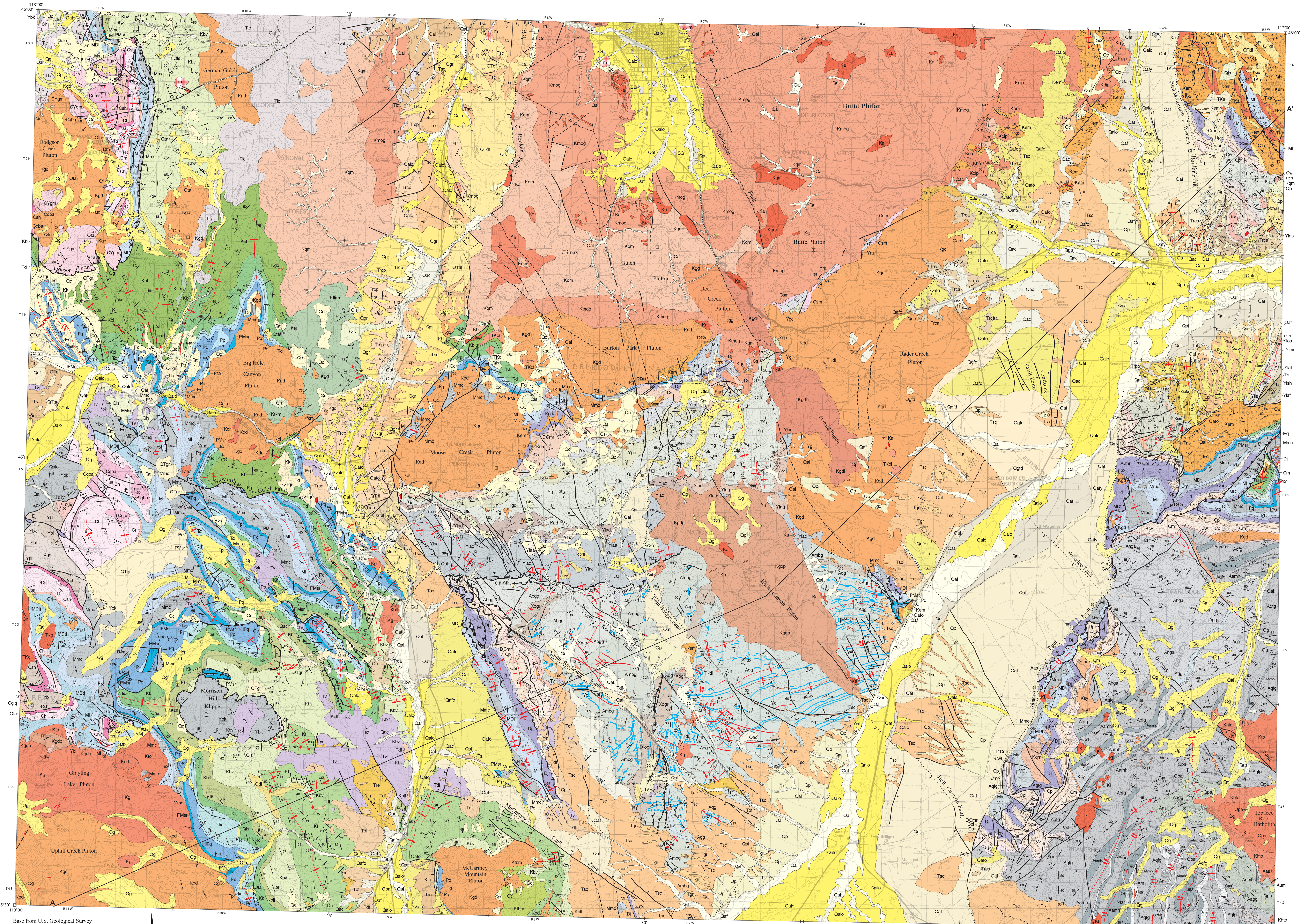


Base from U.S. Geological Survey
Butte South 30'x60' topographic quadrangle
Map date: 1975
Projection: UTM zone 12; 1927 NAD
UTM grid declination 1°04' West
1975 Magnetic North Declination 18° East

