Montana Bureau of Mines and Geology
Open File No. 622

Preliminary Geologic Map of the Butte South 30' x 60' Quadrangle, Southwestern Montana

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

2012

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 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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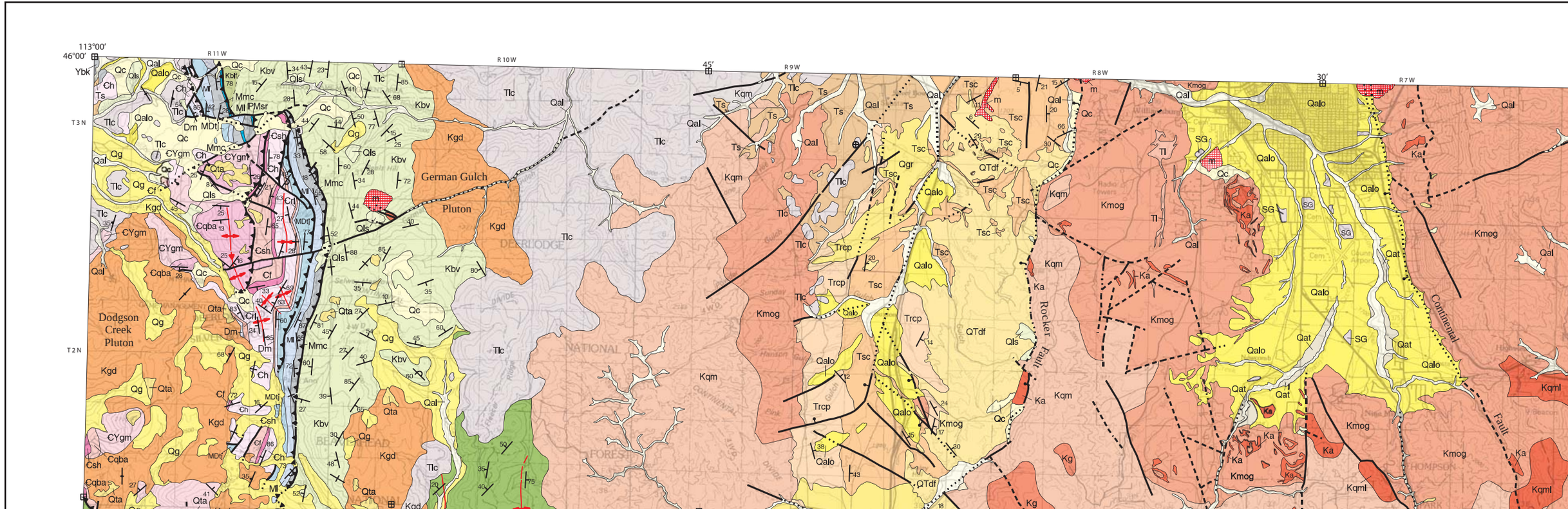
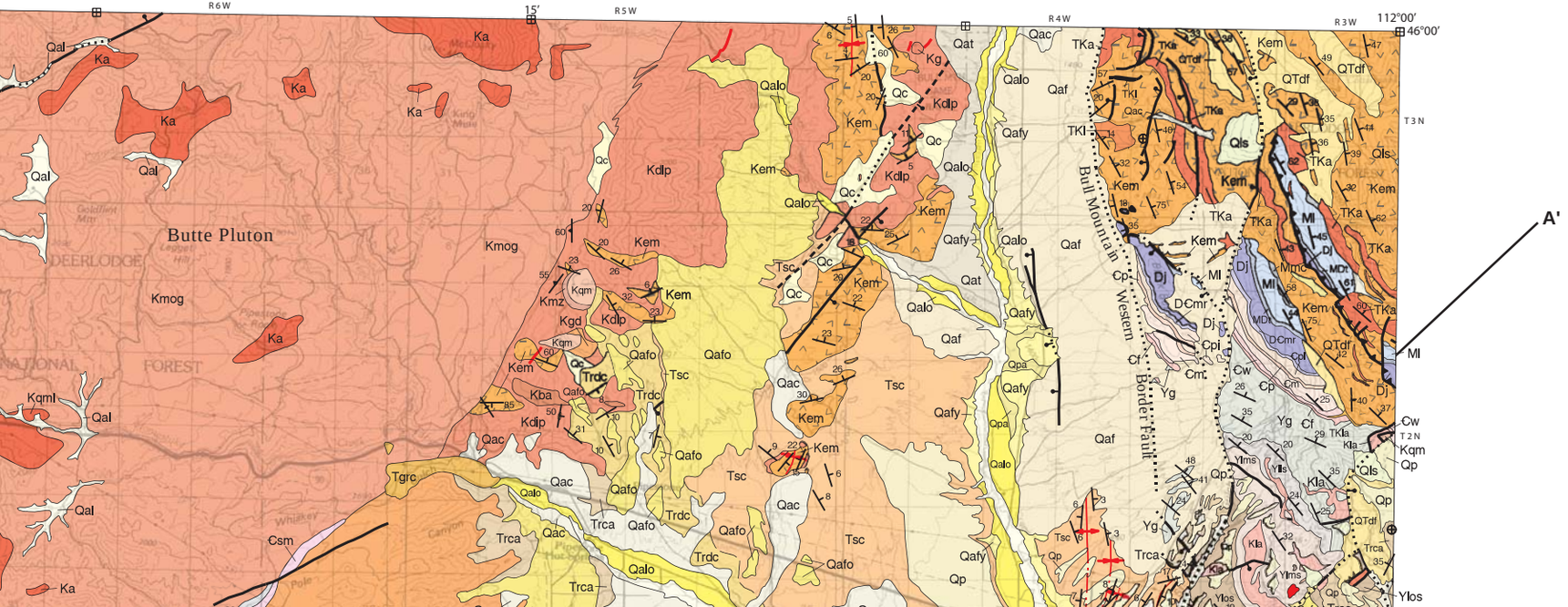
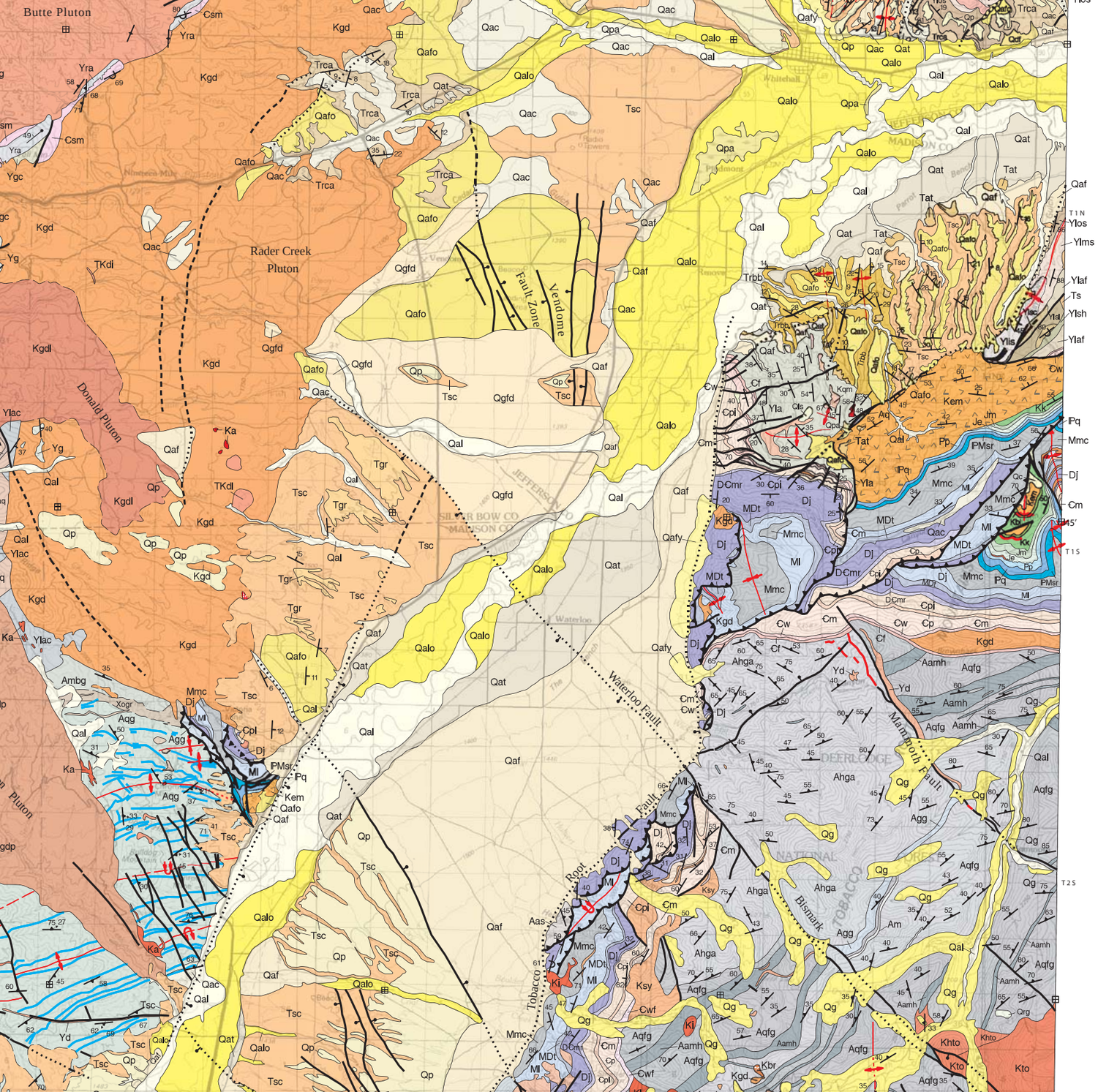
Open-File MBMG 622, Plate 1 of 1
Geologic Map, Butte South 30' x 60' Quadrangle, 2012



