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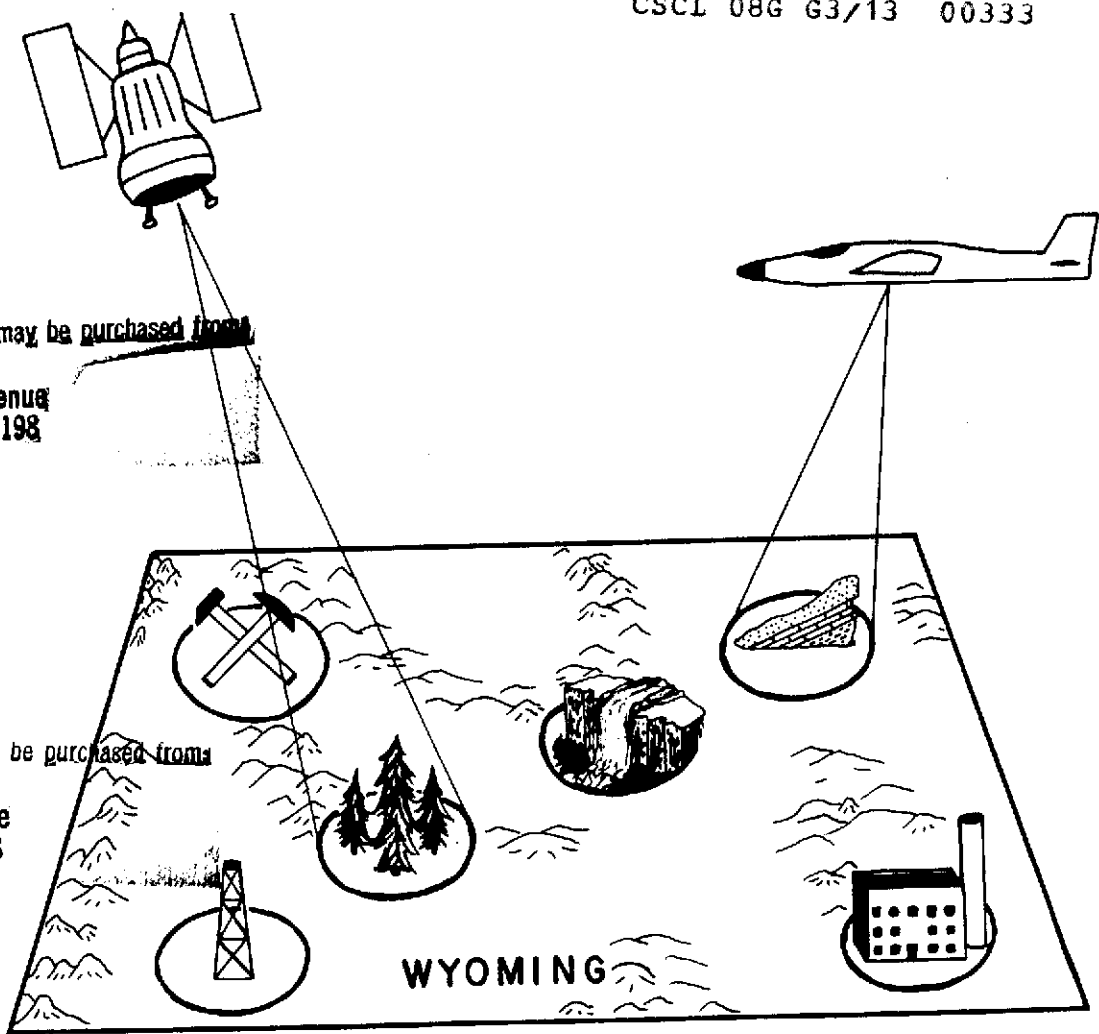
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R. W. MARRS

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TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract Possible geologic structures in the basin sediments of Carbon County and vicinity were located by interpretation of ERTS imagery. These same structures are not evident on existing conventional geologic maps of the area. Subsequent field checks confirmed much of the geologic interpretation, but revealed that two apparent "closed" structures identified on the ERTS imagery were actually topographic pseudostructures in flat or homoclinal sediments. Stereoscopic coverage (where available) allows the interpreter to avoid such misinterpretations.					
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Figure 2. Technical Report Standard Title Page

LOCATION OF GEOLOGIC STRUCTURES FROM INTERPRETATION OF
ERTS-1 IMAGERY, CARBON COUNTY, WYOMING

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INTRODUCTION

The area mapped for this report (Fig. 1) covers most of the eastern half of the image and includes the Hanna Basin, bounded to the north by the Sweetwater Uplift and to the west by the Rawlins Uplift. The Sierra Madre Mountains lie along the southern edge of the mapped area, with the Medicine Bow Mountains at the east and southeast.

