UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of CROW BUTTE RESOURCES, INC. (Marsland Expansion Area)	Docket No. 40-8943-MLA-2 ASLBP No. 13-926-01-MLA-BD01

Hearing Exhibit

Exhibit Number: NRC012

Exhibit Title: Excerpts from Swinehart et al., "Cenezoic Paleogeography of Western Nebraska" (1985)

ROCKY MOUNTAIN SECTION-S.E.P.M.
CENOZOIC PALEOGEOGRAPHY OF WEST-CENTRAL UNITED STATES
R. M. FLORES AND S. S. KAPLAN, EDITORS
DENVER, COLORADO 1985

CENOZOIC PALEOGEOGRAPHY OF WESTERN NEBRASKA

James B. Swinehart Vernon L. Souders Harold M. DeGraw Robert F. Diffendal, Jr.

Conservation and Survey Division-IANR
University of Nebraska-Lincoln
Lincoln, NE 68588-0517

ABSTRACT

The Cenozoic strata of western Nebraska are an extensive sequence of continental deposits that extend eastward from the Hartville, Laramie, and Front Range uplifts and southeast from the Black Hills. The oldest Cenozoic sediments (Chadron Formation, White River Group) are Early Oligocene alluvial valley fills. Subsequent to filling of these drainages and continuing for about the next 7 m.y., landscape development in western Nebraska was dominated by eolian deposition of tremendous volumes of rhyolitic volcanic ash derived from western eruptions. A plain of low relief, with only an occasional narrow drainage heading in the western highlands, was maintained during most of this period. Uplift in the Rocky Mountains and Great Plains (pre-Gering Formation, Arikaree Group) caused erosion and brought epiclastic detritus into the area about 28 m.y. ago. Eolian sediment consisting mostly of pyroclastic detritus continued building the plains during and after Gering alluvial deposition until about 19 m.y. ago when Arikaree deposition ceased. About this time, western volcanic activity declined for several million years and was followed by a marked decrease in the volume of rhyolitic volcanism for the remainder of the Cenozoic. At the end of Arikaree deposition in western Nebraska, a major pulse of erosion (pre-Runningwater Formation, Ogallala Group) was followed by a fundamental change in depositional style and landscape evolution, characterized by a heterogeneous mixture of epiclastic valley fills. Sands and gravels from Rocky Mountain sources were first deposited in a major valley in the northern half of the area and later in valleys to the south. Episodic regional and local structural movements influenced the size and position of many Ogallala valleys. For the past 5 m.y. degradation, in response to major regional uplift, has greatly exceeded aggradation as the dominant factor affecting landscape evolution in western Nebraska.

INTRODUCTION

This report is a general outline of successive changes in the Cenozoic landscape of western Nebraska. It also presents some new interpretations on the role of structure in influencing regional depositional and erosional patterns in this area. Lugn and Lugn (1956) presented the first attempt at a regional synthesis of Tertiary paleogeography of Nebraska. Since 1956, many outcrop studies and paleontologic investigations have modified understanding of the geology of western Nebraska. In addition, analysis of a large amount of subsurface information has provided new insights into the stratigraphy of the region and furnished a data base for paleogeographic interpretations which would be impossible to achieve from outcrop studies alone.

The surface of Cenozoic rocks in the study area forms an eastward sloping plain from the Laramie Range-Hartville Uplift in Wyoming (Fig. 1) that has been deeply eroded in the North Platte River valley and along the Pine Ridge (Fig. 2). Dune sand covers most of the east central part of the area. Subsurface data used in this report came from electric logs of approximately 11,600 oil and gas tests and from samples and electric logs of about 500 test holes

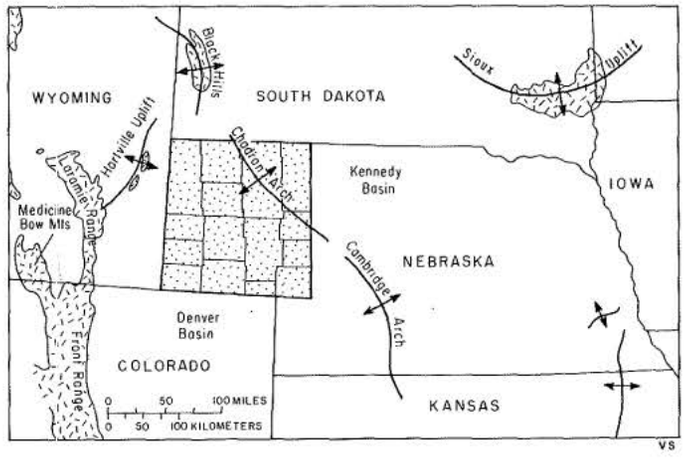

Figure 1. Index map of study area and major regional uplifts and basins.

