

Open-File 86-3

**Surficial - Geologic  
and Slope Stability Study  
of the  
Douglas Pass Region**

**By  
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Colorado Geological Survey  
1985**

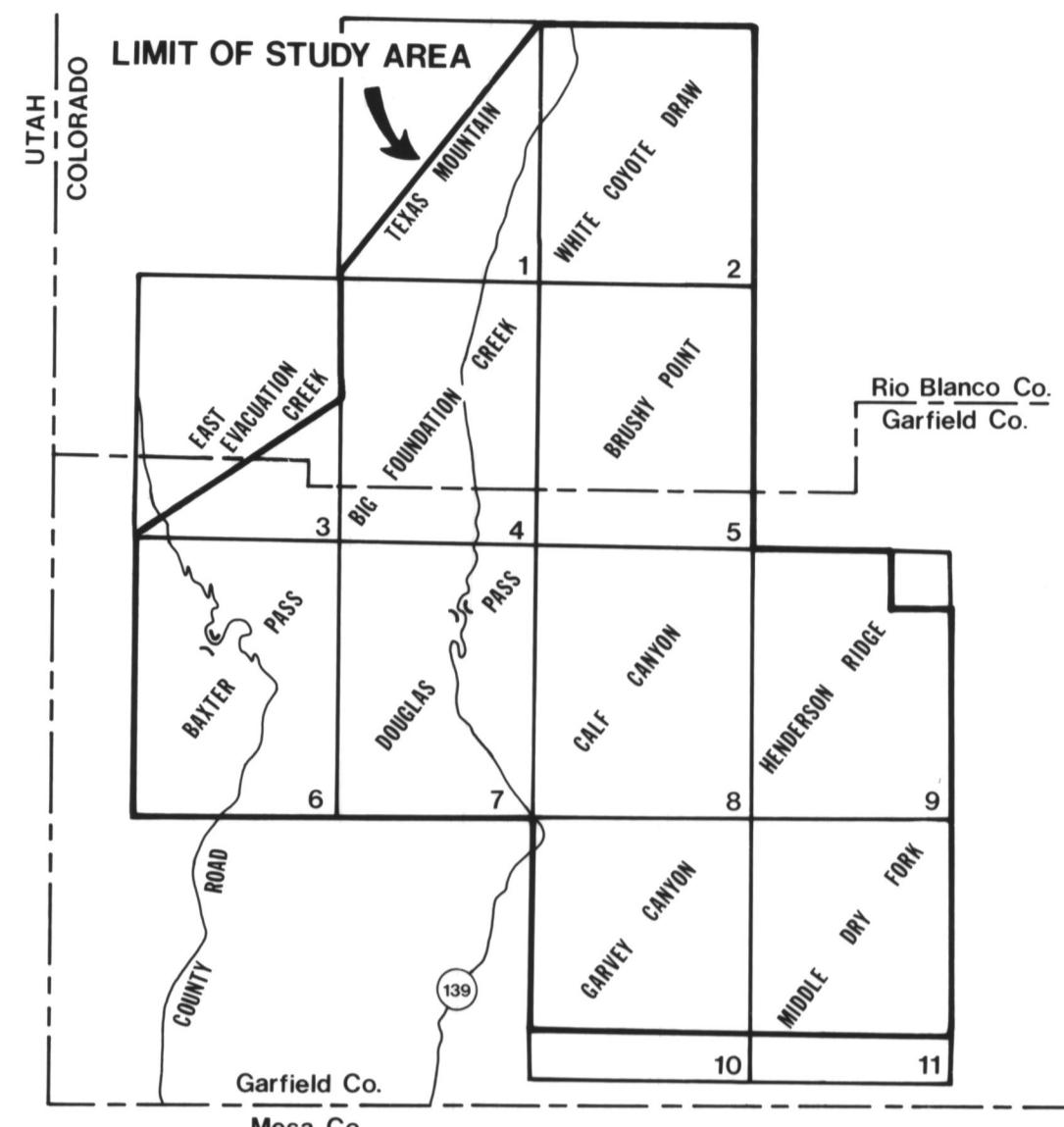
**Folio #2 Geologic Hazards**

# Folio # 2 Geologic Hazards

## Location Map



## Topographical Location Map



## References

- Cashion, W. B., 1973, Geologic and structure map of the Grand Junction Quadrangle, Colorado and Utah: U. S. Geological Survey Miscellaneous Investigations Map I-736, Scale 1:250,000.
- Johnson, R. C., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek Basin, Colorado: U. S. Geological Survey Bulletin 1529-I, 19 p., 1 pl.
- Mears, A. I., 1976, Guidelines and methods for detailed snow avalanche hazard investigations in Colorado: Colorado Geological Survey Bulletin 38, 125 p., 32 figs.
- Nuccio, V. F., 1985, Preliminary geologic map of the Douglas Pass Quadrangle, Garfield County, Colorado: U. S. Geological Survey Miscellaneous Field Studies Map MF-1772, Scale 1:24,000.
- Roehler, H. W., 1973, Geologic map of the Calf Canyon Quadrangle, Garfield County, Colorado: U. S. Geological Survey Geologic Quadrangle Map GQ-1086.
- Roehler, H. W., 1973, Geologic map of the Henderson Ridge Quadrangle, Garfield County, Colorado: U. S. Geological Survey Geologic Quadrangle Map GQ-1113, Scale 1:24,000.
- Roehler, H. W., 1972, Geologic map of the Brushy Point Quadrangle, Rio Blanco and Garfield Counties, Colorado: U. S. Geological Survey Geologic Quadrangle Map GQ-1018, Scale 1:24,000.
- Rogers, W. P., and others, 1974, Guidelines and Criteria for identification and land-use controls of geologic hazard and mineral resource areas: Colorado Geological Survey Special Publication SP-6, 146 p.
- Soule, J. M., and Stover, B. K., 1984, Unpublished, Surficial geology, geomorphology, and general engineering geology of parts of the Colorado River Valley, Roaring Fork River Valley, and adjacent areas, Garfield County, Colorado: Colorado Geological Survey Open File Report OFR 85-1, (In preparation).
- Varnes, D. V., 1978, Slope movement types and processes, in Schuster, R. L., and Krizek, R. J., eds., Landslides: analysis and control: National Academy of Sciences, Transportation Research Board, Special Report 176, p. 11-33.
- Whitney, J. W., 1981, Surficial Geologic Map of the Grand Junction 1X2 degree Quadrangle, Colorado and Utah: U. S. Geological Survey Miscellaneous Investigations Map I-1289, Scale 1:250,000.