The image interpreter, Mr. Ray Barton, had no previous experience in the area and had never before worked with multispectral imagery. Consequently the image interpretation might be considered comparable to a reconnaissance map of an unknown region compiled by standard photointerpretive techniques.

TECHNIQUES

ERTS image 1066-17242 (fig. 2) covering Carbon County and adjacent areas was studied with a primary view to mapping structures in the sedimentary rocks of the Hanna Basin.

A color-composite image was available for the area, so the interpretation was made both on the basis of tonal and textural contrast seen on the black-and-white ERTS-1 image and color information available from the color composite. The overlay map (fig. 3) depicts structural and lithologic relations interpreted from the image set. After the interpretation was completed, the Geologic Map of Wyoming (Love and Weitz, 1952) was used as a guide in naming the major lithologic units identified in the image interpretation. Direct comparison was then made of the image interpretation and the geologic map (generalized for the Hanna Basin area in fig. 4). The units mapped on the interpretation were readily correlated with major units on the state map. Several features (numbered 1 through 6 on the image interpretation) were not indicated on the

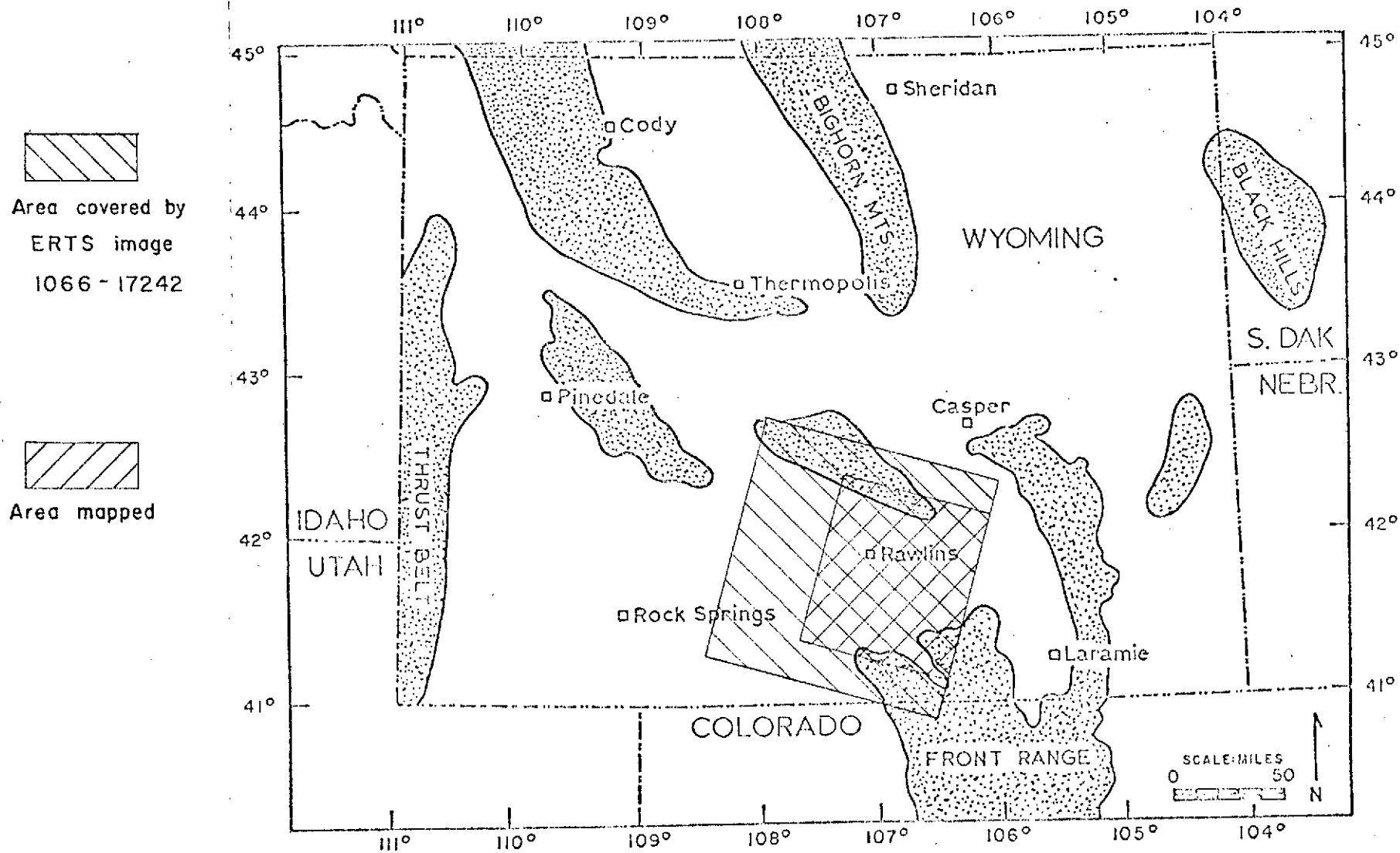


Figure 1. Index map showing the location and orientation of the area covered by ERTS image 1066-17242, and the portion which was mapped.