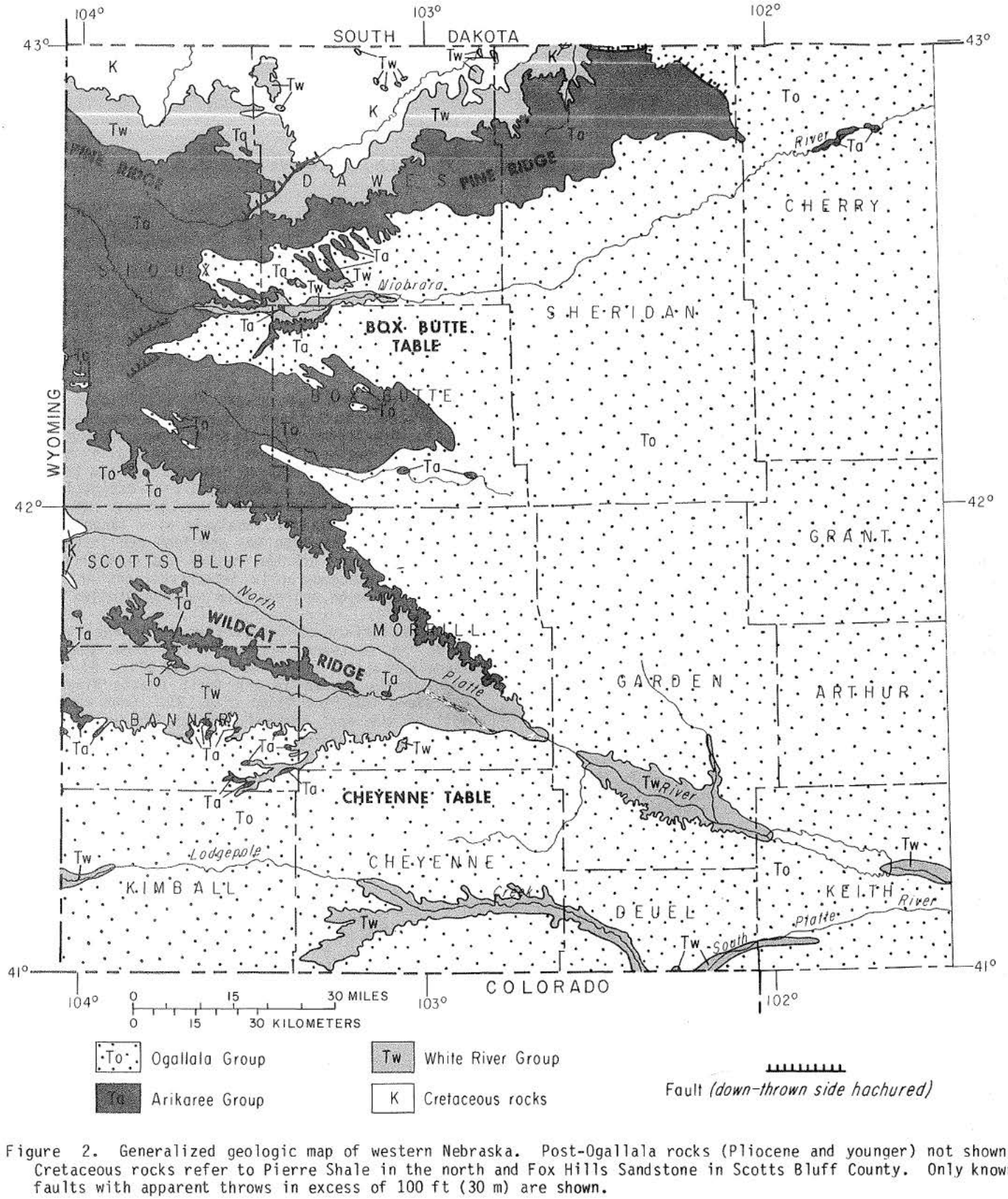

Figure 2. Generalized geologic map of western Nebraska. Post-Ogallala rocks (Pliocene and younger) not shown. Cretaceous rocks refer to Pierre Shale in the north and Fox Hills Sandstone in Scotts Bluff County. Only known faults with apparent throws in excess of 100 ft (30 m) are shown.

