GEOLOGY OF THE CANNONVILLE QUADRANGLE, KANE AND GARFIELD COUNTIES, UTAH

by

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Geologic Map of the Cannonville Quadrangle

Kane and Garfield Counties, Utah

by

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(Map and Text for Publication by Utah Geological and Mineral Survey)

INTRODUCTION

The Cannonville quadrangle is in Kane and Garfield Counties of south-central Utah. Cannonville is the principal community, although Tropic, on the northern boundary of the quadrangle, and Henrieville, 0.4 mi east of the quadrangle, contribute to the economic base of the area. The quadrangle is near the western edge of the Colorado Plateau physiographic province. This portion of the Colorado Plateau is in the Paria River drainage basin whose headwaters are north of the quadrangle in the Table Cliff Plateau and the Pink Cliffs of Bryce Canyon National Park. Altitude ranges from slightly less than 5,560 ft on the Paria River at the southern boundary to slightly more than 7,100 ft in the extreme northwest corner of the quadrangle.

Two field seasons were spent mapping the quadrangle. A preliminary study was undertaken in 1982 at a scale of 1:100,000. The quadrangle was mapped at 1:24,000 scale in 1985. In 1986, a week was spent collecting samples for radiocarbon dating and photographing the Paria River channel north of Cannonville. Many of the formation contacts were located with plane table and alidade using the cut-and-try method of locating geologic features on a topographic map (Sutton, 1968). This method is particularly useful for locating contacts on cliffs and other inaccessible areas such as the south face of Bulldog and Coal Benches.

STRUCTURAL GEOLOGY

Geologic structure of the quadrangle is typical of the Colorado Plateau in south-central Utah. Bedrock formations are subhorizontal, unfolded, mostly unfaulted, and dip north-northwest at about 2 degrees near the center of the quadrangle. A short segment of the Paunsagunt fault crosses the extreme northwest corner of the quadrangle. This north-northeast trending normal fault is the eastern boundary of the transition zone between the Colorado

Plateau and Basin and Range provinces. Quaternary deposits, which are widespread in the quadrangle, have not been faulted or folded, suggesting that the area has been relatively stable tectonically for perhaps the last 500,000 yr.

ECONOMIC GEOLOGY

Mineral potential of the Cannonville quadrangle is probably low. Coal and bentonite are present locally in the Dakota Formation (Upper Cretaceous); however the deposits are impure and lenticular (Robison, 1966; Doelling and Graham, 1972; Bowers, 1975; Doelling, 1975). Two exploratory wells were drilled for oil and gas, but the wells were not productive. Gravel deposits, however, provide material for highway and other construction projects. Table 1 gives the location of coal, clay, and sand and gravel pits in the quadrangle.

The principal economic activities are livestock ranching, farming, and tourism. The arable valley floors, underlain by upper Holocene alluvium, are the major economic resource in the quadrangle. The communities of Cannonville and Tropic were constructed on this upper Holocene valley fill. Floodplains developed since about A.D. 1940 in the Paria River Valley and its tributaries are now utilized for grazing and construction sites. This recent alluviation has added to the arable land in the quadrangle. Floodplains are favored sites for human activity because they are near water; however, potential problems with flooding, erosion, and continued sedimentation exist.

GEOLOGIC HAZARDS

Three potential geologic hazards exist in the quadrangle: earthquakes, debris flows, and floods. The Paunsagunt fault, present in the extreme northwest corner of the quadrangle, marks the eastern limit of the intermountain seismic belt, a zone of pronounced earthquake activity (Smith and Sbar, 1974). Epicenter locations in the intermountain seimic belt cluster along major structures such as the Paunsagunt fault. Thus, hazards related to seismic activity are possible, although historic evidence for earthquake related damage or injury is lacking in the quadrangle vicinity.

Debris flows and landslides are possible at the foot of steep hillslopes. Several of the younger landslide deposits (unit Qly) in the quadrangle appear fresh and were probably active recently. None of these, however, have moved far, and potential damage is largely avoidable through judicious selection of construction sites. Specifically, sites near the base of steep hillslopes should be avoided.

Floodplains of the Paria River, Henrieville Creek, Sheep Creek, and Yellow Creek are susceptible to flooding. Floodplains in these streams are particularly useful because they are near water. Construction of dwellings or permenant structures, however, should be avoided because of possible damage or injury from inundation, sedimentation, and erosion.

STRATIGRAPHY

Five formations of Jurassic to Cretaceous age comprise the bedrock units, which are sandstone, siltstone, and shale (fig. 1). Total thickness of the exposed formations is about 1,800 ft. Surficial deposits are widespread and range in thickness from a few feet to more than 120 ft. Nine Quaternary deposits are present in valleys, capping mesas or benches, and beneath cliffs and steep slopes. These deposits range in age from about middle Pleistocene to latest Holocene, that is about 500,000 to less than 50 years B.P. Most of the surficial deposits are fluvial in origin, but colluvial deposits are present locally.