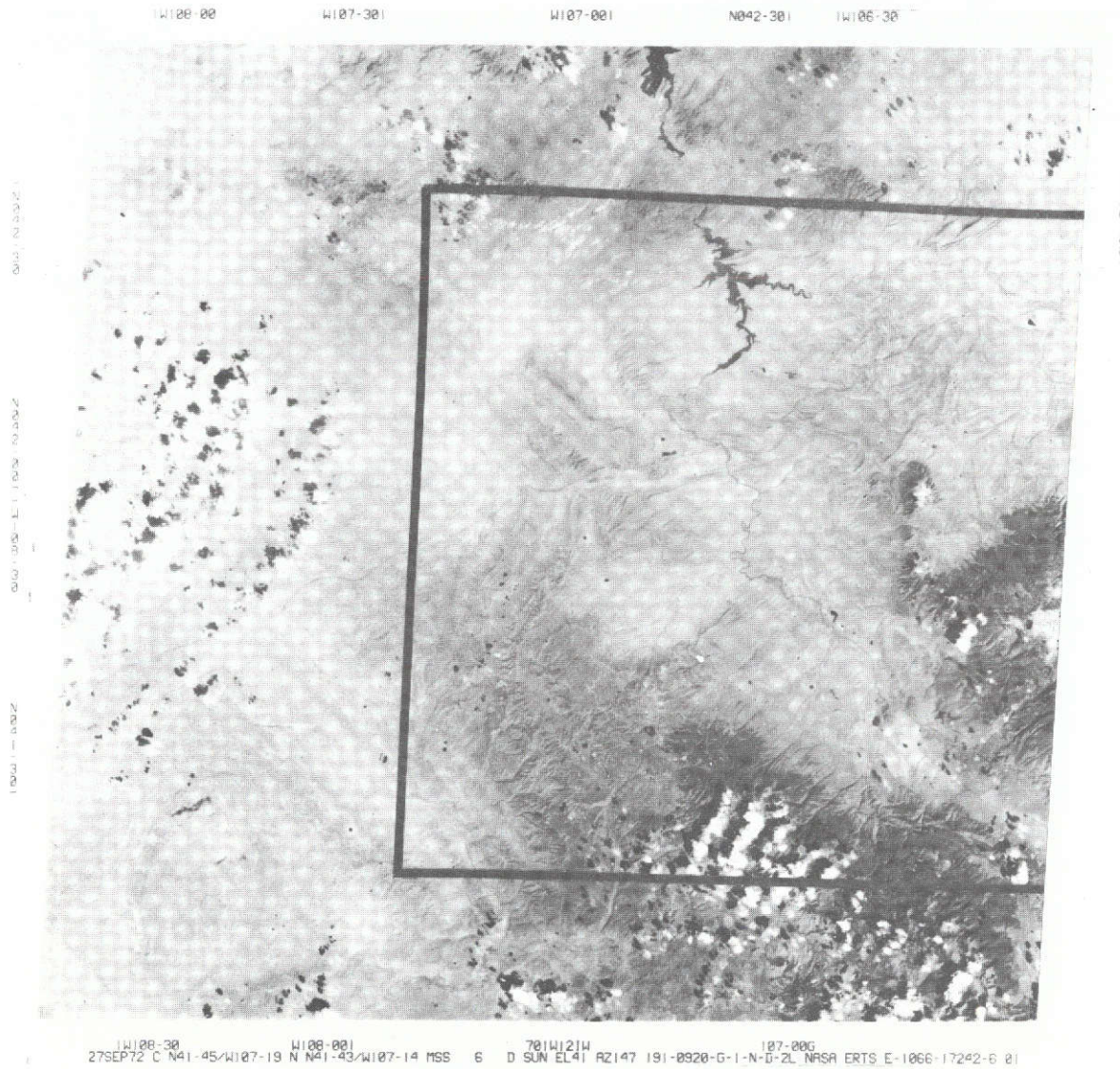
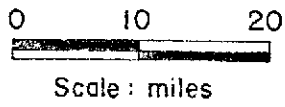