## Notes on Use and Limitations of These Maps

The reconnaissance Geologic Hazards Maps produced within the scope of this project are intended to provide information covering a broad corridor that can be used in planning and evaluating possible future major relocations of highways, pipelines, and related structures. They are not intended to be used in place of detailed site specific studies.

The Geologic Hazards Maps integrate surficial geology, slope and moisture conditions, and the geologic record of ongoing and past geologic processes. The hazard units classify the type and intensity of geologic hazards and their potential impacts on the works of man. The maps show interpretations of slope stability based upon geologic factors, geomorphic expressions, slope aspect and inclination, proximity to actively failing areas, and experience with the types of failure-prone deposits and mass-wasting processes active in the study area. Laboratory testing of materials and formal slope stability analyses have not been used to define slope stability hazards within the scope of this project.

Floodplain delineation and flash flooding hazards were not objectives within the scope of this project. Some degree of flash flood hazard exists along all the steep rocky tributary streams in the study area. Entrenched floodplains exist within the broad alluvial valley floors of all major streams and creeks draining the project area, but have not been investigated or mapped.

## Explanation

### DMA

#### Debris-flow/mudflow-Flooding Area

Debris fans, alluvial fans, and drainage channels subject to potentially destructive inundation by rapid downslope flowage of wet, commonly fluid-like masses of fine-to-coarse debris and water derived from contiguous side slopes, usually during periods of heavy rainfall and/or snowmelt runoff. Map unit includes only those areas subject to this process in modern times.

### PUS

#### Potentially Unstable Slope

Areas subject to slope failure(s) if natural conditions, especially those related to slope, ground moisture, vegetation cover, and drainage, are disrupted. Areas so mapped include those in proximity to or otherwise associated with areas subject to natural slope movements. Does not include steep stream and gully banks, virtually all of which are subject to localized slope failure during periods of heavy runoff.

### US

#### Unstable Slope

Areas subject to natural translational or rotational landslides and/or earthflows. Evidence includes: distinctive landslide and earthflow morphology, proximity to actively failing areas composed of the same or similar geologic units, slope aspect and inclination, vegetation cover conducive to slope failure, and disrupted cultural or structural works.

### AFS

#### Actively Failing Slopes

Areas where active landsliding, slumping and earthflows are involving the ground surface. The areas shown are as of fall, 1979. These areas are now probably much larger, and undoubtedly hundreds of additional active slides have occurred in the back country of the Douglas Pass study area since 1979. **AFS**

### RF

areas along highway 139 are shown as of spring 1985. Several new **AFS** areas have probably occurred along the highway even since that field work was completed.

#### Rockfall Area

Area subject to free-falling, toppling, bounding, or rolling of rock fragments including large cobbles, boulders, and blocks capable of damaging or destroying most types of structures. Areas so mapped include rock source areas and estimated runout zones below cliffs where mobilized rocks come to rest. The exact extent of the runout zone is typically difficult or impossible to predict or map precisely without site-specific studies because of the varying effects of ground-surface texture, size and shapes of mobile rock fragments, and localized vegetation, ground moisture, and slope variations.

**Note:** Virtually all the steep rocky cliffs and slopes of the Mesa Verde Formation (**Kmv**) have some potential for rockfall, ranging from minor to severe. It is impractical to map all these areas due to the significant variations of the rockfall hazard in relation to a specific slope or cliff. Only a few more prominent or observed rockfall hazard areas are mapped within the Mesa Verde Formation outcrop.

### PUS/RF

#### Steep Potentially Unstable Slopes and Rockfall Hazard Areas

Combined hazard unit; steep slopes and cliffs in the Green River Formation which are subject to rockfall hazards and potential slope instability hazards as described (in detail) above.

### UA

#### Mine-Subsidence Area

Area overlying abandoned underground coal mine(s) that could be subject to potentially

destructive surface subsidence and ground failure. Areas so mapped are zones broad enough to indicate where precise extent of undermining and its surface effects might cause problems for activities on the land surface. Detailed investigations, including drilling, may in some cases be necessary to precisely delineate the hazard area.

### HEP

High Erosion-Potential Area  
Alluvial valley floor presently undergoing rapid headward erosion, gulling, stream bank caving, and/or sheet erosion exhibiting a high potential for continued erosion (generalized). These areas are generally underlain by fine grained alluvium which is highly susceptible to erosion.

