



Geology of the Emigrant Peak intrusive complex, Park County, Montana
by Albert L Basler

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Applied Science
Montana State University
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Abstract:

The Emigrant Peak area, located in Park County, Montana, 16 miles north of Yellowstone National Park, is an intrusive complex of andesitic to dacitic composition. It is located along the northwest-trending Cooke City structural zone and may represent an ancient volcanic conduit. The oldest rocks of the complex are andesitic intrusions, monolithologic autobreccias, and heterolithologic breccias which grade into one another in some places and are in sharp contact in others. The andesite varies from aphanitic to porphyritic with phenocrysts of zoned to unzoned plagioclase, An 45-60, up to 5 millimeters long. Green hornblende phenocrysts are present in lesser amount. The andesites are believed to have formed by subsurface crystallization because of the lack of vesicularity and ash layers in the breccias.

At the head of Emigrant Gulch, a dacite porphyry stock with two systems of associated dacite dikes intrudes the andesitic rocks. The older dikes contain little biotite and either strike parallel to the stock and dip into it in a discontinuous cone sheet pattern, or are arranged radially to the stock. The younger dikes are biotite-rich and are radial to the stock.

The andesitic rocks seem to represent vent breccias and solidified magma deep in the conduit of an old volcano. The dacites probably represent fracture fillings and larger masses crystallized in the vent during the last, more acidic phases of volcanism.

Similar datites in the nearby Mill Creek drainage have been dated as 49 million years, suggesting an Eocene age for the complex.

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June, 1965

ACKNOWLEDGMENTS

Sincere appreciation is extended to the National Science Foundation for the grant which made this study possible and to the Department of Earth Sciences for rendering a portion of that grant available to support my field research. In particular I would like to thank Dr. Robert A. Chadwick for his valuable suggestions and time and Drs. William J. McMannis and John Montagne for critical advice on structural and geomorphic problems. I would also like to thank my sister Joyce for typing the preliminary manuscript and Carol Brooks for typing the final manuscript.

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ABSTRACT

The Emigrant Peak area, located in Park County, Montana, 16 miles north of Yellowstone National Park, is an intrusive complex of andesitic to dacitic composition. It is located along the northwest-trending Cooke City structural zone and may represent an ancient volcanic conduit. The oldest rocks of the complex are andesitic intrusions, monolithologic auto-breccias, and heterolithologic breccias which grade into one another in some places and are in sharp contact in others. The andesite varies from aphanitic to porphyritic with phenocrysts of zoned to unzoned plagioclase, An 45-60, up to 5 millimeters long. Green hornblende phenocrysts are present in lesser amount. The andesites are believed to have formed by sub-surface crystallization because of the lack of vesicularity and ash layers in the breccias.

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INTRODUCTION

Location and Accessibility

Emigrant Peak is located in south-central Park county, Montana, approximately 25 miles south of Livingston on the east side of the Yellowstone River (Figure 1).

The area studied extends from Six Mile Creek on the southwest to Emigrant Gulch and the ridge north of Fridley Creek on the northeast. The northwestern boundary is the front of the Beartooth Mountains and the south and southeastern boundaries are the southern border of the Emigrant quadrangle and a hypothetical line somewhat southeast of the border of the Emigrant stock respectively (Plate 1). The area comprises approximately 18 square miles. Sec. ? T ? R ?

Purpose and Scope of the Study

Moderately altered volcanic breccia, intrusive andesites and dacites, and Precambrian schist comprise the bedrock in the area.