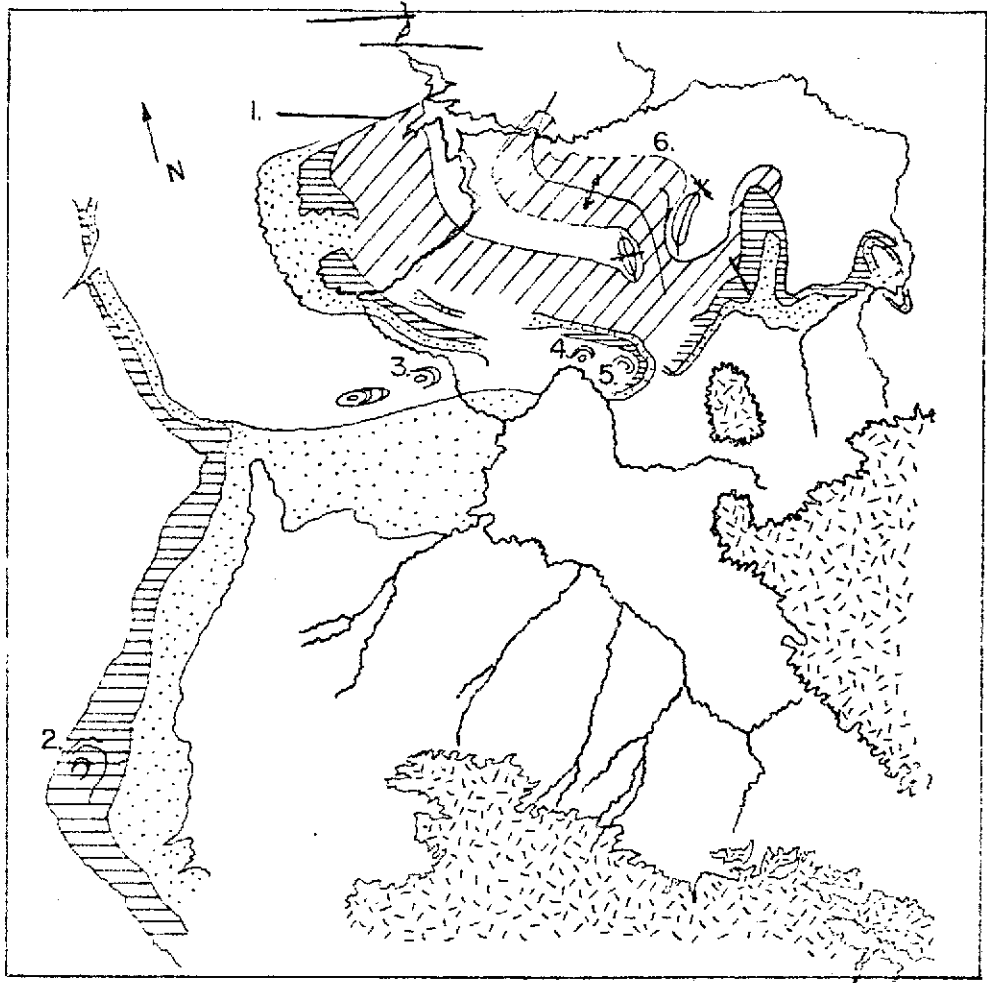