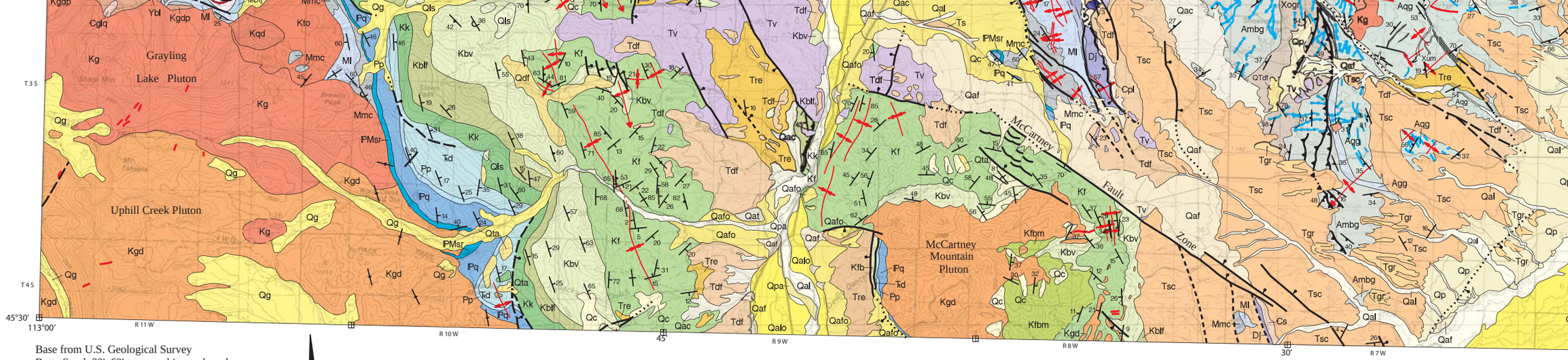

R6W
15'
R5W
R4W
R3W
112°00'
46°00'
T3N
T2N
A'
Butte Pluton
Bull Mountain - Western Border Fault
DEERLODGE
NATIONAL
FOREST
Qal
Ka
Kmog
Kqml
Kem
Kdlp
Kgd
Kba
Kmz
Kqm
Kg
Qc
Qat
Qaf
Qafy
Qafo
Qalo
Qac
Qpa
Qp
Tsc
Tgrc
Trdc
Trca
Csm
TKa
TKl
QTdf
Qls
Ml
Mml
MDl
DCmr
Dj
Cpl
Cp
Cm
Cw
Cf
Yg
Yms
Yls
Ylos
Kla


Johnson Thrust
Big Hole Canyon Pluton
Moose Creek Pluton
Climax Gulch Pluton
Deer Creek Pluton
Burton Park Pluton
Sawmill Gulch Fault
July 4th of Fault
Camp Creek Fault
North Rochester Fault
South Rochester Fault
Twin Bridges Fault
Hells Canyon
Morrison Hill Klippe
T2S
T1S
T1N
45'