JURASSIC SYSTEM

Carmel Formation (Jc)

The Carmel Formation (Middle Jurassic) is fine- to medium-grained sandstone and interbedded mudstone, siltstone, and gypsum in the upper part. Sandstone beds are poorly developed, massive, and range in thickness from 1-3 ft. Mudstone beds are dense and average about 1 ft in thickness. The formation is widely exposed in the south half of the quadrangle where it is greater than 350 ft thick and typically forms reddish-brown slopes. The base of the formation is not exposed in the quadrangle.

Entrada Sandstone (Je)

The Entrada Sandstone (Middle Jurassic) is fine- to coarse-grained, massive to cross-stratified sandstone. The basal one-third of the formation is fine grained, reddish brown, and forms a distinctive ledge above the underlying Carmel Formation. The upper two-thirds is medium to coarse grained and is very light gray with discontinuous reddish-brown coloration. The Entrada Sandstone is about 590 ft thick in the southeast part of the quadrangle (sec. 4, T. 38 S., R. 2 W.) where a complete section of the formation is exposed. It has a sharp to gradational contact with the underlying Carmel Formation. The sandstone forms spectacular cliffs at the south end of Bulldog and Coal Benches in the central part of the quadrangle.

CRETACEOUS SYSTEM

Dakota Formation (Kd)

The Dakota Formation (Upper Cretaceous) is a cliff-forming sandstone interbedded with slope-forming mudstone, carbonaceous mudstone, and thin discontinuous coal beds. The sandstone is typically light brown, coarse-grained, contains abundant quartz granules, and is cross-stratified in discontinuous sets. Carbonaceous mudstone is dark brown to black, and beds are lenticular. A pebble to small cobble conglomerate 1-5 ft thick is present at the base of the formation. The formation is 140-230 ft thick. Contact with the underlying Entrada Sandstone is an erosional unconformity with 50-100 ft of relief in the quadrangle.

Coal in the Dakota Formation is lenticular and impure (Bowers, 1975; Doelling and Graham, 1972) and not of commercial quality or quantity. Small-scale mining operations have exploited bentonite deposits from the base of the formation (Robison, 1966; Doelling, 1975). These mines and prospects are tabulated in Table 1.

Tropic Shale (Kt)

The Tropic Shale (Upper Cretaceous) is slope-forming, medium gray to olive-gray shale of marine origin. Marine fossils are present locally near the base of the formation. The shale interfingers with the underlying Dakota Formation. The shale is greater than 400 ft thick in the quadrangle, although its top is not present.

Straight Cliffs Formation (Ksc)

The Straight Cliffs Formation (Upper Cretaceous) is present only in the extreme northwest corner of the quadrangle on the downthrown side of the Paunsagunt fault. The formation is predominantly sandstone that is massive to cross-stratified and cliff forming. The top and base of the formation are not exposed in the quadrangle.

QUATERNARY SYSTEM

Pleistocene and Holocene Colluvial Deposits

Older landslide deposits (Qlo)

The older landslide deposits are probably entirely Pleistocene. They are rotated blocks of bedrock, typically from the Dakota Formation and Tropic Shale, that have moved downslope. These landslide deposits occur as erosional remnants as much as 100 ft above valley floors and are probably inactive.

Younger landslide deposits (Qly)

Younger landslide deposits are probably Holocene. These deposits are primarily slumps and debris flows at the foot of steep slopes. In Yellow Creek basin, the younger landslide deposits are spatially related to the Naha(?) Alluvium; thus, the debris flows are probably not much older than the Naha(?) or Tsegi(?) Alluviums. The slumps and debris flows north of Cannonville in sec. 12, T. 37 S., R. 3 W. appear fresh and may be active. Thus, slumping and debris flows are possible geologic hazards in this part of the quadrangle.

Pleistocene Alluvial Deposits

Three widespread alluvial deposits were mapped, the older alluvium (Qao), intermediate alluvium (Qai), and younger alluvium (Qay). These deposits are lithologically similar, being predominantly sandy gravel and coarse sand. The three units contain abundant pebbles to small boulders of quartzite derived from the Claron Formation (Tertiary) and Cretaceous sandstones present to the west, east, and north of the quadrangle. Thicknesses of these alluvial units are (1) older, 10-60 ft; (2) intermediate, 10-120 ft, and (3) younger, 20-60 ft. The principal difference among the three deposits is their elevation above the Paria River (Fig. 2). From youngest to oldest, the elevation of each deposit is progressively higher, indicating that the deposits are separated from each other in time by a period of downcutting and bedrock incision. The younger alluvium forms terraces and pediments 110-180 ft above the Paria River and Henrieville Creek. The intermediate alluvium forms terraces and pediments 140-240 ft above the river, and on Bulldog and Coal Benches, the older alluvium forms pediments 40-200 ft above the intermediate alluvium.

