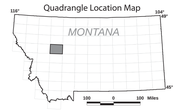
### Location of Major Disturbed Belt Structures

Very little was published on the structure of the Montana Disturbed belt until the regional synthesis and interpretations of Mudge (1970, 1972b) based on his extensive geologic mapping for the U.S. Geological Survey. That mapping led to recognition of the Eldorado, Steinbach, and Hoadley faults in the Dearborn River quadrangle, which, along with the Lewis thrust to the north, form the leading edge of a major thrust slab that places Paleozoic and Mesoproterozoic rock over Mesozoic and Paleozoic rock. Subsequently, much of the Dearborn River quadrangle was mapped in more detail by the U.S. Geological Survey (see sources below). Sears and others (2002, 2005) identified a triangle zone within the eastern part of the Dearborn River quadrangle, the apex of which extends from Highway 200 to north of the northeastern border of the quadrangle in the Sun River area. Henry (2007) mapped and interpreted this triangle zone, which is an extension of the Canadian Rocky Mountain foothills triangle zone. Other duplex zones were also mapped and interpreted in the area (Dolberg, 1986, Johnson, 1988).

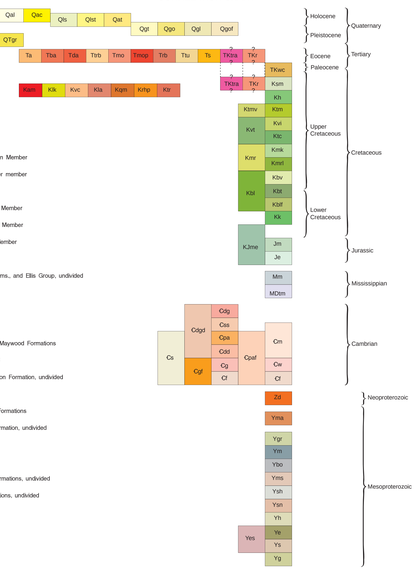
**1. Duplex** (Dolberg, 1986)
The duplex involves a wedge of 10 or more thrust slices of Paleozoic and Mesozoic rocks beneath the Mesoproterozoic Belt Supergroup rocks of the structurally higher Steinbach-Eldorado roof thrust system.

**2. Triangle Zone** (Sears and others, 2002, 2005; Henry, 2007)
The triangle zone is composed of complex antiformal wedge structures. Passive roof thrusting raised the Augusta syncline above an east-dipping thrust, analogous to and correlative with a triangle zone associated with the Alberta syncline to the northwest in Canada.

Quadrangle Location Map




CORRELATION CHART




## MAP UNITS

- Qal Alluvium
- Qac Alluvium and colluvium, undivided
- Qls Landslide deposit
- Qlst Landslide and talus deposits, undivided
- Qat Alluvial terrace deposit
- Qgf Glacial till
- Qgo Glacial outwash deposit
- Qgl Glacial lake deposit
- Qgof Glacial outwash fan
- QTgr Gravel
- Ta Andesite
- Tba Basalt
- Tda Dacite
- Tmo Monzonite
- Tmop Monzonite porphyry
- Tsrb Trachybasalt
- Trb Rhyolite
- Tlu Tuff
- Ts Sediment or sedimentary rocks, undivided
- TKva Trachyandesite
- TKr Rhyolite
- TKwc Willow Creek Formation
- TKvc Adel Mountain Volcanics
- Kla Lacustrine deposits
- Kvc Volcanic conglomerate
- Kla Latite
- Kqm Quartz monzonite porphyry
- Kchp Rhyodacite porphyry
- Klr Trachyte
- Ksm St. Mary River Formation
- Kfs Horsethief Formation
- Klm Two Medicine Formation
- Klmv Two Medicine Formation, volcanic facies
- Kvl Virgelle and Telegraph Creek Formations, undivided
- Kvl Virgelle Formation
- Ktc Telegraph Creek Formation
- Kmv Marias River Formation
- Kmk Marias River Formation, Kevin Member
- Kmrl Marias River Formation, lower member
- Kbf Blackleaf Formation
- Kbv Blackleaf Formation, Vaughn Member
- Kbf Blackleaf Formation, Taft Hill Member
- Kbfl Blackleaf Formation, Flood Member
- Kfs Kootenai Formation
- KJme Mount Pablo and Morrison Frms., and Ellis Group, undivided
- Jm Morrison Formation
- Je Ellis Group, undivided
- Mm Madison Group, undivided
- MDm Three Forks, Jefferson, and Maywood Formations
- Cs Sedimentary rocks, undivided
- Cdgd Devils Glen through Damnation Formation, undivided
- Cdg Devils Glen Formation
- Cas Switchback and Steamboat Formations
- Cpaf Pagoda through Flathead Formation, undivided
- Cm Meagher Limestone
- Cpa Pagoda Limestone
- Cdd Dearborn and Damnation Formations, undivided
- Cgf Gordon and Flathead Formations, undivided
- Cw Wolsey Shale
- Cg Gordon Shale
- Cf Flathead Formation
- Zd Diorite
- Yma Meta-andesite and metadiorite
- Ygr Garnet Range Formation
- Ym McNamara Formation
- Ybo Bonner Formation
- Yms Mount Shields Formation
- Ysh Shepard Formation
- Ysn Snowslip Formation
- Yh Helena Formation
- Yes Empire and Spokane Formations, undivided
- Ye Empire Formation
- Ys Spokane Formation
- Yg Greyson Formation

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

Approximately located contacts and faults based on aerial photo and satellite image interpretation by compiler.