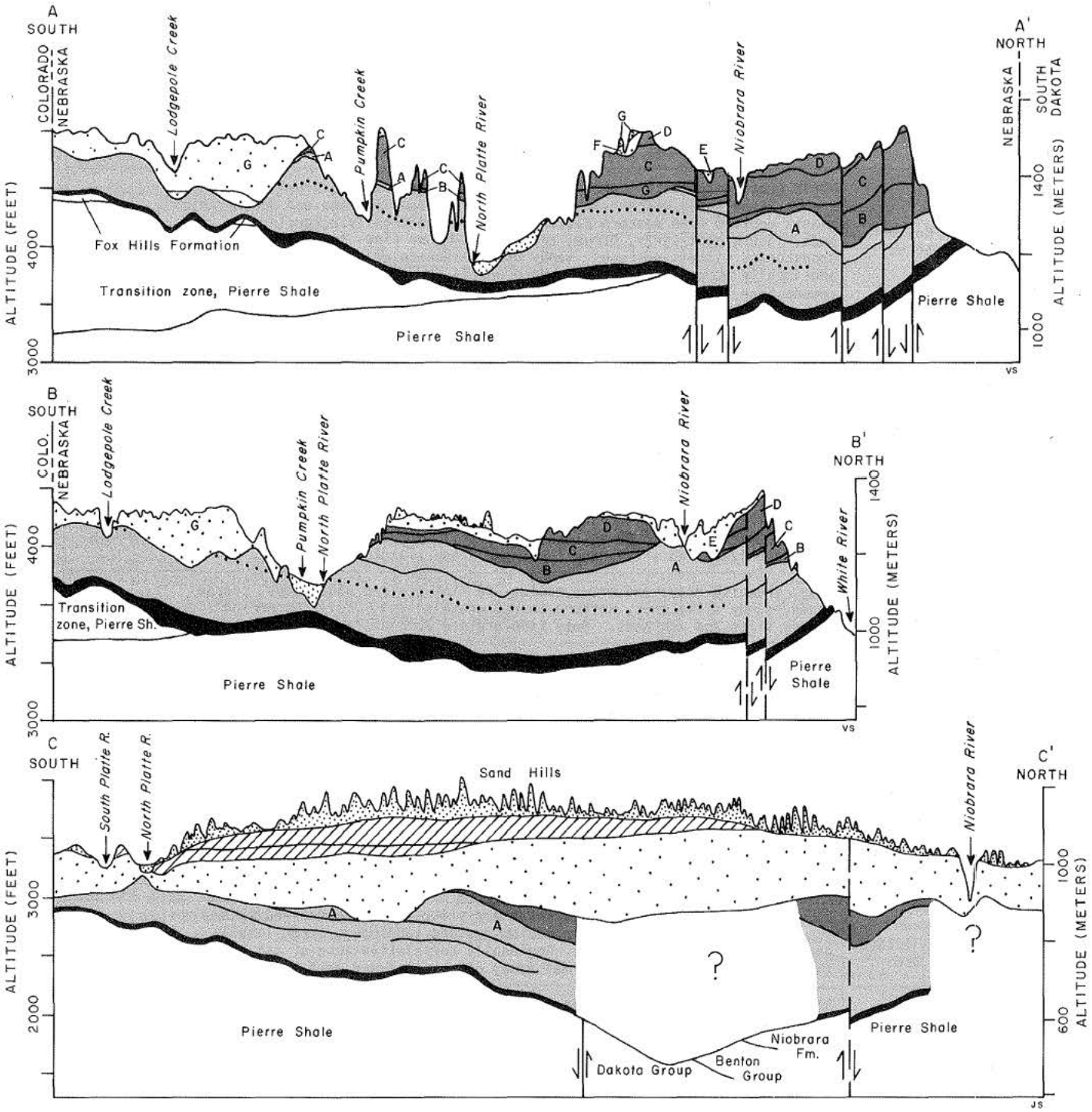

Figure 5. Geologic sections across study area. Brule Formation, Arikaree Group and Ogallala Group are subdivided in selected areas as follows: A-Brown Siltstone beds; B-Gering Formation; C-Monroe