The older and intermediate alluviums are well exposed on Bulldog and Coal Benches. The surfaces of the deposits slope southwest and southeast into the Paria River valley. On the west side of the Paria River the surfaces of the deposits extend upslope to the foot of the Pink Cliffs in Bryce Canyon National Park outside the quadrangle. On the east side of the Paria River, the surfaces trace upslope to the base of the Table Cliff Plateau outside the quadrangle.

The older alluvium is inferred to post-date 500,000 yr, based on regional geologic mapping. The alluvium is younger than the upper part of the Sevier River Formation (Tertiary-Quaternary) which is present outside the quadrangle on the drainage divide between the Paria and Sevier River basins about 9 mi north-northwest of Cannonville. At this locality the Sevier River Formation is tuffaceous and extends 14 mi west-northwest to the mouth of Red Canyon where it is probably stratigraphically related to a basalt flow dated at 500,000 yr (P.D. Rowley, U.S. Geological Survey, written commun., 1980).

A fourth alluvial deposit (Qal) of possible Pleistocene age is present only locally near Cannonville where it is 20-40 ft above the Paria River. Its coarse grain size and height above the Paria River suggest that it is Pleistocene, although distribution of the unit is limited and little is known about its age.

Holocene Alluvium

Three units of upper Holocene alluvium are present in the quadrangle (Fig. 2). They are from oldest to youngest the Tsegi(?) Alluvium (Qt), Naha(?) Alluvium (Qn), and modern alluvium (Qm). These are predominantly valley-fill alluviums of unconsolidated, very poorly sorted coarse silt to fine sand and minor gravel at the base of the alluvium.

The Tsegi(?) Alluvium forms a terrace, locally present, 10-15 ft above the Naha(?) Alluvium; thickness of the Tsegi(?) ranges from 10-30 ft. The Tsegi(?) Alluvium is mappable only locally northeast of the junction of the Paria River with Henrieville Creek. The Tsegi(?) is also present beneath the Naha(?) Alluvium in tributaries of Yellow Creek, but the exposures are too small to show on the map. Radiocarbon dates (Table 2) indicate ongoing deposition of the alluvium at about A.D. 550.

The Naha(?) Alluvium is 5-20 ft thick and forms a terrace 5-20 ft above modern alluvium in the axis of stream valleys. Regional study of the Naha (?) indicates that it consists of two units recognized by location in the valley and lithologic criteria (Hereford, 1987). The units are the valley-axis and the valley-margin units. These units were not mapped separately in the quadrangle, although both are present. The valley-margin unit typically contains as much as 30 pecent clay and is up to 5 ft thick. In contrast, the valley-axis unit contains only about 10 percent clay and is up to 20 ft thick.

Living and dead juniper trees partially buried in the alluvium are common in the Naha(?) of southern Utah (Hereford, 1987). This type of burial occurs in the quadrangle as shown in figure 3. Radiocarbon dates (Table 2) indicate deposition after about A.D. 1200 and ending in the early 1880s during regional stream entrenchment (Gregory and Moore, 1931).

Tsegi and Naha are names applied by Hack (1941; 1942) to upper Holocene valley-fill in north-central Arizona. Scott and others (1984) redescribed the formations of Hack (1941; 1942) as the Tsegi and Naha Alluviums, respectively. Using geologic and archeologic data, Hack (1942) determined that deposition of the Tsegi was largely contemporaneous with Anasazi occupation of northern Arizona and ended before about A.D. 1100. Deposition of the Naha began after A.D. 1100 to 1300 and ended about A.D. 1880 during the episode of arroyo cutting, or stream entrenchment, that affected much of the Southwest. Channels in the Paria River basin were also deepened and widened beginning in the early 1880s (Gregory and Moore, 1931). Deposits of similar age, geologic history, and composition occur in most southern Colorado Plateau valleys (Christenson, 1985; Oviatt, 1985; Webb, 1985; Hereford 1986; 1987).

Samples for radiocarbon dating were obtained at four localities in the quadrangle from the Naha(?) and Tsegi(?) Alluviums (Table 2). The dates suggest that these deposits are approximate time equivalents of the typical Tsegi and Naha Alluviums of northern Arizona. Correlation of the units in the quadrangle, however, with the formations in northern Arizona is uncertain, and the formation names are queried because of this uncertain correlation.

Modern alluvium (Qm) forms the channel and floodplain deposits of the Paria River, Sheep, Yellow, and Henrieville Creeks. These deposits, which are 5-10 ft thick, are in the active channel and the adjacent, elevated floodplain. In transverse cross-section, the channel constitutes about 25 percent of combined channel and floodplain width. The floodplain is lightly to densely vegetated and is 2-6 ft above the active channel.