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



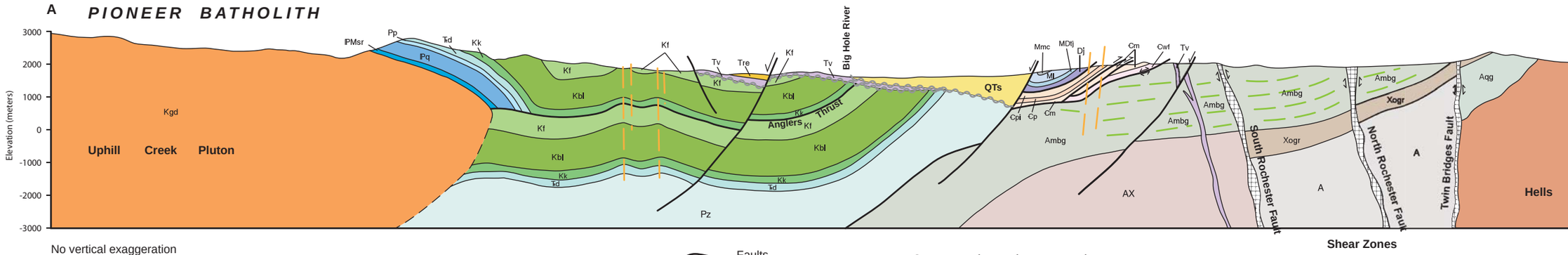
Base from U.S. Geological Survey
Butte South 30'x60' topographic quadrangle
Map date: 1975
Projection: UTM zone 12; 1927 NAD
UTM grid declination 1°04' West
1975 Magnetic North Declination 18° East

KILOMETERS 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
MILES 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13

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

1000 0
5000 0

Cross Section A-A'



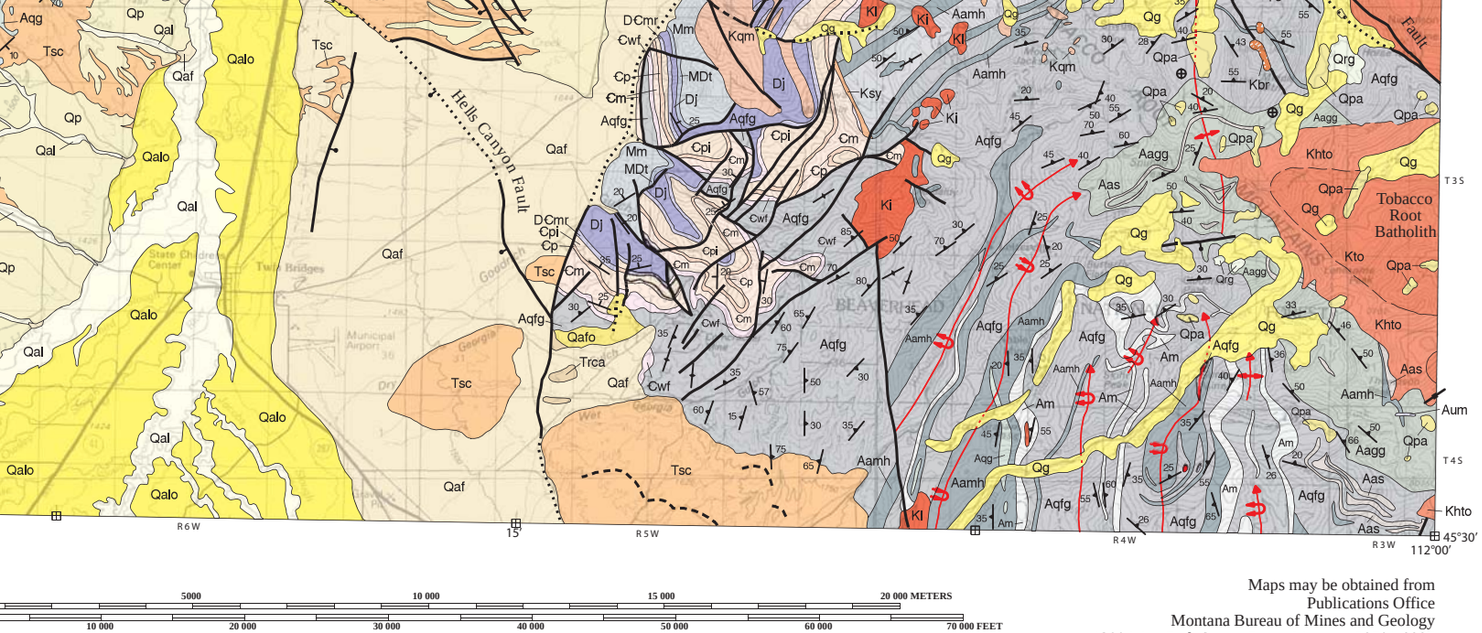
No vertical exaggeration
Surficial units not shown