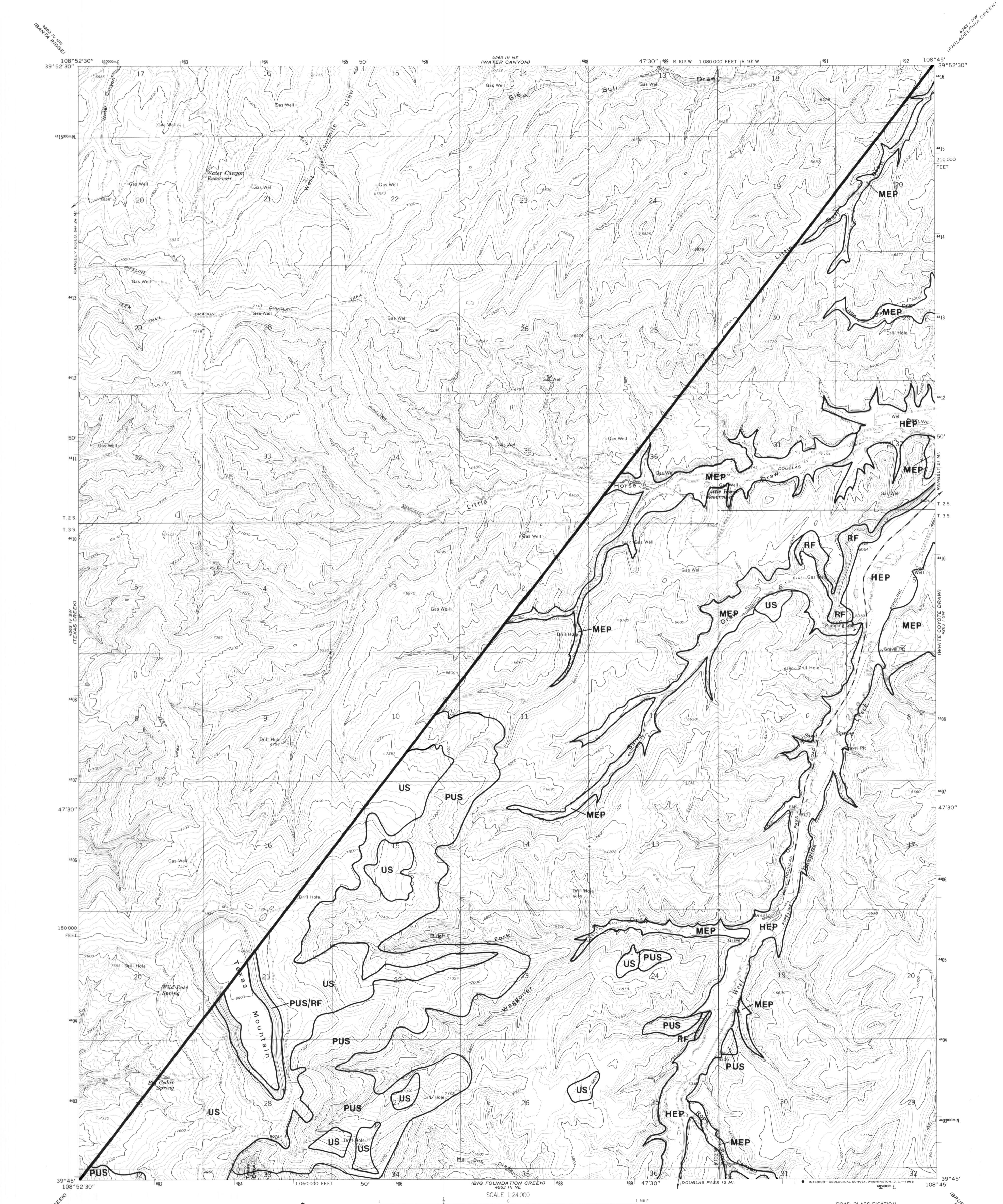
### MEP

Moderate Erosion-Potential Area  
Alluvial valley floor undergoing moderate gulling, headward erosion, bank caving and exhibiting a moderate potential for continued erosion (generalized).

#### Snow Avalanche Tracks

Steep chutes on north facing slopes which channel masses of wet or dry snow, ice, and debris rapidly down slope to runout zones below. Avalanches can exert forces great enough to destroy structures and uproot or snap off large trees. Dry powder avalanches may be preceded by a destructive "air blast". Tracks are characterized by a lack of vegetation, or predominance of quick-growing aspen and low shrubs. Actual extents of runout zones have not been delineated due to the scale of reconnaissance mapping, but can be considered to extend at least to valley floors or local base levels.

Contact between units



Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

photographs taken 1965. Field checked 1964  
Polyconic projection. 1927 North American datum  
10,000-foot grid based on Colorado coordinate system  
north zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

UTM GRID AND 1964 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

A horizontal scale bar with markings at 1000, 0, 1000, 2000, 3000, 4000, 5000, 6000, and 7000 FEET. Below the main scale, there is a smaller scale bar with markings at 1, 5, 0, and 1 KILOMETER. The 1 KILOMETER mark is aligned with the 5000 FEET mark on the top scale.

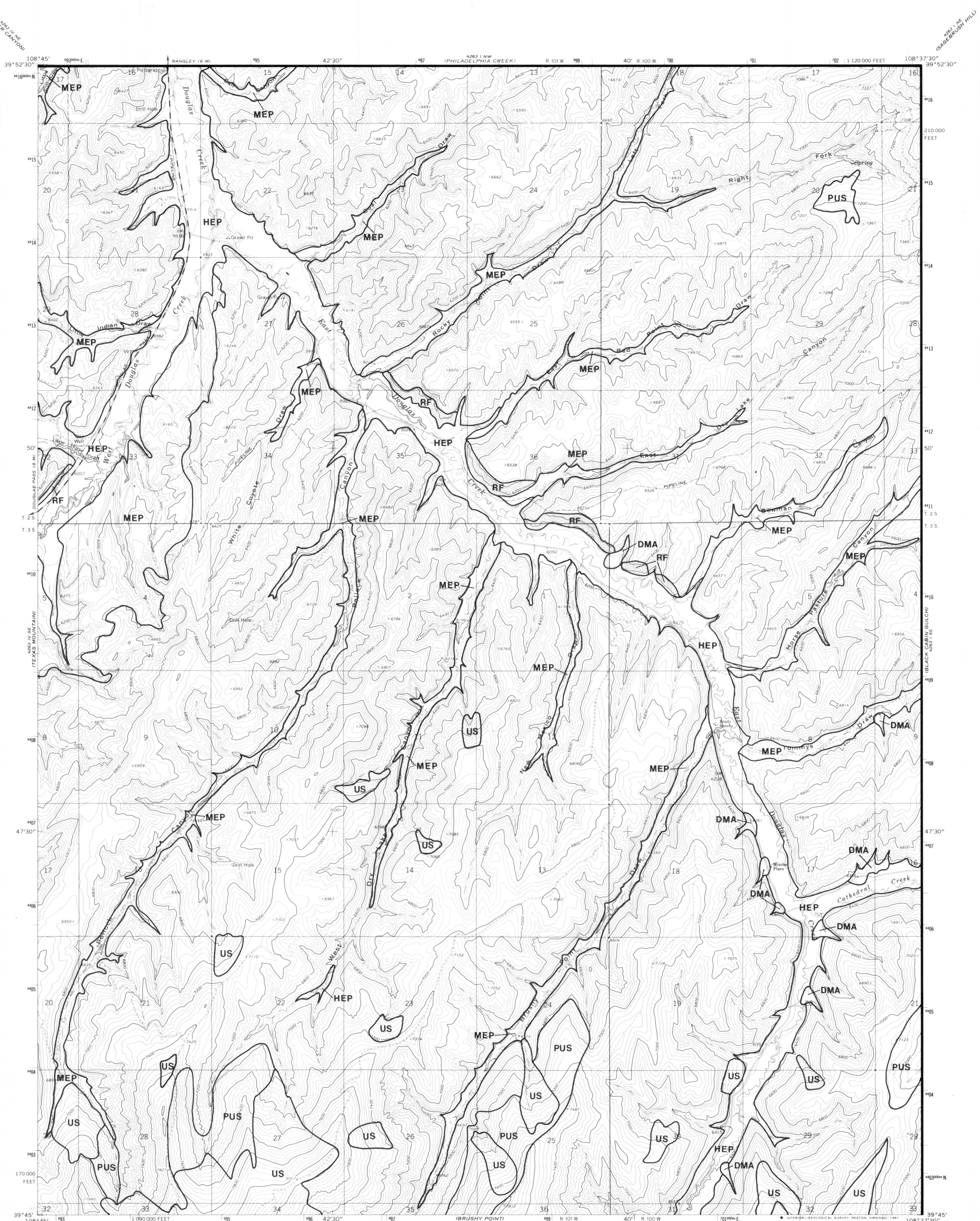
CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION  
Medium-duty ..... ——— Light-duty ..... ———  
Unimproved dirt ..... ———