Modern alluvium was deposited after about A.D. 1940 in the quadrangle and in the Paria River drainage basin (Hereford, 1986). Deposition of this alluvium reduced substantially the width of stream channels throughout the basin. Figure 4 shows the channel of the Paria River about one mile north of Cannonville in 1932 and in 1986. In 1932 (Fig. 4a), the channel was wide and lacked a well-defined floodplain. The 1986 photograph (Fig. 4b) shows a substantially narrower channel and a vegetated floodplain. This floodplain is useable for livestock grazing, agriculture, and construction. Continued deposition and flooding, however, are likely; therefore the floodplain resource should be used with caution.

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Figure Captions

Figure 1. Stratigraphy of the Cannonville quadrangle.

Figure 2. Conceptualized cross-section of the Paria River valley near the center of the quadrangle showing the geomorphic and stratigraphic relations of Quaternary alluvial deposits. Vertical scale shows approximate height of deposits above the Paria River.

Figure 3. A) Exhumed juniper tree partially buried in Naha(?) Alluvium in an unnamed tributary of Yellow Creek. Subhorizontal line near third mark above base of scale (20 cm divisions) is the top of Tsegi(?) Alluvium and the germination position of the buried tree. At this locality, another juniper tree 10 ft stratigraphically below the top of the Tsegi(?) Alluvium was dated at A.D. 542 (Table 2, Lab No. W-5919). B) Two partially buried and exhumed juniper trees in the Naha(?) Alluvium on the south side of Henrieville Creek. The inner rings of the tree on the left were dated at A.D. 1208 (Table 2, Lab No. W-5923). Scale divisions are 20 cm.

Figure 4. A) The Paria River channel in 1932 about 1 mile north of Cannonville. View is to the northeast and covers most of the SW 1/4 sec. 18 T. 37 S., R. 2 W. Photograph is by R.W. Bailey and is in the U.S. Forest Service Collection, Utah State Historical Society, Salt Lake City. B) Photograph taken in 1986 from essentially the same locality as (A). Channel has shifted east and an elevated floodplain has developed in the former channel. These are the modern alluvial deposits (Qm) mapped in the quadrangle.

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Table 1. Coal, clay, and sand and gravel deposits in the Cannonville quadrangle.