Faults
Angular unconformity
Regional cleavage
Mylonitic fabric

Cross section units not used on map

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

100K Quadrangle Location Map



49 46 Strike and dip of bedding where stratigraphic tops were confirmed using primary sedimentary structures; may be upright or overturned

Vertical bedding

29 Strike and dip of foliation: gneissic banding in Archean rocks, slaty or fracture cleavage in Phanerozoic rock

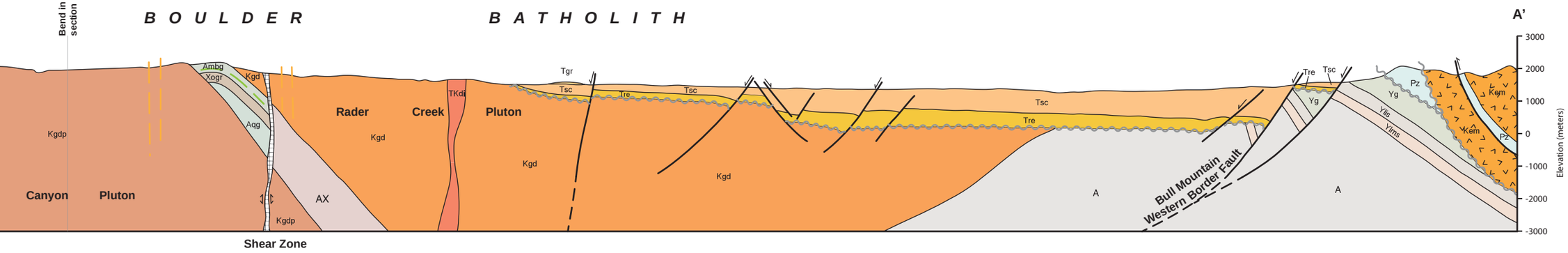
75 27 Strike and dip of foliation parallel to layering, usually bedding

Vertical foliation

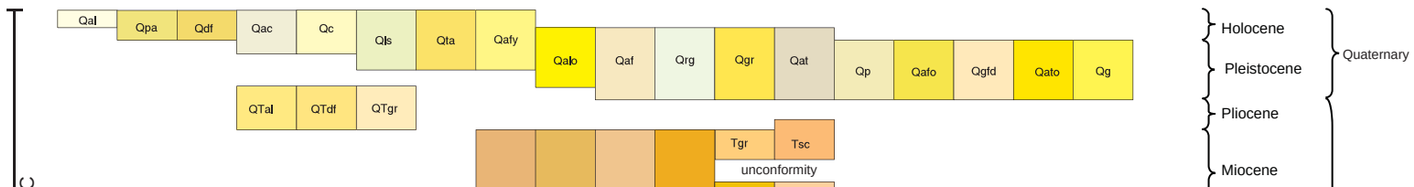
Modified

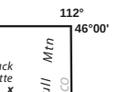
SG Sand and gravel

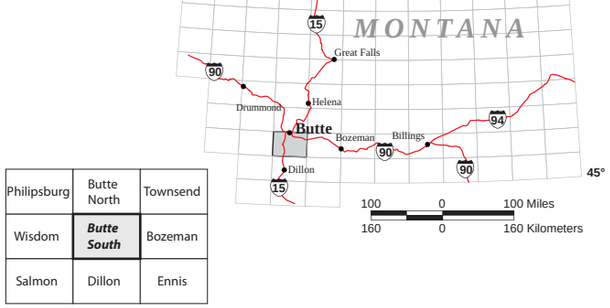
Maps may be obtained from
Publications Office
Montana Bureau of Mines and Geology
1300 West Park Street, Butte, Montana 59701-8997
Phone: (406) 496-4174 Fax: (406) 496-4451
http://www.mbmg.mtech.edu