Unimproved dirt =====

TEXAS MOUNTAIN G

## TEXAS MOUNTAIN, COLO.



photographs taken 1963. Field checked 1964

photographs taken 1963. Field checked 1964  
Polyconic projection. 1927 North American datum  
10,000-foot grid based on Colorado coordinate system,  
north zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 7 meters north and 57 meters east as shown by dashed corner ticks

Map photoinspected 1973  
No major culture or drainage changes observed

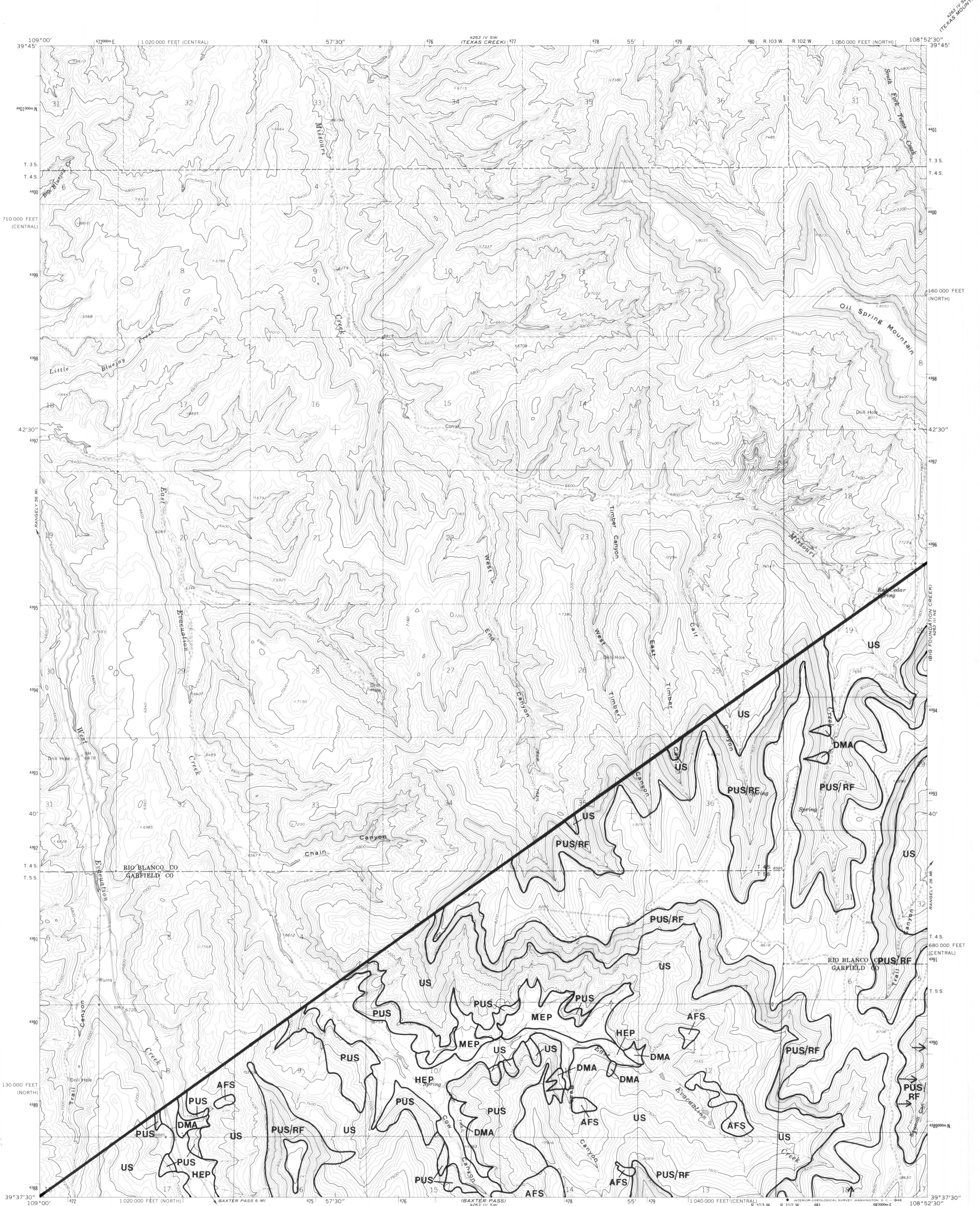
UTM GRID AND 1964 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

SCALE 1:24 000  
 0  
 1000 2000 3000 4000 5000  
 5 0  
 CONTOUR INTERVAL 40 FEET  
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Unimproved dirt -----

## WHITE COYOTE DRAW, COLO.



Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

Polyconic projection. 1927 North American datum  
10,000-foot grids based on Colorado coordinate system,  
north and central zones  
100-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET  
1°19' 15''  
23 MILS 267 MILS