## MAP SYMBOLS

- Contact—Dashed where inferred; dotted where concealed
- Normal Fault—Dashed where inferred; dotted where concealed
- Thrust Fault—Teeth on upper plate; dotted where concealed
- Strike-slip Fault—Arrows indicate relative movement
- Linear Feature—May be a fault
- Anticline axial trace—Showing direction of plunge; dotted where concealed
- Syncline axial trace—Showing direction of plunge; dotted where concealed
- Overturned anticline axial trace—Showing direction of dip of limbs
- Overturned syncline axial trace—Showing direction of dip of limbs
- Tertiary or Cretaceous dike or sill
- Neoproterozoic sill
- 25 Strike and dip of beds—Number indicates dip in degrees
- 80 Strike and dip of overturned beds—Number indicates dip in degrees
- Horizontal beds
- Ash bed

30' x 60' Quadrangle Index

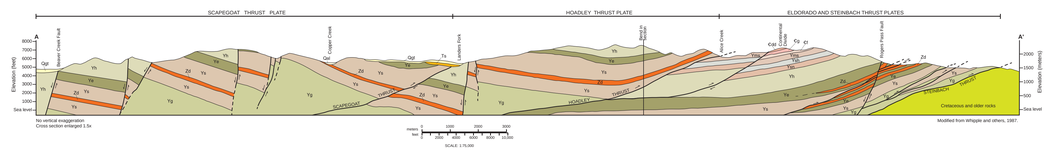
| | | |
|---|---|---|
| Swan Peak | Choteau | Great Falls N |
| Seeley Lake | **Dearborn River** | Great Falls S |
| Missoula East | Elliston | Canyon Ferry Dam |

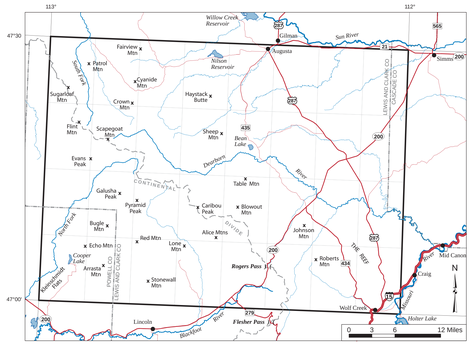
Compilation sources and index of 7.5' quadrangles

| 113° / 47°30' | | | | | | | | 112° |
|---|---|---|---|---|---|---|---|---|
| Benchmark | Wood Lake | Double Falls | Nilan Reservoir | Augusta | Gouchnour Ranch | Bowmans Corners NW | Bowmans Corners NE | |
| 5, 6 | 5, 6 | 1, 5, 6 | 1, 5, 6 | 5, 6 | 2 | 2 | 5 | |
| Flint Mountain | Scapegoat Mountain | Jake Creek | Steamboat Mountain | Bean Lake | Krone Ranch | Bowmans Corners | Henry Creek | |
| 5, 6 | 5, 6 | 3, 5, 6 | 3, 5, 6 | 5, 6 | 2 | 2 | 5 | |
| Lake Mountain | Olson Peak | Heart Lake | Caribou Peak | Blowout Mountain | Johnson Mountain | Comb Rock | Coburn Mountain | |
| 5, 6 | 5, 6 | 11 | 11 | 4, 11 | 4, 11 | 8 | 7 | |
| Coopers Lake | Arrastra Mountain | Stonewall Mountain | Silver King Mountain | Caddoe Creek | Rogers Pass | Roberts Mountain | Wolf Creek | |
| 6 | 6 | 11 | 11 | 11 | 11 | 10, 11 | 9 | |
| 47°00' | | | | | | | | |

1. Dolberg, 1986
2. Henry, 2007
3. Holcombe, 1963
4. Lange, 1963
5. Mudge and Earhart, 1983
6. Mudge and others, 1982
7. Schmidt, 1972a
8. Schmidt, 1972b
9. Schmidt, 1972c
10. Schmidt and Strong, 1972
11. Whipple and others, 1987

Please see text for reference citations.




Geographic features in the Dearborn River 30' x 60' quadrangle.

Base from U.S. Geological Survey
Dearborn River 30' x 60' topographic quadrangle
Map date: 1993
Projection: UTM zone 12; 1927 NAD
UTM grid declination 1°06' West
1984 Magnetic North Declination 16.5° East

KILOMETERS 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
MILES 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 10 000 15 000 20 000 METERS
5000 0 10 000 20 000 30 000 40 000 50 000 60 000 70 000 FEET

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

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

MBMG
Montana Bureau of Mines and Geology

Montana Bureau of Mines and Geology
Open-File Report 649

# Preliminary Geologic Map of the Dearborn River 30' x 60' Quadrangle, West-Central Montana

Compiled by Susan M. Vuke

2014