Correlation of Map Units

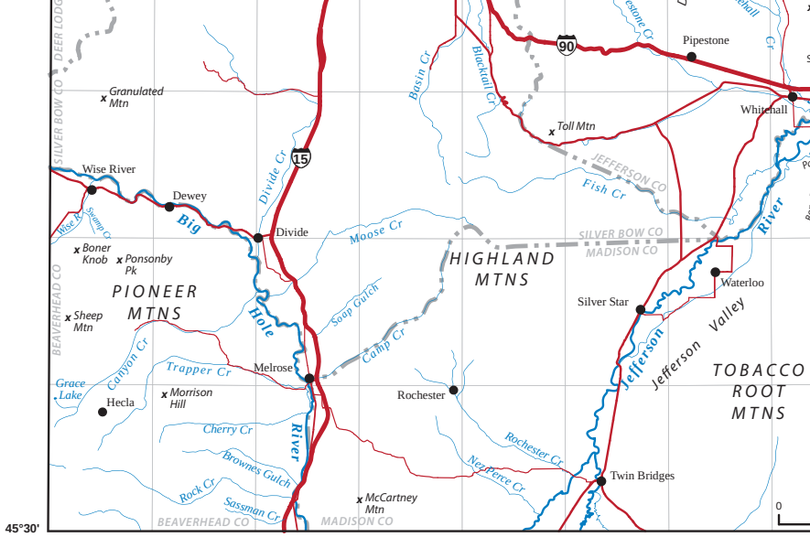






Philipsburg	Butte North	Townsend
Wisdom	**Butte South**	Bozeman
Salmon	Dillon	Ennis

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



Geologic Map Units

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

CENOZOIC

MESOZOIC

PALEOZOIC

PROTEROZOIC

ARCHEAN

Tertiary
- Oligocene
- Eocene
- Paleocene

Cretaceous

Jurassic

Triassic

Permian

Pennsylvanian

Mississippian

Devonian

Cambrian

Late Proterozoic (Neoproterozoic)

Middle Proterozoic (Mesoproterozoic)

Early Proterozoic (Paleoproterozoic)

Ts Tat Tdf Tgrc Tre Trcp Trdc Trca Trbb

Volcanic: Tv Tlc Tba

Intrusive: Ti TKl TKdl TKla TKg Ka Ksy Kdl Kdip Kg Kgd Kmog Kgdl Kgdp Kgg Kto Khto Ki Kmz Kqm Kqml Kqd Kbr

TKa Kem Kla Kba Kan

Kfb Kbl Kf Kbv Kblf Kfbm Kfkm

Kk

unconformity

Jm Je Trd

unconformity

Pp

unconformity

IPq IPMsr

unconformity

Mm Mmc Ml

unconformity

MDtj MDt Dj Dm

North Pioneer Mtns

Highland & Tobacco Root Mtns

DCmr

Crl

unconformity

Ch Csh Cf Cqba Cglq

Cs Cpi Cp Cm Cw Cwf Csm

unconformity

Johnson Thrust Fault

CYgm Ybk Ybl

Highland Mtns

Yra Ygc Yg Ylad Ylaa Ylaq Ylac

Tobacco Root Mtns

Yd Yg Yla Ylaf Ylsh Ylsl Ylsc Ylls Ylms Ylos

unconformity

Xga

Xmb Xogr Xum

unconformity

Abgg

Tal	Alluvial terrace deposit
Tdf	Debris-flow deposit
Tgr	Gravel
Tgrc	Gravel deposit, coarse grained
Tsc	Sixmile Creek Formation

Kg	Granite
Kgd	Granodiorite
Kmog	Monzogranite
Kgdl	Granodiorite, leucocratic
Kgdp	Granodiorite, porphyritic

PMsl	Snowcrest Range Group
Mm	Madison Group, undivided
Mmc	Mission Canyon Limestone
Ml	Lodgepole Limestone
MDtj	Three Forks and Jefferson Formations, undivided

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

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.

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

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

113°
46°00'

Dickie Peak 11, 24, 25, 27, 28,54	Burnt Mountain 11, 27, 28, 54	Buxton 5, 11, 33, 43, 46
Wise River 11, 13, 17, 18, 28, 49	Dewey 11, 14, 18, 27, 49, 52	Tucker Creek 11, 42, 46, 49, 52
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
Mount Tahepia 26, 32, 34, 55	Storm Peak 20, 32, 36, 50, 55	Earls Gulch 20, 31, 32, 36, 46, 50

45°30

#39, Er

ARCHEAN

Archean

th 30' x 60' Previous Mapping

112°

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
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
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
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

N

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.