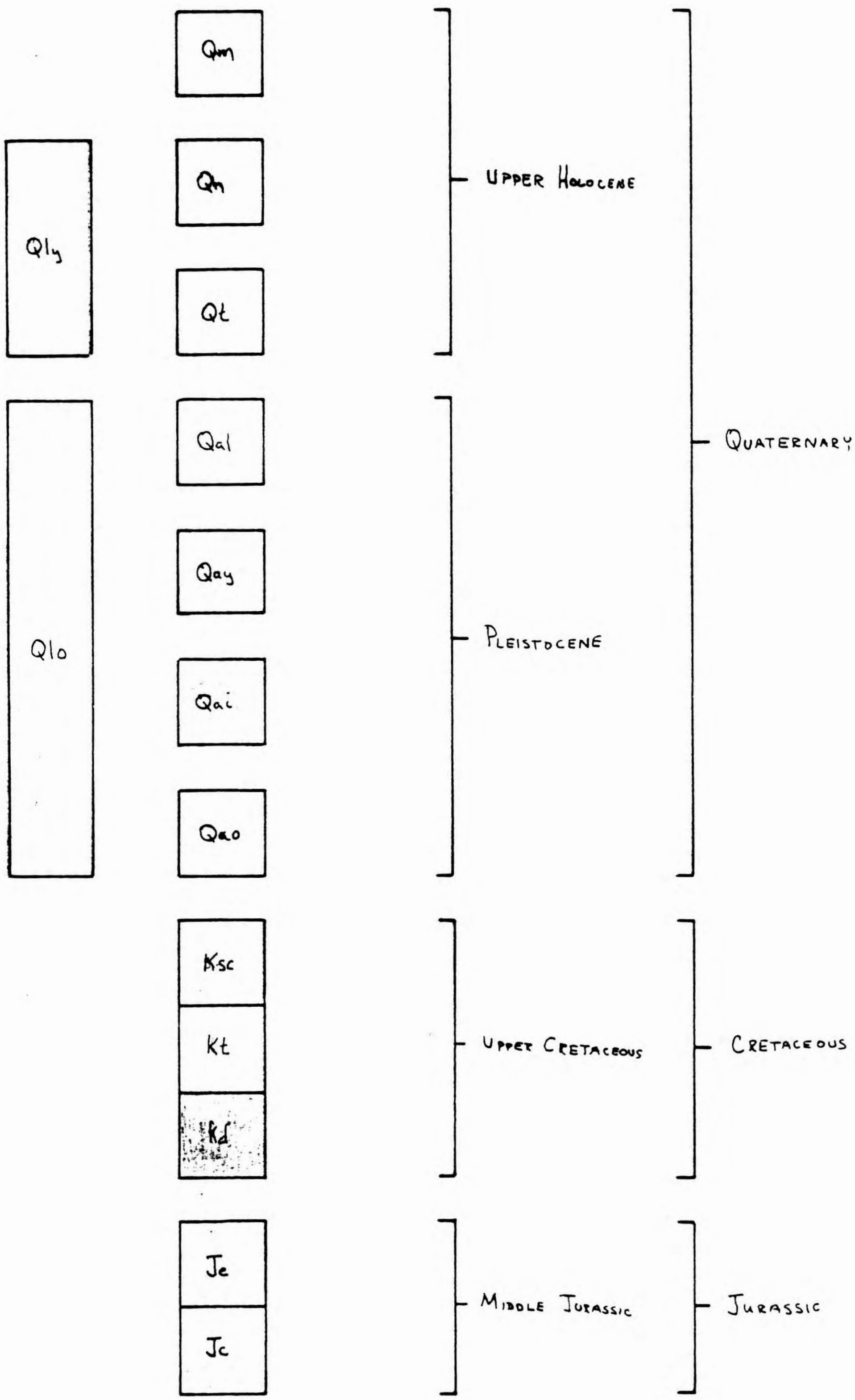
Deposit Name	Location	Commodity
Death Hollow	NE, SE, sec. 16, T. 37 S., R. 3 W.	Coal
American Mud and Chemical	NE, SW, sec. 13, T. 37 S., R. 3 W.	Clay, coal
Coal Bench	SE, SW, sec. 7, T. 37 S., R. 2 W.	Coal
South Coal Bench	SW, SE, sec. 18, T. 37 S., R. 2 W.	Coal
Utah Dept. Highways pit #09031	NW, NW, sec. 19, T. 37 S., R. 2 W.	Sand and gravel
Utah Dept. Highways pit #09030	NE, SW, sec. 19, T. 37 S., R. 2 W.	Sand and gravel
Utah Dept. Highways pit #09029	SW, SE, sec. 12, T. 37 S., R. 3 W.	Sand and gravel
Utah Dept. Highways pit #09028	NW, SE, sec. 2, T. 37 S., R. 2 W.	Sand and gravel
Wildcat pit	SW, NW, sec. 29, T. 37 S., R. 2 W.	Sand and gravel, clay
Paria pit	SW, SE, sec. 30, T. 37 S., R. 2 W.	Sand and gravel, clay
Bulldog pit	NE, NE, sec. 9, T. 37 S., R. 3 W.	Sand and gravel, clay

Table 2. Radiocarbon dates from upper Holocene alluvium in the Cannonville quadrangle. (Radiocarbon dates were determined by Meyer Rubin, U.S. Geological Survey Radiocarbon Laboratory, Reston, Virginia.)

Locality	Lab No.	Latitude Longitude	Material	Date (A.D.)[1] (B.P.)
Paria River	W-5921	37° 32′ 08" N 112° 02′ 25" W	Pith of buried juniper tree	1552 ± 112[2] 350 ± 100
Henrieville Creek	W-5923	37° 32′ 46" N 112° 01′ 12" W	Pith of buried juniper tree	1208 ± 108[2] 800 ± 120
North side of Henrieville Creek	W-5927	37° 33′ 02" N 112° 01′ 45" W	Charcoal in hearth	565 ± 168[3] 1480 ± 170
Yellow Creek tributary	W-5919	37° 33′ 22" N 112° 04′ 48" W	Pith of buried tree	542 ± 119[4] 1510 ± 120

1. Radiocarbon years calibrated to calendar years by U.S. Geological Survey Radiocarbon Laboratory. Error limits in years
2. Alluvium overlying buried tree is Naha(?) Alluvium
3. Hearth about 2 ft below surface of Tsegi(?) Alluvium
4. Tsegi(?) Alluvium overlain by Naha(?) Alluvium. Outcrop of Tsegi(?) is too small to show on map at this locality

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qm **Modern alluvium (upper Holocene)**--Unconsolidated deposits of sand, silt, and minor gravel. Underlies floodplains and includes channel deposits

Qn **Naha(?) Alluvium (upper Holocene)**--Unconsolidated deposits of sand, silt, and minor gravel

Qt **Tsegi(?) Alluvium (upper Holocene)**--Unconsolidated deposits of sand, silt, and minor gravel

Qly **Younger landslide deposits (Holocene)**--Slump and earthflow deposits at the foot of steep slopes

Qal **Alluvium (Pleistocene)**--Isolated, weakly consolidated deposits of sandy gravel