Figure 2. ERTS Image No. 1066-17242-4 covering Carbon County and adjacent areas. The present study was concerned with the eastern portion of the image, which consists mostly of folded sedimentary rocks of the Hanna Basin. The basin is bounded to the north by the Sweetwater Uplift, to the west by the Rawlins Uplift, and to the southeast by Medicine Bow Mountains. The Sierra Madre Mountains occupy much of the southeastern part of the image. The Washakie Basin lies in the southwest corner of the image area.








-  Fault
-  Medicine Bow Formation
-  Lewis Shale
-  Mesaverde Formation
-  Precambrian

Figure 3. Geologic map showing structural features and lithologic relation between Medicine Bow, Lewis, and Mesaverde formations in the Carbon County area. Prepared from a portion of ERTS image 1066-17242 and colour composite 1066-17242.

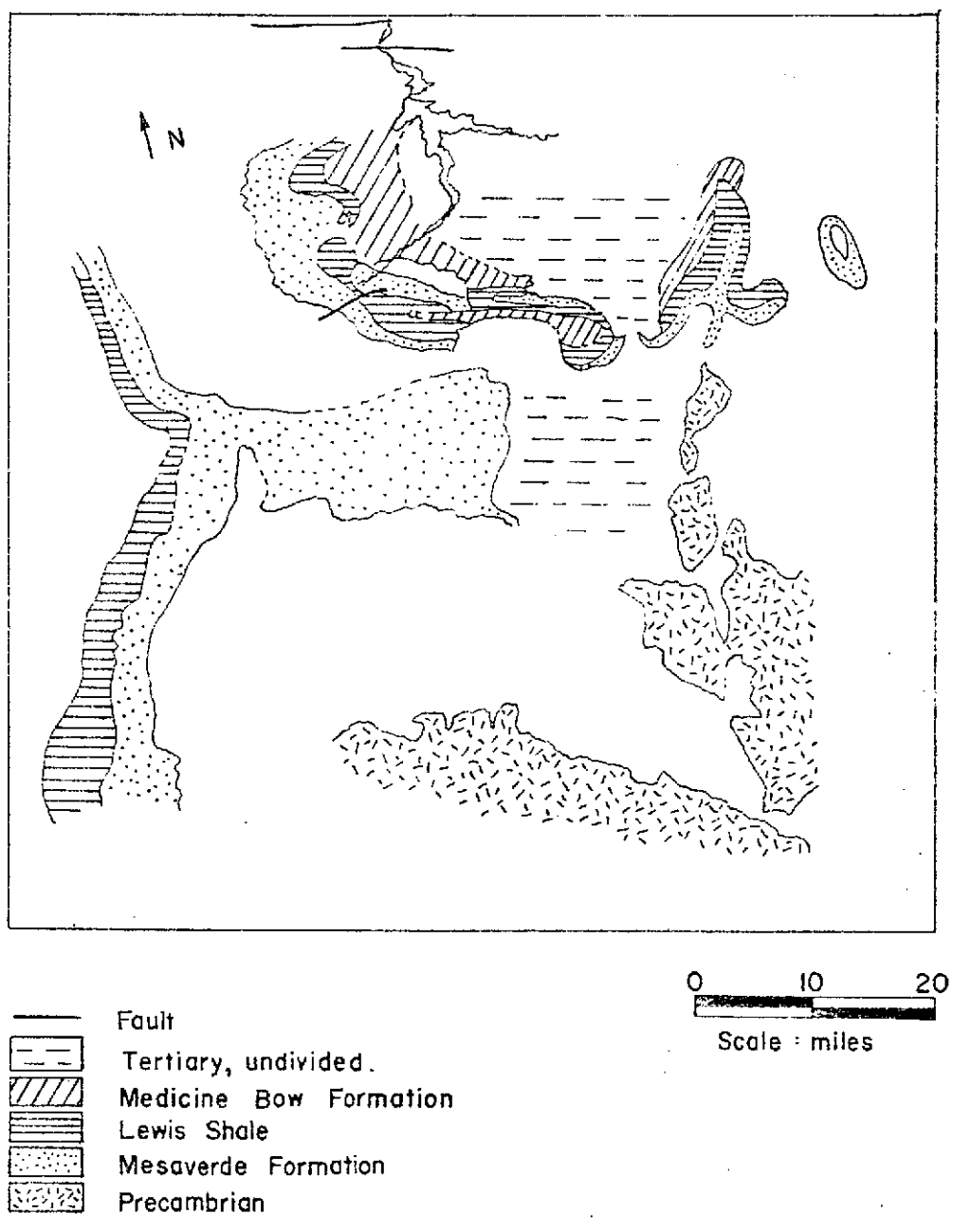


Figure 4. Geologic map showing relation between Medicine Bow, Lewis, and Mesaverde formations in Carbon County. Prepared from the Geologic Map of Carbon County by J. L. Weitz and J. D. Love, 1952 (Covers the same area as fig. 3).

geologic map, but were marked by the interpreter as significant geologic features warranting further investigation. The numbered features described below are found on the photogeologic map (fig. 3) at the locations indicated by the corresponding numbers.

1. Although emphasis in the study was placed on lithologic relationships, some of the more prominent linear features were also noted. The east-west lineation west of Seminole Reservoir, interpreted as a fault from the image, does not appear on the state geologic map.

2. To the northeast of the Washakie Basin the ERTS image indicates a structure, possibly domal, in the Lewis shale. There is no evidence of this on the geologic map.

3. Just north of center on the ERTS image, immediately east of Grenville Dome, occurs a structure which is interpreted as anticlinal. Again, this is not shown on the geologic map.

4 & 5. On the nose of the major synclinal structure east of Feature 3 and due west of Elk Mountain, in the Medicine Bow formation, two minor folds can be seen on the ERTS image; they are not shown on the geologic map.

6. North northwest from Elk Mountain, the ERTS image suggests a major anticlinal fold in the Medicine Bow formation. The geologic map shows only Tertiary cover.