SCALE 1:100 000
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
CONTOUR INTERVAL 50 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ELEVATIONS SHOWN TO THE NEAREST METER

Maps may be obtained from
Publications Office
Montana Bureau of Mines and Geology
1300 West Park Street, Butte, Montana 59701-8997
Phone: (406) 496-4174 Fax: (406) 496-4451
http://www.mbmg.mtech.edu

Geologic Map Units

Symbol	Unit
Qal	Alluvium
Qpa	Paludal deposit
Qdf	Debris-flow deposit
Qac	Alluvium and colluvium
Qc	Colluvium
Qls	Landslide deposit
Qta	Talus deposit
Qafy	Alluvial fan deposit, younger than Qaf
Qalo	Alluvium, older than Qal
Qaf	Alluvial fan deposit
Qrg	Rock glacier deposit
Qgr	Gravel deposit
Qat	Alluvial terrace deposit
Qp	Pediment deposit
Qafo	Alluvial fan deposit, older than Qaf
Qgfd	Glacial fan deposit
Qato	Alluvial terrace deposit, older than Qat
Qg	Glacial deposit
QTal	Alluvium
QTdf	Debris-flow deposit
QTgr	Gravel
Ts	Sediment or sedimentary rocks, undivided
Tat	Alluvial terrace deposit
Tdf	Debris-flow deposit
Tgr	Gravel
Tgrc	Gravel deposit, coarse grained
Tsc	Sixmile Creek Formation
Tre	Renova Formation, undivided
Trcp	Renova Formation, Cabbage Patch Member
Trbb	Renova Formation, Bone Basin Member
Trdc	Renova Formation, Dunbar Creek Member
Trca	Renova Formation, Climbing Arrow Member
Tv	Volcanic rocks, undivided
Tlc	Lowland Creek Volcanics
Tba	Basalt
Ti	Intrusive rocks, undivided
TKi	Intrusive rocks, undivided
TKa	Andesite
TKdi	Diorite
TKg	Granite
TKla	Lamprophyre
Kem	Elkhorn Mountains Volcanics
Kan	Andesite
Ka	Aplite
Kla	Latite
Kba	Basalt
Ksy	Syenite
Kdi	Diorite
Kdip	Diorite porphyry
Kg	Granite
Kgd	Granodiorite
Kmog	Monzogranite
Kgdl	Granodiorite, leucocratic
Kgdp	Granodiorite, porphyritic
Kgg	Granite, granophyric
Kto	Tonalite
Khto	Hornblende tonalite
Ki	Intrusive rocks, undivided
Kmz	Monzonite
Kqm	Quartz monzonite
Kqml	Quartz monzonite, leucocratic
Kqd	Quartz diorite and tonalite
Kbr	Breccia
Kfb	Frontier and Blackleaf Formations, undivided
Kfbm	Frontier and Blackleaf Formations, metamorphosed
Kfkm	Frontier, Blackleaf, and Kootenai Formations, metamorphosed
Kf	Frontier Formation
Kbl	Blackleaf Formation
Kbv	Blackleaf Formation, Vaughn Member
Kblf	Blackleaf Formation, Flood Member
Kk	Kootenai Formation
Jm	Morrison Formation
Je	Ellis Group, undivided
Ꞧd	Dinwoody Formation
Pp	Phosphoria Formation
IPq	Quadrant Formation
IPMsr	Snowcrest Range Group
Mm	Madison Group, undivided
Mmc	Mission Canyon Limestone
Ml	Lodgepole Limestone
MDtj	Three Forks and Jefferson Formations, undivided
MDt	Three Forks Formation
Dj	Jefferson Formation
DCmr	Maywood and Red Lion Formations, undivided
Dm	Maywood Formation
Cs	Sedimentary rocks, undivided
Csm	Sedimentary rocks, metamorphosed
Crl	Red Lion Formation
Ch	Hasmark Formation
Cpi	Pilgrim Formation
Cp	Park Formation
Cm	Meagher Formation
Csh	Silver Hill Formation
Cwf	Wolsey and Flathead Formations, undivided
Cw	Wolsey Formation
Cf	Flathead Formation
Cqba	Quartzite and argillite
Cglq	Quartzite of Grace Lake
CYgm	Quartzite of Granulated Mountain
Yd	Diabase
Ybk	Quartzite of Boner Knob
Ybl	Black Lion Formation
Yra	Ravalli Group
Ygc	Greyson Formation, upper calcsilicate member
Yg	Greyson Formation
Yla	LaHood Formation, undivided
Ylad	LaHood Formation, dark argillite and carbonate facies
Ylaq	LaHood Formation, quartzite facies
Ylaa	LaHood Formation, argillite and siltite facies
Ylac	LaHood Formation, coarse facies
Ylaf	LaHood Formation, alluvial fan and fan-delta facies
Ylsh	LaHood Formation, shelf facies
Ylsl	LaHood Formation, slope facies
Ylsc	LaHood Formation, submarine-canyon facies
Ylis	LaHood Formation, inner submarine fan facies
Ylms	LaHood Formation, middle submarine fan facies
Ylos	LaHood Formation, outer submarine fan facies
Xga	Gneiss and amphibolite
Xmb	Mafic dikes and sills
Xogr	Igneous and metamorphic rock, undivided
Xum	Ultramafic rock
Abgg	Biotite-garnet gneiss
Ambg	Mylonitic biotite gneiss
Agg	Garnet gneiss and schist
Aqg	Quartz-feldspar gneiss and schist
Aagg	Anthophyllite-gedrite gneiss
Aamh	Amphibolite and hornblende gneiss
Aas	Aluminous schist
Ahga	Hornblende plagioclase gneiss and amphibolite
Am	Marble
Aqfg	Quartzofeldspathic gneiss
Aum	Ultramafic rock
	Hydrothermally altered rock