Qay **Younger alluvium (Pleistocene)**--Weakly consolidated deposits of sandy gravel and sand

Qai **Intermediate alluvium (Pleistocene)**--Weakly to moderately consolidated deposits of sandy gravel and sand

Qao **Older alluvium (Pleistocene)**--Weakly to moderately consolidated deposits of sandy gravel and coarse sand

Qlo **Older landslide deposits (Pleistocene)**--Slumped and rotated blocks of bedrock 0-100 ft above present valley fill

Ksc **Straight Cliffs Formation (Upper Cretaceous)**--Sandstone, light-gray, massive to cross-stratified, cliff-forming

Kt **Tropic Shale (Upper Cretaceous)**--Shale, medium-gray to olive-gray; forms slopes

Kd **Dakota Formation (Upper Cretaceous)**--Sandstone, mudstone, carbonaceous mudstone, and thin discontinuous coal

Je **Entrada Sandstone (Middle Jurassic)**--Sandstone, fine- to coarse-grained, massive to cross-stratified

Jc **Carmel Formation (Middle Jurassic)**--Sandstone and interbedded mudstone and siltstone; reddish brown

Contact

Fault, bar and ball on downthrown side

Oil and gas test well

CANNONVILLE

SYSTEM	SERIES	FORMATION	SYMBOL	THICKNESS IN FEET	LITHOLOGY
QUATERNARY	HOLOCENE	Modern alluvium	Qm	5-10	
		Naha (?) Alluvium	Qn	5-20	
		Tsegi (?) Alluvium	Qt	10-30	
		Younger landslide deposits	Qly	10-40	
	PLEISTOCENE	Quaternary alluvium	Qal	10-20	
		Younger alluvium	Qay	20-60	
		Intermediate alluvium	Qai	10-120	
		Older alluvium	Qao	10-60	
		Older landslide deposits	Qlo	10-100	Unconformity
CRETACEOUS	UPPER	Straight Cliffs Formation	Ksc	200+	Fault Contact
		Tropic Shale	Kt	400+	
		Dakota Formation	Kd	140-230	Unconformity
JURASSIC	MIDDLE	Entrada Sandstone	Je	540-630	
		Carmel Formation	Jc	350+	