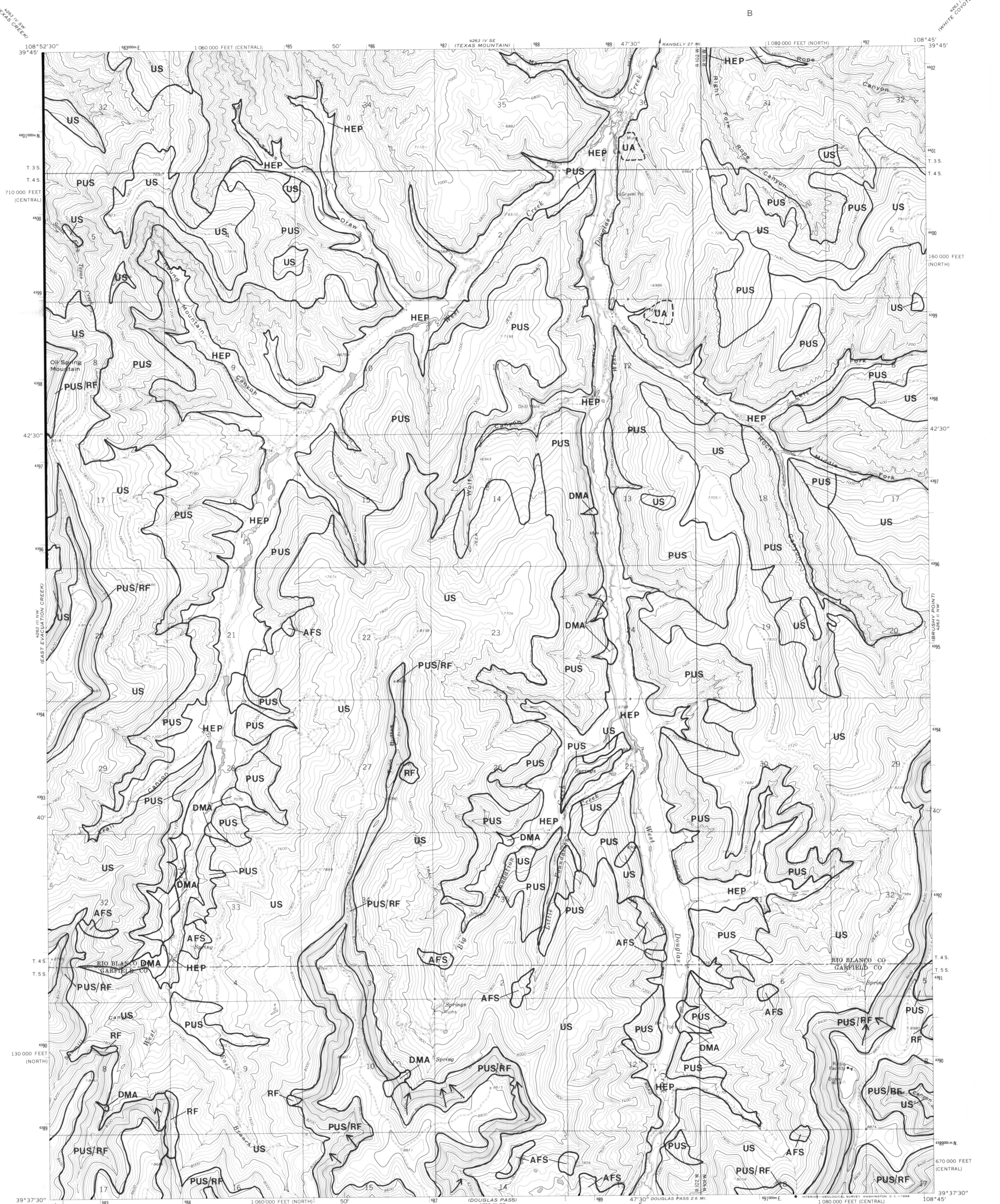
SCALE 1:24,000  
CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

Light-duty ————— Unimproved dirt - - - - -



EAST EVACUATION CREEK, COLO.



(BAXTER PASS)  
4263 III SW

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

Polyconic projection. 1927 North American datum  
10,000-foot grids based on Colorado coordinate system,  
north and central zones  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

Fine red dashed lines indicate selected fence lines

GN MN  
1°24' 15°  
25 MILS 267 MILS  
UTM GRID AND 1964 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

1 1000 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 5 0 1 2 0 1 KILOMETER  
SCALE 1:24,000  
CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL



ROAD CLASSIFICATION  
Light-duty Unimproved dirt

BIG FOUNDATION CREEK, COLO.



Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

Polyconic projection. 1927 North American datum  
10,000-foot grids based on Colorado coordinate system,  
north and central zones  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue  
Fine red dashed lines indicate selected fence lines

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1964 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

## ROAD CLASSIFICATION

## BRUSHY POINT, COLO.



Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

Polyconic projection. 1927 North American datum  
10,000-foot grid based on Colorado coordinate system,  
central zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

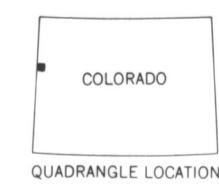
Fine red dashed lines indicate selected fence lines

Certain land lines are omitted because of insufficient data

GN MN  
1°19' 15'  
23 MILS 267 MILS  
UTM GRID AND 1964 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

SCALE 1:24 000  
1 MILE  
0 1000 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 5 0 1 KILOMETER  
CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION  
Light-duty Unimproved dirt

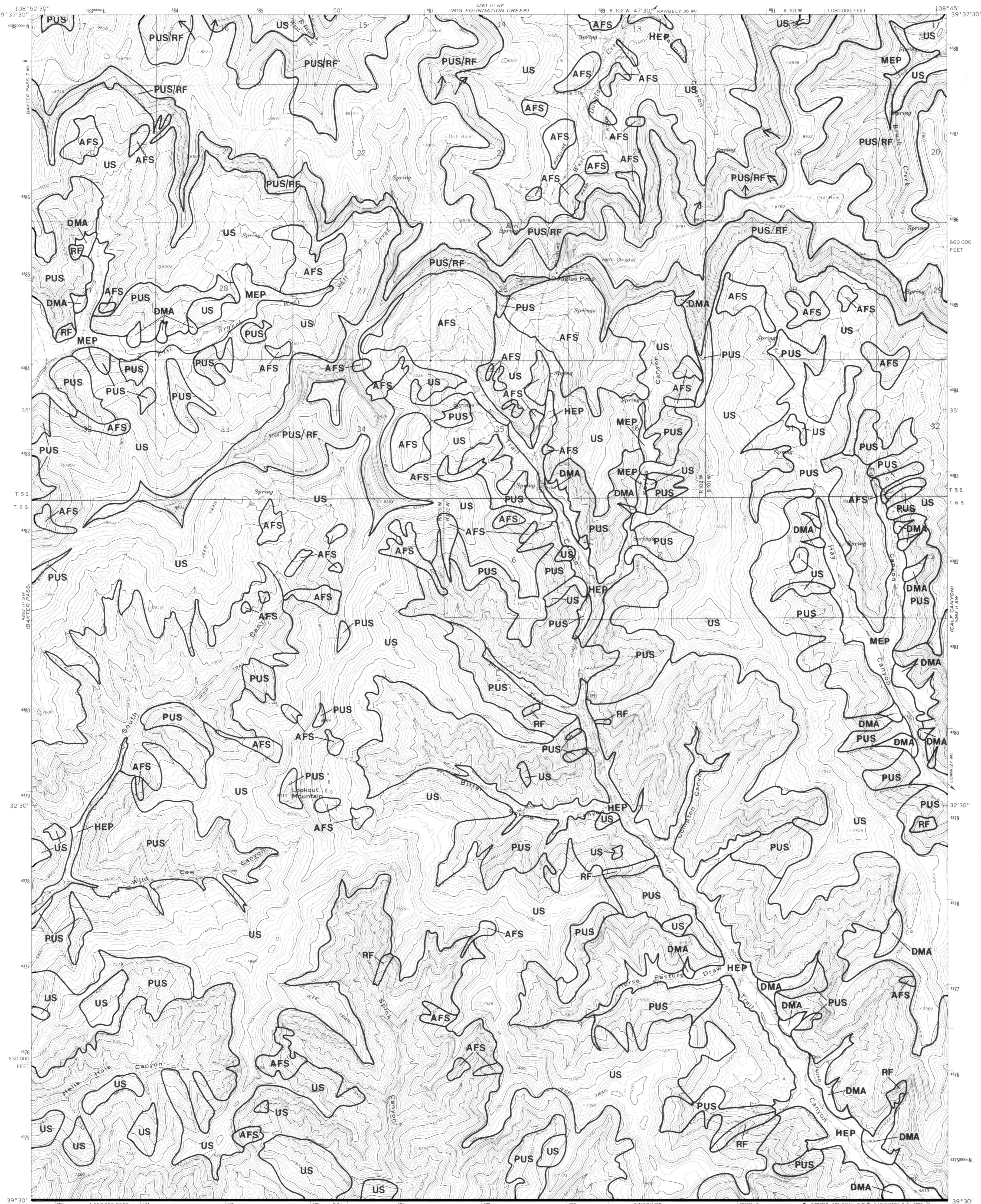


BAXTER PASS, COLO.