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

Map symbols

- Contact: long dash where approximately located; short dash where inferred
- Fault: unknown sense of movement; dashed where approximately located; dotted where concealed
- Normal fault: dashed where approximately located; dotted where concealed; bar and ball on downthrown side
- Strike-slip fault: dashed where approximately located; dotted where concealed. Arrows along fault trace indicate relative strike-slip displacement
- Reverse or thrust fault: teeth on upthrown block; dashed where approximately located; dotted where concealed
- Bedding sub-parallel fault: unknown sense of movement; dashed where approximately located; dotted where concealed
- Reactivated fault: unknown sense of movement; dashed where approximately located; dotted where concealed
- Monocline: showing axial plane trace of anticlinal flexure and direction of plunge; dashed where approximately located; dotted where concealed
- Syncline: showing trace of axial plane and plunge direction where known; dashed where approximately located; dotted where concealed
- Anticline: showing trace of axial plane and plunge direction where known; dashed where approximately located; dotted where concealed
- Overturned syncline: showing trace of axial plane and bedding dip direction; dashed where approximately located; dotted where concealed
- Overturned anticline: showing trace of axial plane and bedding dip direction; dashed where approximately located; dotted where concealed
- Granitic dikes
- Diabase dikes
- Mafic dikes and sills in Archean gneisses
- Granitic dikes and sills in Archean gneisses
- Zone of tectonic brecciation, or brecciation and shearing
- Shear zone
- Strike and dip of inclined bedding
- Strike and dip of overturned bedding
- Horizontal bedding
- Strike and dip of bedding where stratigraphic tops were confirmed using primary sedimentary structures; may be upright or overturned
- Vertical bedding
- Strike and dip of foliation: gneissic banding in Archean rocks, slaty or fracture cleavage in Phanerozoic rock
- Strike and dip of foliation parallel to layering, usually bedding
- Vertical foliation
- m Modified
- SG Sand and gravel