Two of these features have since been checked against other data (nos. 6 and 3). Feature 6 was checked against work presented in a U. S. Geological Survey Bulletin (Dobbin and others, 1929). Attitudes reported for the rocks in the area discount the existence of an anticlinal structure. Comparison of the image interpretation with a topographic map of the area indicates the apparent structure is a combined effect of outcrop and topography.

Feature 3 was field-checked by Mr. Barton. He found the area covered by soils derived from the Cody shale (the dominant lithology). A few scattered outcrops of the thin sands were found. The strike and dip data gathered from these outcrops were not excellent, but were sufficient to show that beds are conformable to the nearby Grenville Dome structure. There was no evidence of a separate dome in the anomalous area. Evidence was found suggesting that the anomalous area is sometimes covered by standing water -- that it is a playa lake. The anomalous light-colored spot, interpreted as a circular outcrop pattern, corresponds to the relatively saline soil of the playa.

The other four features have not yet been field checked.

Generally favorable comparison of the Geologic Map and the ERTS-1 image interpretation demonstrates that the ERTS-1 imagery serves very well as a reconnaissance mapping base. Topographically controlled outcrop patterns or soil anomalies can easily be misinterpreted as structure. Stereoscopic coverage would eliminate much of the ambiguity that leads to such misinterpretation. Similar mapping efforts in other parts of Wyoming (Houston and Marrs, 1973) have demonstrated that color-composite imagery, and low-altitude aircraft photography greatly augment construction of an accurate geologic reconnaissance map. The experience of the interpreter is also a very important factor. The experienced geologist/interpreter can use his knowledge of the regional structure and stratigraphy and his refined interpretive ability to maximize the information gained from the image interpretation and construct a more complete and accurate geologic map.

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Love, J. D., and Weitz, J. L., 1952, Geologic Map of Wyoming; U. S. Geological Survey Map.

Houston and Marrs, 1973, Application of the ERTS System to the study of Wyoming resources -- with emphasis on the use of basic data products; 3rd ERTS Symposium, Washington D. C., sponsored by NASA/Goddard Space Flight Center.