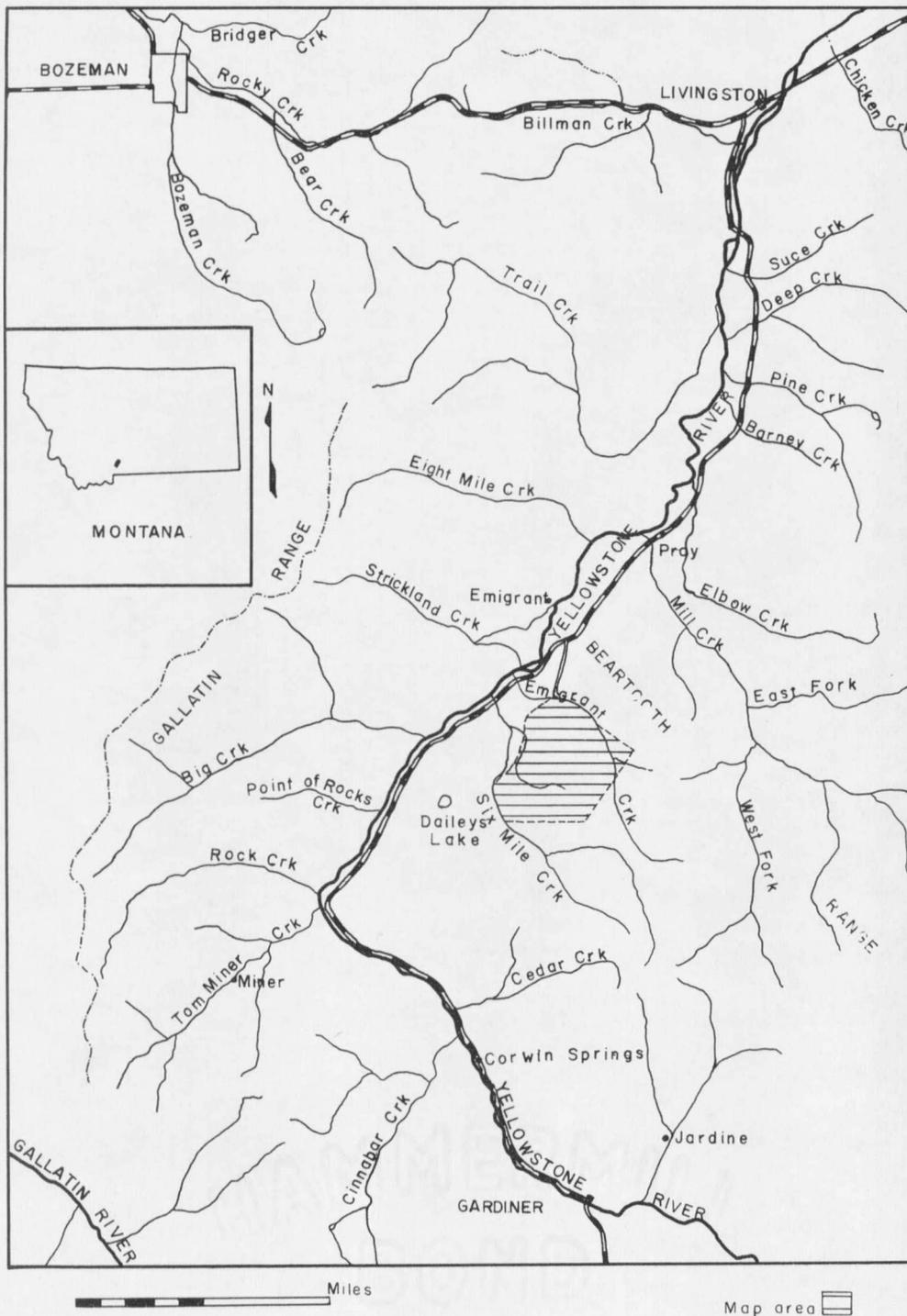


Figure 1. Index Map

The principal objectives of this investigation are:

(1) to determine the nature and mode of origin of the andesitic breccia and andesitic intrusive rocks; (2) to determine the relationships of the dacitic intrusive rocks to the andesitic rocks. A secondary objective is to gain some understanding of the associated sulfide mineralization.

Previous Work

Iddings and Weed (1894) studied the Emigrant Peak area as part of the Livingston 1° quadrangle. The geological work was very general. They considered the stock at the head of Emigrant Gulch to be a plug in an old volcanic conduit which had baked and altered the volcanic rock around it.

P. Purdy and R. Applegate, of American Metal Climax Company, studied an area along both sides of Emigrant Gulch during the summers of 1962 and 1963 prior to a drilling campaign. Purdy (oral communication, 1963) believes that the volcanic rocks are largely intrusive rather than extrusive and that Emigrant Peak may be an ancient dissected caldera.

Considerable work has been done in nearby areas and will be discussed in the succeeding section of this paper. The writers cited in connection with the Beartooth Mountains are: Emmons (1908), Foose, et al (1961), Lovering (1929), Rouse,