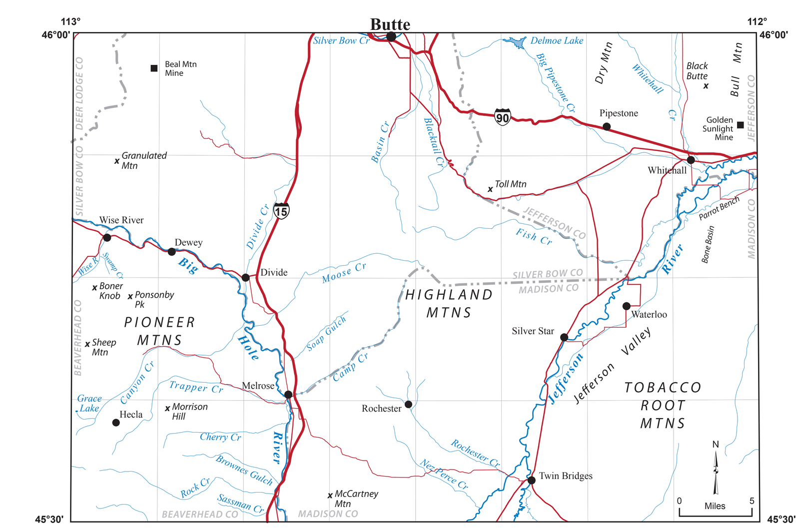
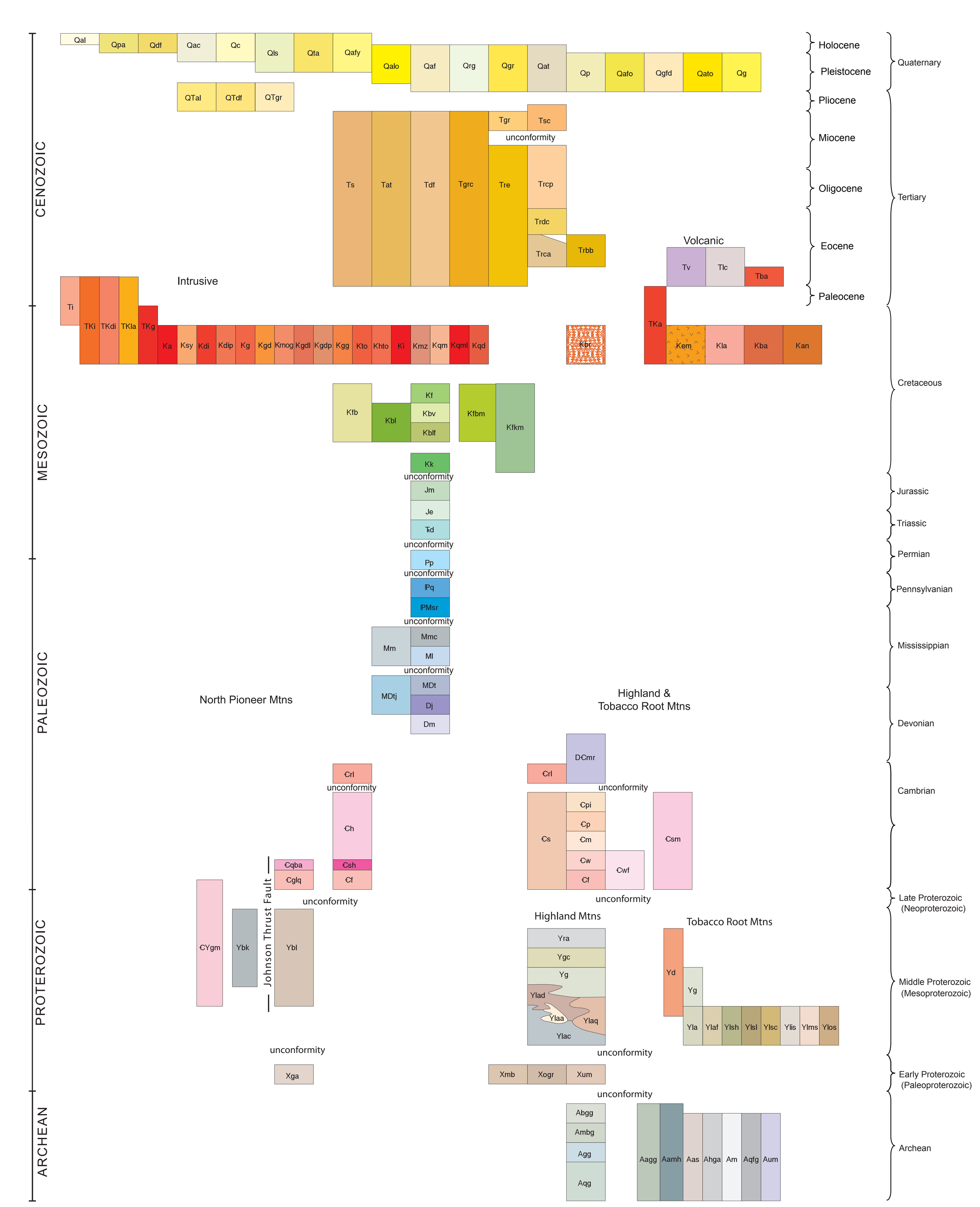
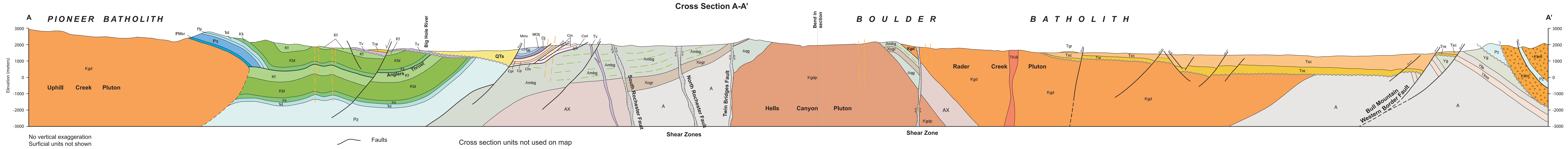