(EAST CREEK)

4263 11 N  
NEW CREEK

4263 11 NW  
BRUSHY POINT



Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964.

Polyconic projection. 1927 North American datum. 10,000-foot grid based on Colorado coordinate system, central zone. 1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue.

Fine red dashed lines indicate selected fence lines.

Certain land lines are omitted because of insufficient data.

GN  
M/N  
1° 23' 25 MILS  
15° 267 MILS  
UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

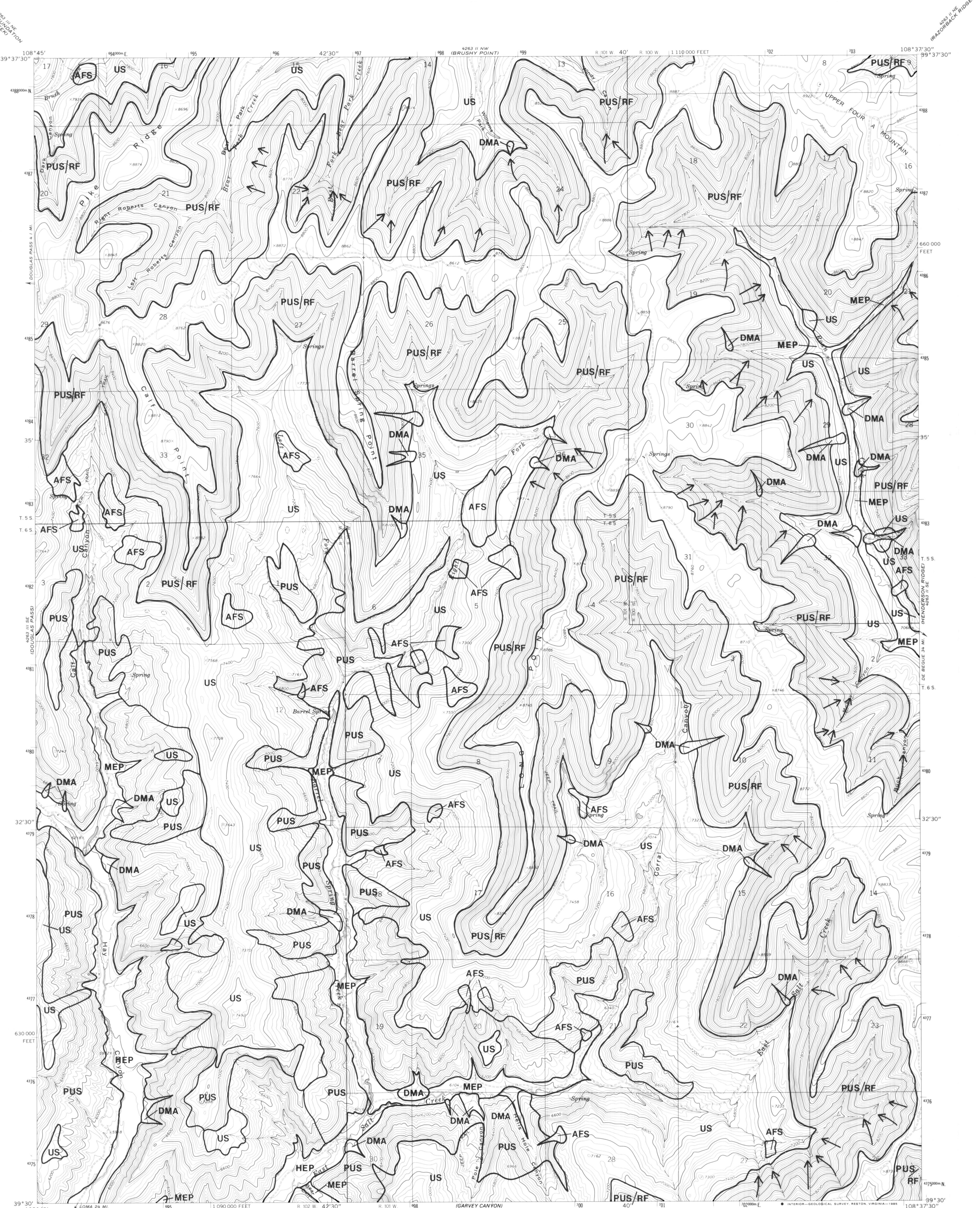
SCALE 1:24,000  
0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 MILE  
1 2 3 4 5 0  
1000 2000 3000 4000 5000 6000 7000 MILS  
1 KILOMETER

CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL



ROAD CLASSIFICATION  
Light-duty Unimproved dirt  
State Route

DOUGLAS PASS, COLO.

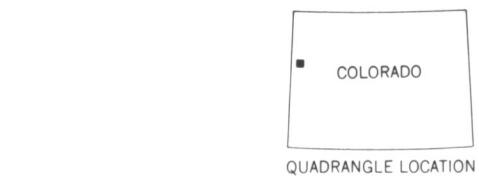


Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964.  
Polyconic projection. 1927 North American Datum  
10,000-foot grid based on Colorado coordinate system,  
central zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

