Geologic analysis of the northern margin of the Boulder Batholith II: Geologic map of the Esmerelda Hills Quadrangle

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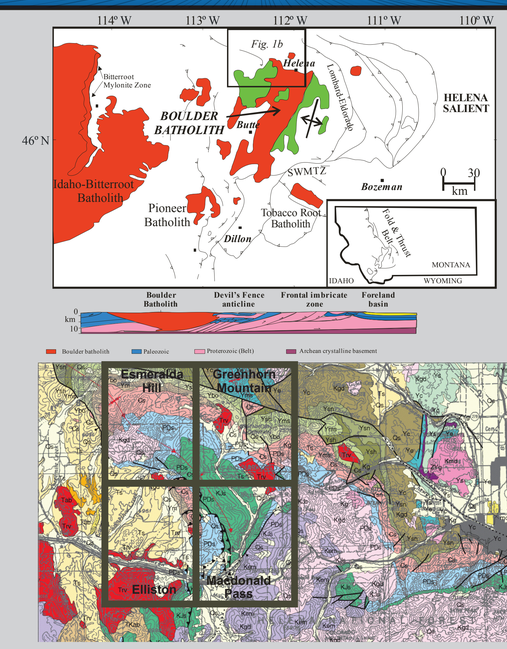
ABSTRACT

Southwest Montana experienced large-scale magmatism and regional contraction during the Late Cretaceous. Understanding the genetic linkages between these geologic processes is important for understanding the causes of mountain-building in the Cordillera. The relationship between the plutonic rocks of the Boulder batholith, the coeval volcanic rocks of the Elkhorn Mountain volcanics, and the folding and thrusting associated with foreland contraction is the subject of ongoing debate. Part of the debate is the result of incomplete field relations. We present detailed mapping of the Esmeralda Hills, Montana 7.5 minute quadrangle situated on the northern margin of the Helena salient, near the juncture between deformed Paleozoic strata, the voluminous intrusive rocks of the batholith, and the overlying volcanic rocks. Our analysis of the field relationships between the Boulder magmatic system and the folded Paleozoic rocks constrain the sequence of events that shaped the tectonomagmatic evolution of the Helena salient.

INTRODUCTION



Faculty and students from the Department of Geology at the University of Wisconsin-Eau Claire have been examining this region under the auspices of the MBGS/USGS EDMAP since 2004. Our program has focused on detailed (1:24,000) geologic mapping and associated structural, stratigraphic, geochemical, geochronologic and isotopic investigations.