Figure 1. Geographic features in the Butte South 30' x 60' quadrangle. Light gray lines are U.S. Geological Survey 7.5' quadrangle boundaries.

Correlation of Map Units



Cross Section A-A'



No vertical exaggeration
Surficial units not shown

- Faults
- Angular unconformity
- Regional cleavage
- Mylonitic fabric

Cross section units not used on map

Symbol	Unit
QTs	Quaternary &Tertiary deposits, undivided
Pz	Paleozoic rocks, undivided
AX	Archean & Proterozoic rocks, undivided
A	Archean rocks, undivided

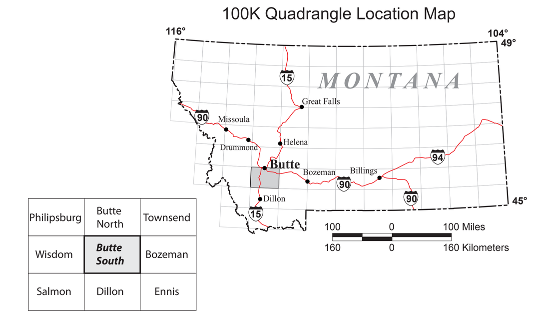
Montana Bureau of Mines and Geology
Open-File 622

Geologic Map of the Butte South 30' x 60' Quadrangle Southwest Montana

Compiled and mapped by
Catherine McDonald, Colleen G. Elliott, Susan M. Vuke, Jeffrey D. Lonn and Richard B. Berg

2012

100K Quadrangle Location Map



Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award number G10AC00365. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

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

Butte South 30' x 60' Previous Mapping

Dickie Peak 11, 24, 25, 27, 28,54	Burnt Mountain 11, 27, 28, 54	Buxton 5, 11, 33, 43, 46	Butte South 5, 11, 19, 33, 44, 46	Homestake 5, 11, 19, 46	Delmoe Lake 2, 8, 22, 46, 53	Dry Mountain 2, 22, 37, 53	Black Butte 1, 2, 7, 9, 22, 23, 38, 48, 53
Wise River 11, 13, 17, 18, 28, 49	Dewey 11, 14, 18, 27, 49, 52	Tucker Creek 11, 42, 46, 49, 52	Mount Humbug 11, 31, 45, 46, 52	Pipestone Pass 8, 11, 31, 46	Grace 2, 8, 11, 22, 31, 46, 53	Vendome 2, 3, 10, 11, 22, 46, 53	Whitehall 2, 23, 41, 53
Vipond Park 15, 16, 26, 29, 32, 34, 49, 55	Cattle Gulch 14, 15, 18, 29, 32, 49, 55	Melrose 11, 31, 32, 46, 49, 52	Wickiup Creek 11, 31, 46, 52	Table Mountain 11, 31, 46	Silver Star 10, 17, 31, 35, 46, 53	Waterloo 17, 30, 40, 53	Manhead Mountain 30, 41, 51, 53
Mount Tahepia 26, 32, 34, 55	Storm Peak 20, 32, 36, 50, 55	Earls Gulch 20, 31, 32, 36, 46, 50	Nez Perce Hollow 4, 6, 12, 31	Twin Bridges SW 12, 31	Twin Bridges 3, 10, 31, 53	Old Baldy Mountain 21, 31, 40, 51, 53	Noble Peak 30, 47, 51

#39, Entire map at 1:250,000 scale

1. Alexander (1955)
2. Axelrod (1984)
3. Bartholomew and others (1990)
4. Brandon (1984)
5. Berg and Hargrave (2004)
6. Brumbaugh (1972)
7. Chadwick (1996)
8. Cox (unpublished mapping)
9. Dixon and Wolfgram (1998)
10. Dresser (1996)
11. Elliott and McDonald (2009)
12. Feinstein and Reid (2010)
13. Fraser and Waldrop (1972)
14. Fowler (1955)
15. Goudarzi (1941)
16. Guttormsen (1952)
17. Hanneman and Wideman (1991)
18. Hespenheide (2003)
19. Houston (2001)
20. Hutchinson (1948)
21. Johns (1961)
22. Kuenzi (1966)
23. Nilsen (1991)
24. Lewis (1990)
25. McDonald (2011)
26. Mero (1962)
27. Moore (1956)
28. Noel (1956)
29. Obert (1962)
30. O'Neill (1983)
31. O'Neill and others (1996)
32. Richards and Pardee (1925)
33. Patton (1985)
34. Pearson and Zen (1985)
35. Petkewich (1972)
36. Peters (1971)
37. Prostka (1966)
38. Richard (1966)
39. Ruppel and others (1993)
40. Samuelson and Schmidt (1981)
41. Schmidt (1975)
42. Smedes (1967a)
43. Smedes (1967b)
44. Smedes (1967c)
45. Smedes (1967d)
46. Smedes and others (1988)
47. Smith (1970)
48. Streeter (1983)
49. Theodosis (1956)
50. Tysdal and others (1994)
51. Vitaliano and Cordua (1979)
52. Vuke (2004)
53. Vuke and others (2004)
54. Wilke (1996)
55. Zen (1988)

Full citations in text pamphlet.