Figure 1

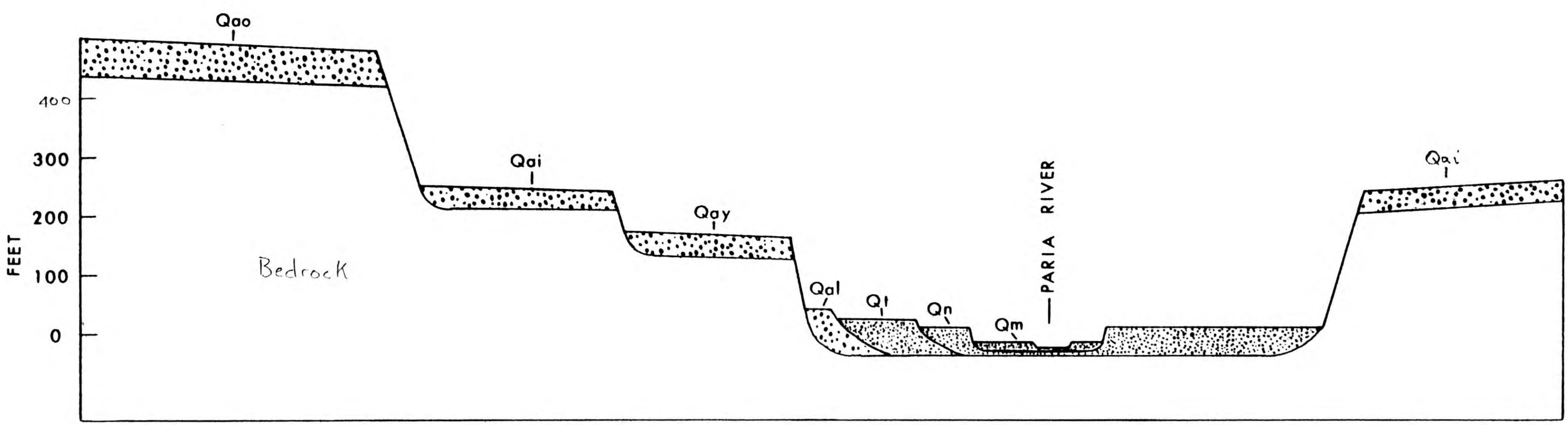

Qao
400
300
200
100
0
FEET
Bedrock
Qai
Qay
Qal
Qt
Qn
Qm
PARIA RIVER
Qai

Figure 2