Acknowledgments

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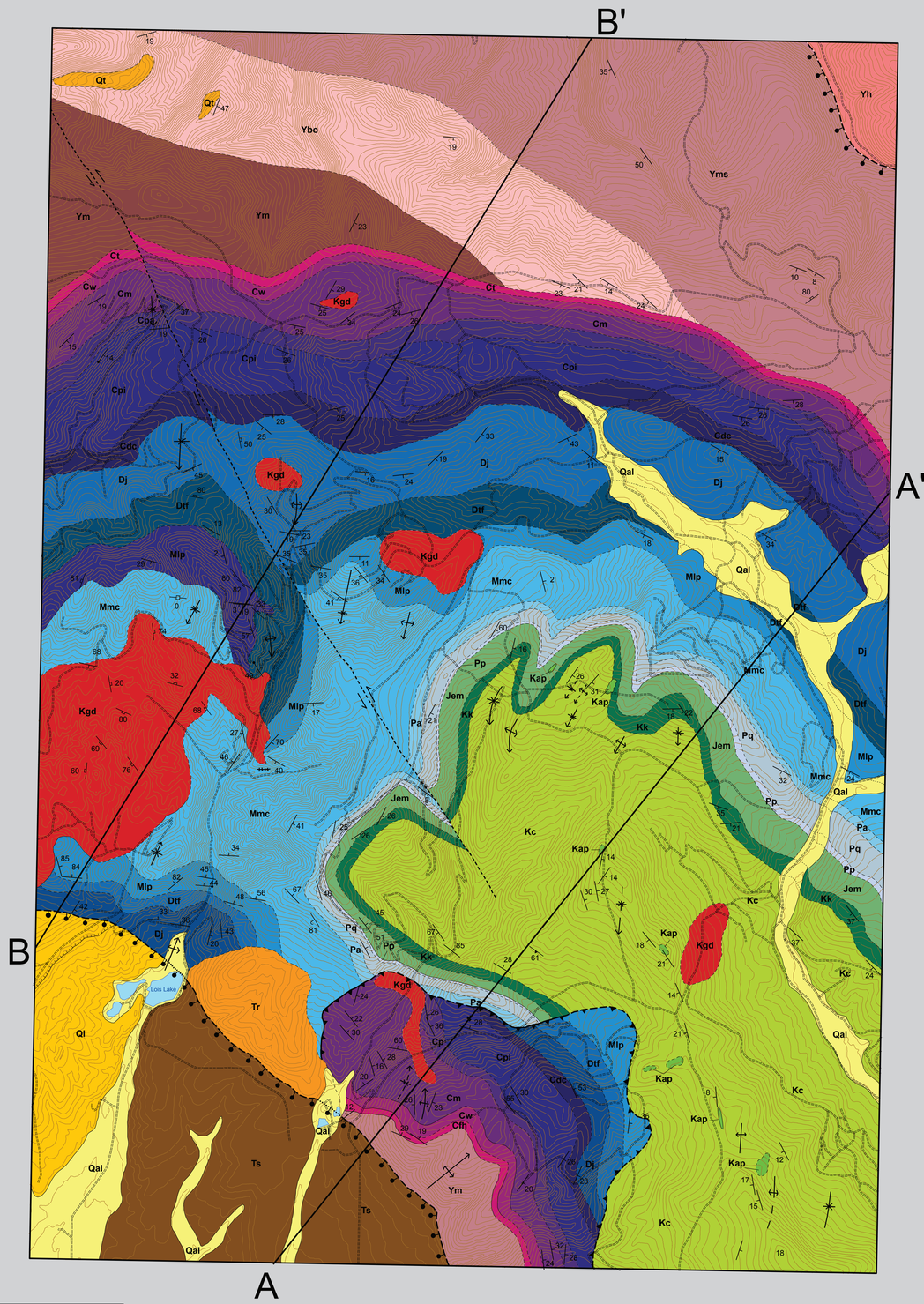
Esmeralda Hills, Montana 7.5 Minute Quadrangle



SCALE : 1:24 000

0 437.5 875 1,750 2,625 3,500 Meters
0 0.4 0.8 1.6 2.4 3.2 Kilometers
0 0.25 0.5 1 1.5 2 Miles

CONTOUR INTERVAL : 40 FEET

N

MONTANA
QUADRANGLE LOCATION

Geologic Units

Cenozoic

- Qal — Quaternary alluvium (Holocene)
- Ql — Quaternary colluvium (Holocene)
- Qt — Quaternary glacial moraine

Tertiary-Eocene

- Tr — Tertiary Rhyolite Porphyry
- Ts — Tertiary sedimentary rocks

Mesozoic

Cretaceous Intrusive Rocks

- Kap — Andesite porphyry
- Kgd — Intrusive rocks of the Boulder Batholith, undivided

Cretaceous Sedimentary Rocks

- Kc — Colorado Group
- Kk — Kootenai Formation

Jurassic sedimentary rocks

- Jem — Morrison Formation and Ellis Group, undivided

Paleozoic

Perminan sedimentary rocks

- Pp — Phosphoria

Pennsylvanian sedimentary rocks

- Pq — Quadrant Formation
- Pa — Amsden Formation

Mississippian sedimentary rocks

Madison Group

- Mmc — Mission Canyon Formation
- Mlp — Lodgepole Formation

Mississippian-Devonian sedimentary rocks

- Dtf — Three Forks Formation
- Dj — Jefferson Formation

Cambrian sedimentary rocks

- Cdc — Dry Creek Formation
- Cpi — Pilgrim Formation
- Cpa / Cp — Park Formation
- Cm — Meagher Formation
- Cw — Wolsey Formation
- Ct / Cfh — Flathead Formation

Proterozoic sedimentary rocks

Middle Proterozoic Belt Supergroup

- Ym — MacNamara Formation
- Ybo — Bonner Formation
- Yms — Mount Shields Formation
- Yh — Helena Formation

Map Symbols

- Structures
- Roads
- Lake

Contacts

- Approximate
- Approximate Normal
- Approximate Thrust
- Covered
- Covered Normal
- Known
- Known Thrust
- Landslide Head Scarp

Data Points

- Normal
- Normal (up)
- Overturned
- Foliation
- Joint
- Flat Joint