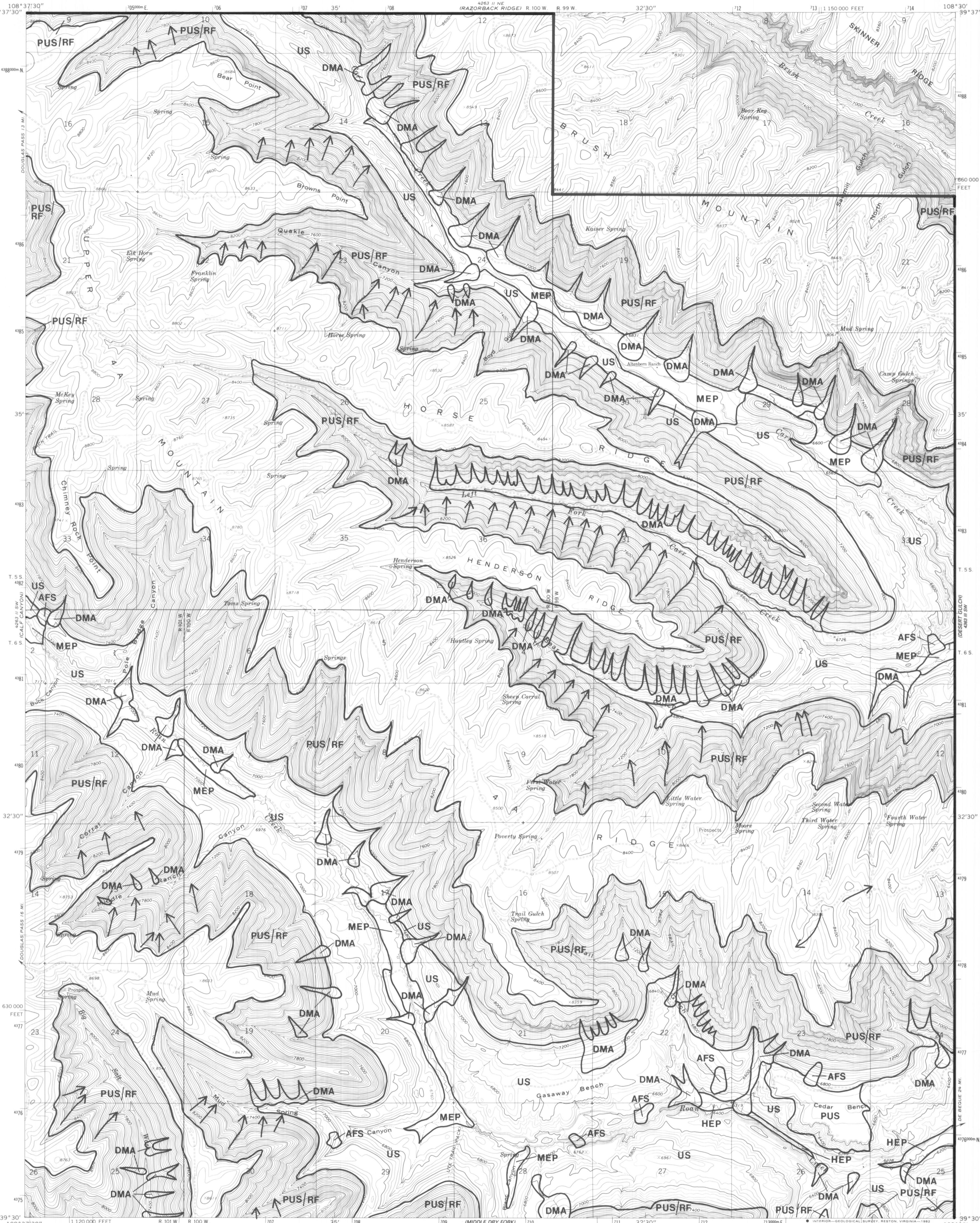
Fine red dashed lines indicate selected fence lines  
Certain land lines are omitted because of insufficient data  
To place on the predicted North American Datum 1983  
move the projection lines 6 meters north and  
57 meters east as shown by dashed corner ticks

Map photoinspected 1973  
No major culture or drainage changes observed

SCALE 1:24 000  
CONTOUR INTERVAL 40 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929



CALF CANYON, COLO.



(GARVEY CANYON)  
4262 1 NW

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964

Polyconic projection. 1927 North American datum  
10,000-foot grid based on Colorado coordinate system,  
central zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

Fine red dashed lines indicate selected fence lines

To place on the predicted North American Datum 1983  
move the projection lines 6 meters north and  
57 meters east as shown by dashed corner ticks

UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1°33' 28 MILS  
GN MN  
15° 267 MILS

SCALE 1:24 000  
0 1 MILE  
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