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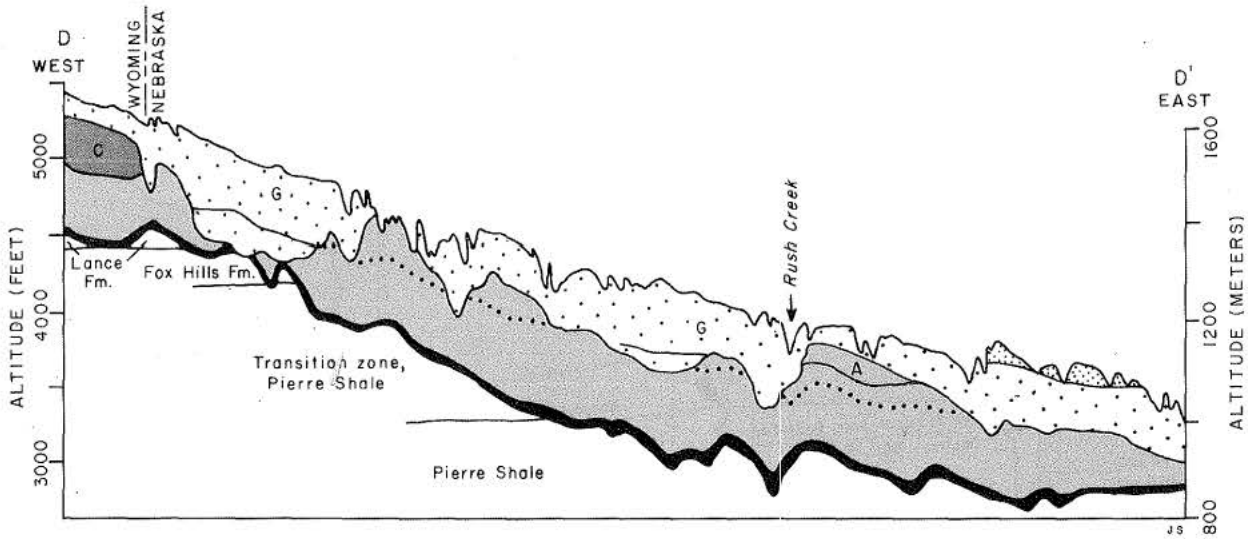

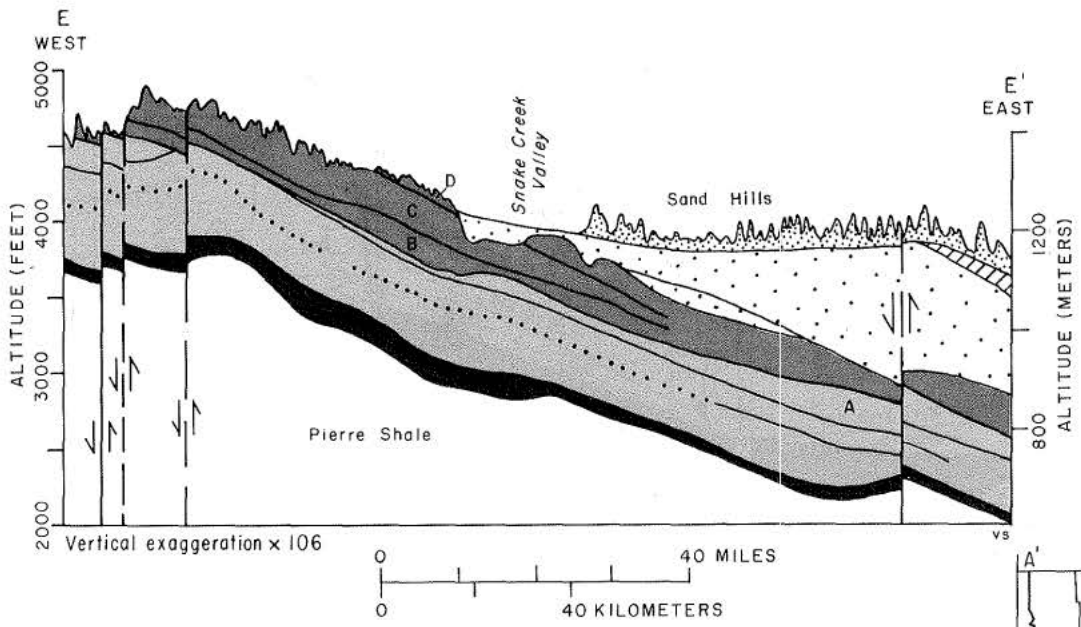

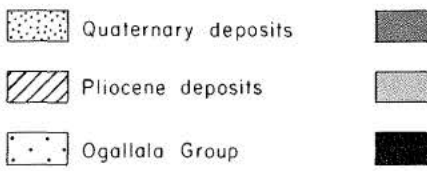

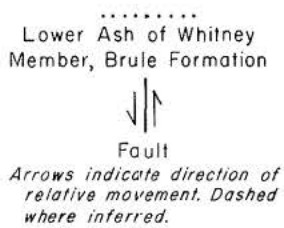

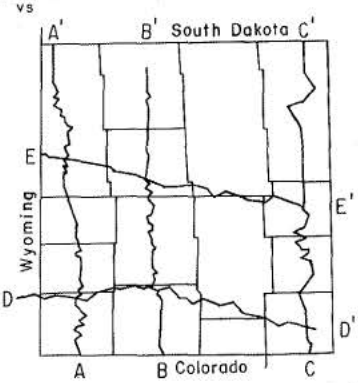

Creek-Harrison formations; D-Upper Harrison beds; E-Runningwater Formation; F-Sheep Creek and Olcott formations; G-Ash Hollow Formation.