



General geology and geomorphology of the Middle Creek area, Gallatin County, Montana
by William Mark Weber

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 stratigraphic section in the Middle Creek area, Gallatin County, Montana, is comprised of more than 4,400 feet of Paleozoic and Mesozoic sedimentary rocks. Rocks of known Ordovician, Silurian, and Triassic age are not present in the map area.

The sedimentary sequence is underlain by metamorphic gneiss and schist of Precambrian age, and is unconformably overlain by volcanic breccias and flows of middle Eocene age.

The existing structure of the area is thought to be the result of recurrent deformation along structural trends established in Precambrian time and subsequent Laramide compressional deformation and segmentation of the pre-Laramide structure.

The oldest and most extensive stage of glaciation has been tentatively correlated with the Marble Point stage which is late pre-Wisconsin in age. This glaciation was not restricted to the Middle Creek drainage but rather was a large ice sheet which capped most of the crest of the Gallatin Range.

Bedrock spurs within Hyalite Canyon suggests that there may have been a maximum of 600 feet of valley cutting between late pre-Wisconsin and early Wisconsin glaciation.

Comparative analysis of the morphology and areal extent of Wisconsin glacial features indicates that two stages of valley glaciation have occurred. Deposits of the earliest advance ' have been tentatively assigned to the Bull Lake stage and deposits of the succeeding advance have been tentatively assigned to the Pinedale stage.

Small terminal moraines indicate that ice of the Neoglacial, Temple Lake and Little Ice Age stages occupied cirques in the higher parts of the Gallatin Range.

GENERAL GEOLOGY AND GEOMORPHOLOGY OF THE MIDDLE
CREEK AREA, GALLATIN COUNTY, MONTANA

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by

W. MARK WEBER

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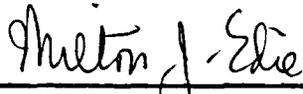
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ABSTRACT

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INTRODUCTION

Geographic Setting

The area of this field study is located along the Middle Creek drainage in the northern end of the Gallatin Range of south-central Montana. The Gallatin Range lies within the southeastern part of the Northern Rocky Mountain physiographic province. The map area (Figure 1) lies approximately 15 road miles south of Bozeman, Montana, and is bounded on the east, south, and west by the drainage divide of Middle Creek. The northern boundary lies along the Gallatin Range front.

The map area includes approximately 56 square miles of rugged, tree-covered topography ranging in elevation from 5440 feet at the range front to 10,300 feet along the crest of the Gallatin Range at Hyalite Peak. Relatively easy access is gained to the area by the Hyalite Canyon road. Numerous logging roads and Forest Service trails provide access to many of the more remote sections of the area.