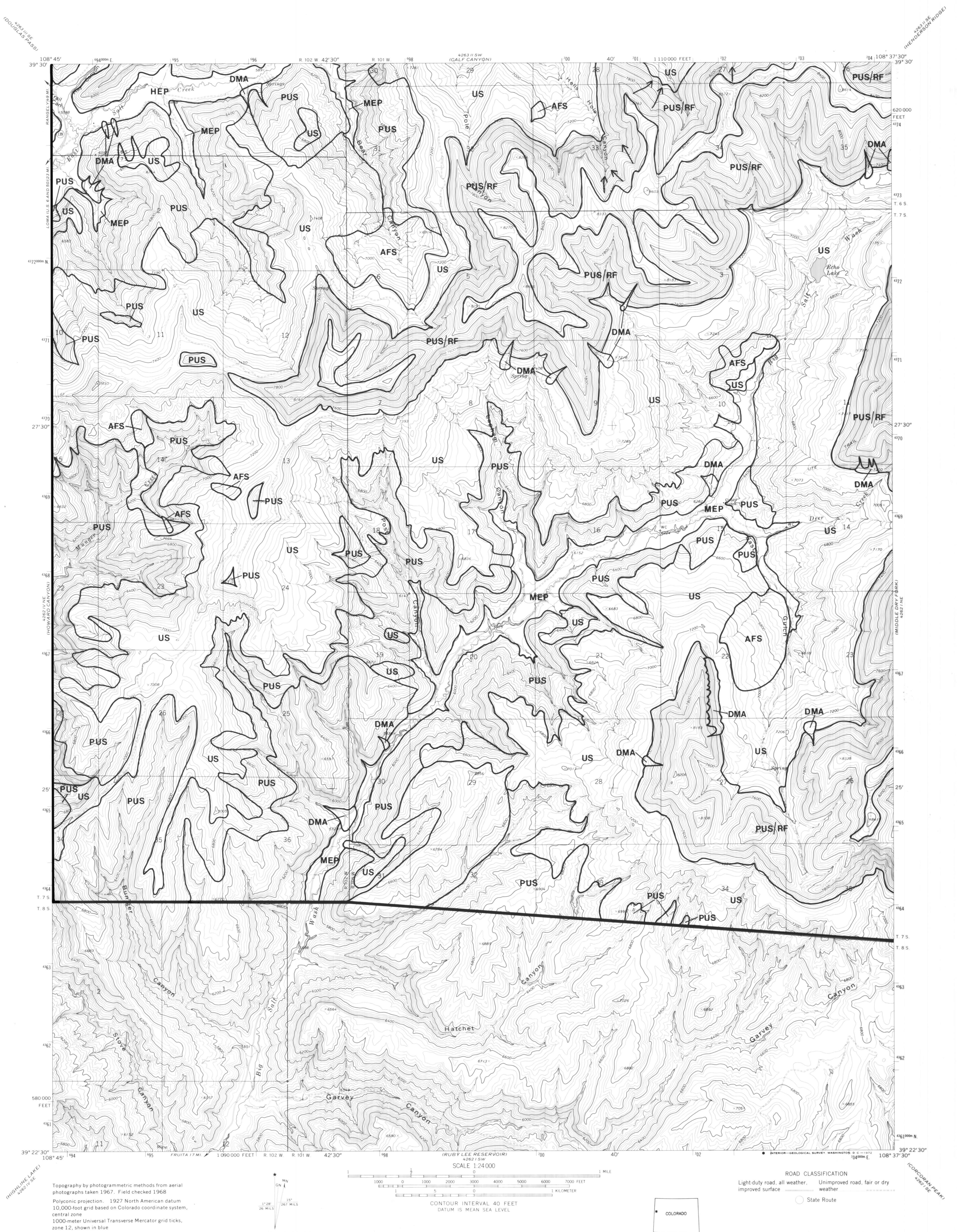
■ COLORADO

QUADRANGLE LOCATION

Map photoinspected 1973  
No major culture or drainage changes observed

ROAD CLASSIFICATION

Light-duty Unimproved dirt



Topography by photogrammetric methods from aerial photographs taken 1967. Field checked 1968.

Polyconic projection. 1927 North American datum. 100,000-foot grid based on Colorado coordinate system, central zone.

1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue.

Certain land lines are omitted because of insufficient data.

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

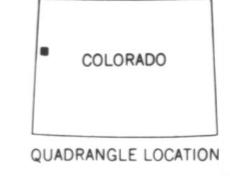
\* MN  
GN  
15°  
1° 28' 267 MILS  
26 MILS

SCALE 1:24,000  
1 1000 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 5 0 1 0 1 1 KILOMETER

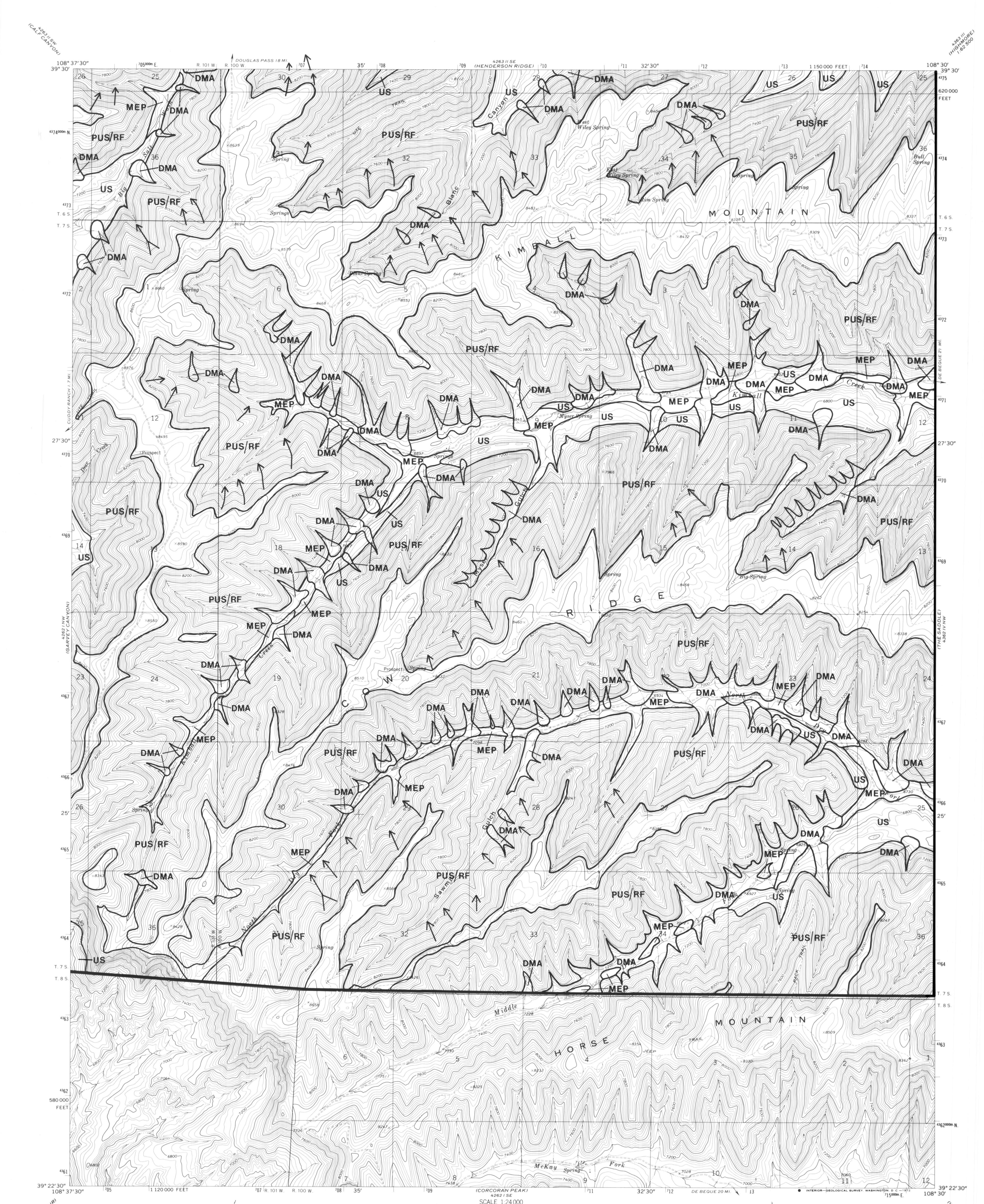
CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION  
Light-duty road, all weather. Unimproved road, fair or dry improved surface

State Route



GARVEY CANYON, COLO.



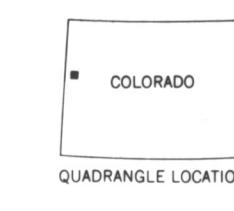
Topography by photogrammetric methods from aerial photographs taken 1967. Field checked 1968  
Polyconic projection. 1927 North American datum  
10,000-foot grid based on Colorado coordinate system,  
central zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 12, shown in blue

Certain land lines are omitted because of insufficient data

GN MN  
1° 33' 27 MILS  
15° 267 MILS  
UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

SCALE 1:24,000  
1 1000 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 5 0 1 1 KILOMETER



(WINTER FLAT)  
4362 NW  
4362 SE