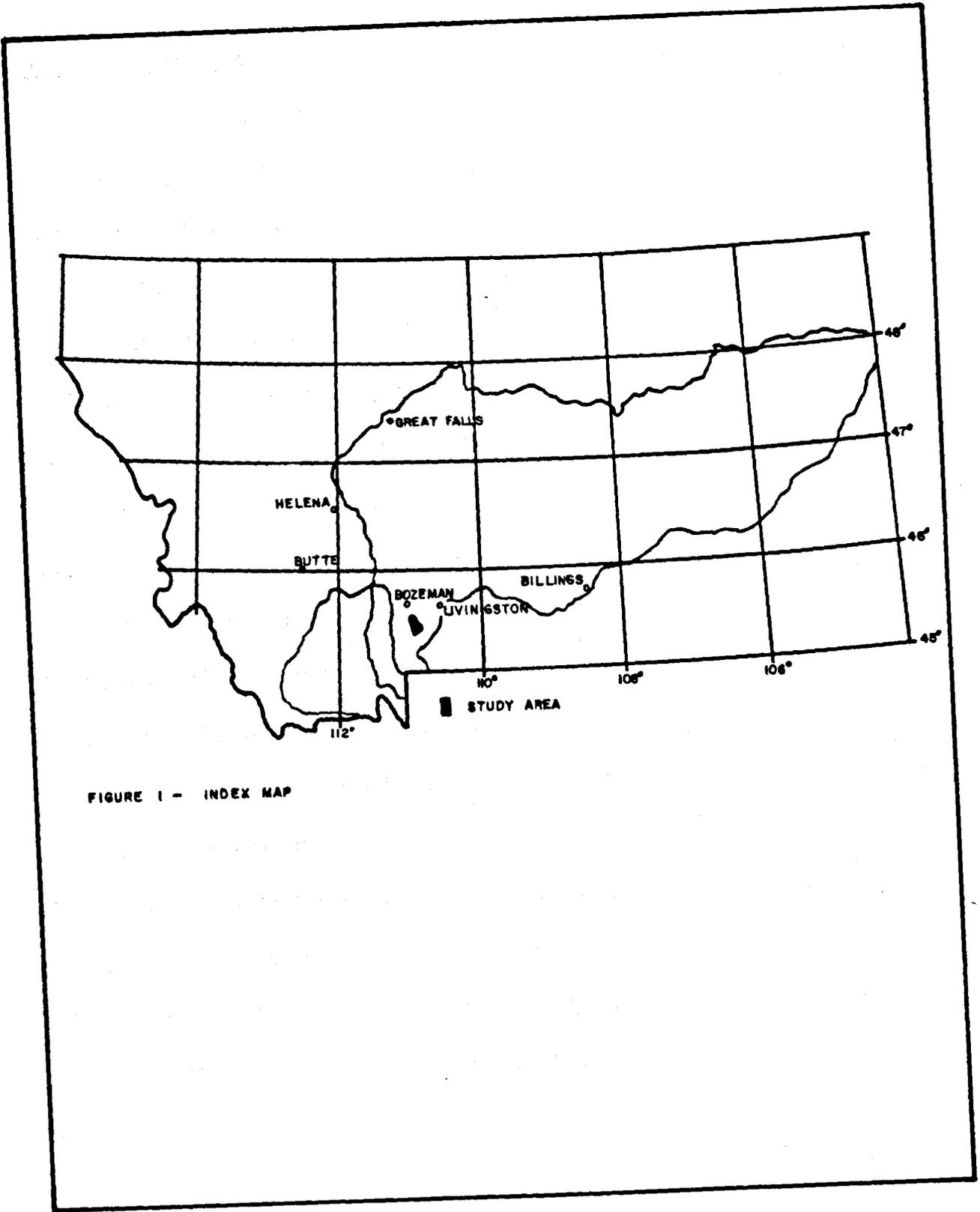


FIGURE 1 - INDEX MAP

Previous Investigations

The bedrock geology of this area has been previously mapped in part by Iddings and Weed (1894) in preparation of the Livingston Folio (No. 1), and in part by Peale (1896) in preparation of the Three Forks Folio (No. 24). These maps and their attendant descriptions are, at best, only generalizations regarding the gross structural trends and stratigraphy. A more detailed map of the area was begun in 1959 by S.A. Alsup as part of his M.S. requirements at Montana State College but this work was never completed. The most recent work in the area has been done by A.E. Roberts (1964) and McMannis and Chadwick (1964). Robert's research was concentrated on the Sourdough Creek drainage which lies directly to the east of the Middle Creek drainage. The southwesternmost part of Robert's map area does, however, fall within the Middle Creek drainage and, therefore, is very relevant to this study. The northeastern part of the Garnet Mountain Quadrangle (McMannis and Chadwick, 1964) also falls within the study area. This map and its related text has been very useful in this study.

No previous geomorphic studies have been done in the map area but the field notes of S.A. Alsup (Unpublished M.S. Thesis, 1960) do mention the general geomorphic characteristics. The work of M.D. Mifflin (Unpublished M.S. Thesis, 1962) and later unpublished data has many regional implications related to the Middle Creek map area which will be discussed at greater length in this paper.

Objectives

The objectives of this study were to construct a geologic map of the bedrock of a selected portion of the map area; to construct a second map of the glacial geomorphology of the map area; to describe rock units and structural and geomorphic relationships encountered in compiling the afore mentioned maps; and to propose a possible correlation of glacial substages within the map area with glacial substages previously described in adjacent regions.

STRATIGRAPHY

Lithologic units in the map area range in age from Precambrian (Archean ?) to Recent. These rocks crop out within the map area in a broad NE-SW trending belt (Figure 2). Although exposures are generally adequate for field mapping, heavy vegetal cover, glacial debris, and Tertiary volcanic cover precluded a detailed stratigraphic study of the formational units represented. The lithologic descriptions and formational thickness are, therefore, generalized. Thicknesses set forth herein were estimated by a detailed study of the literature of previous investigations in nearby areas.

Precambrian

Precambrian rocks are extensively exposed in the northern portion of the map area. The Precambrian is in probable fault contact on the north with Tertiary sediments and in depositional contact with Quaternary alluvial cover, and on the south it is bounded by the Precambrian -- Cambrian contact. One isolated exposure of Precambrian rock is exposed along a