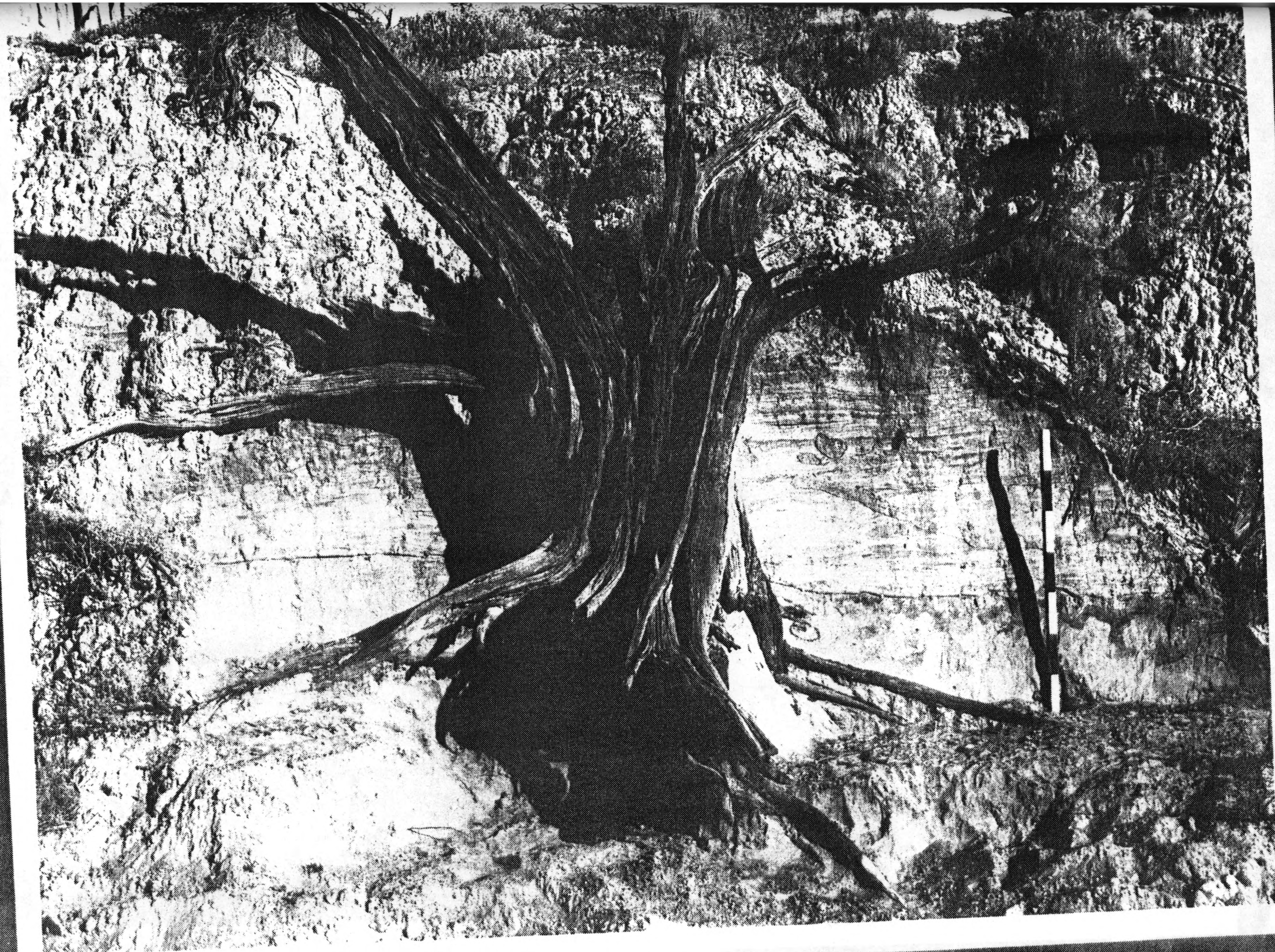


figure 3A

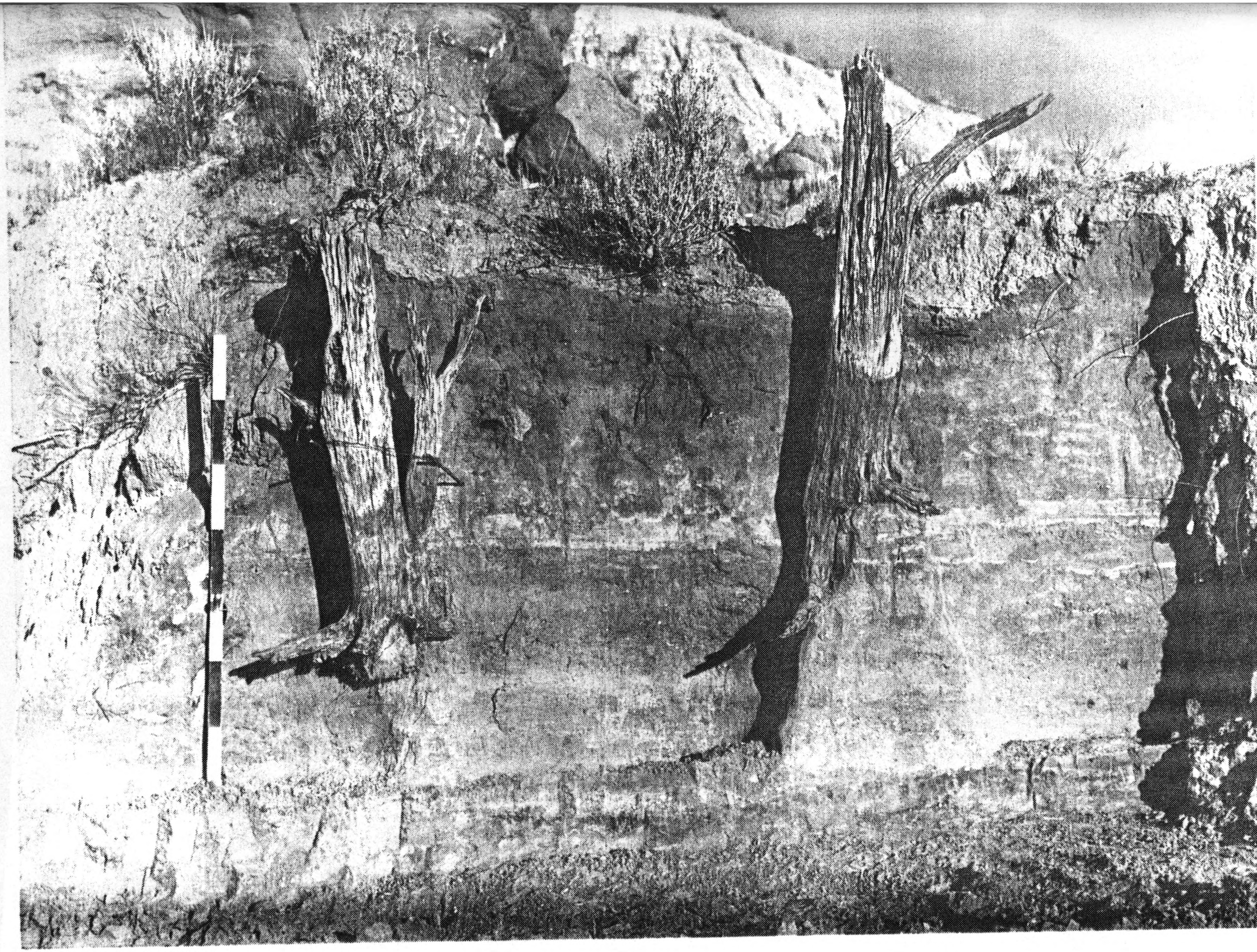


Figure 3B

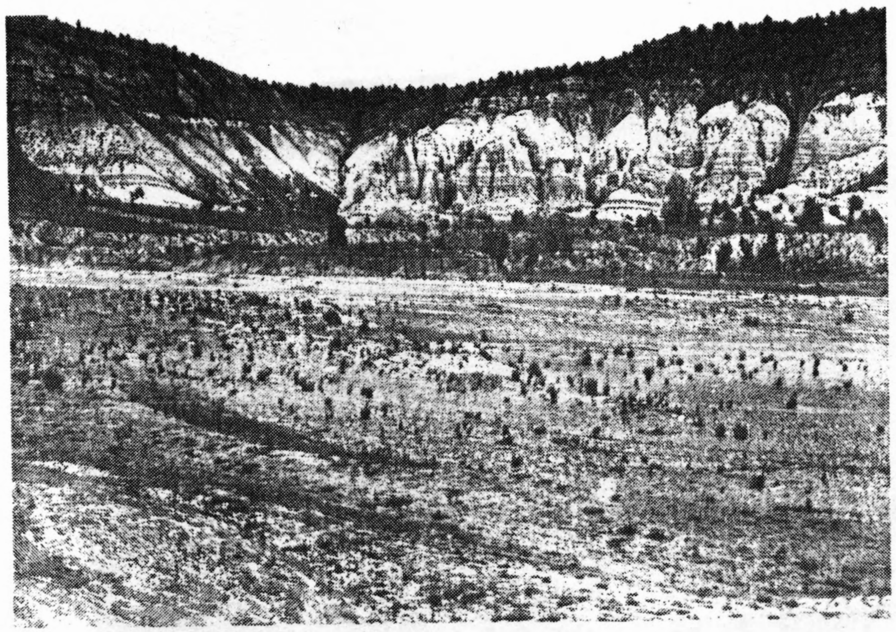


figure 4A

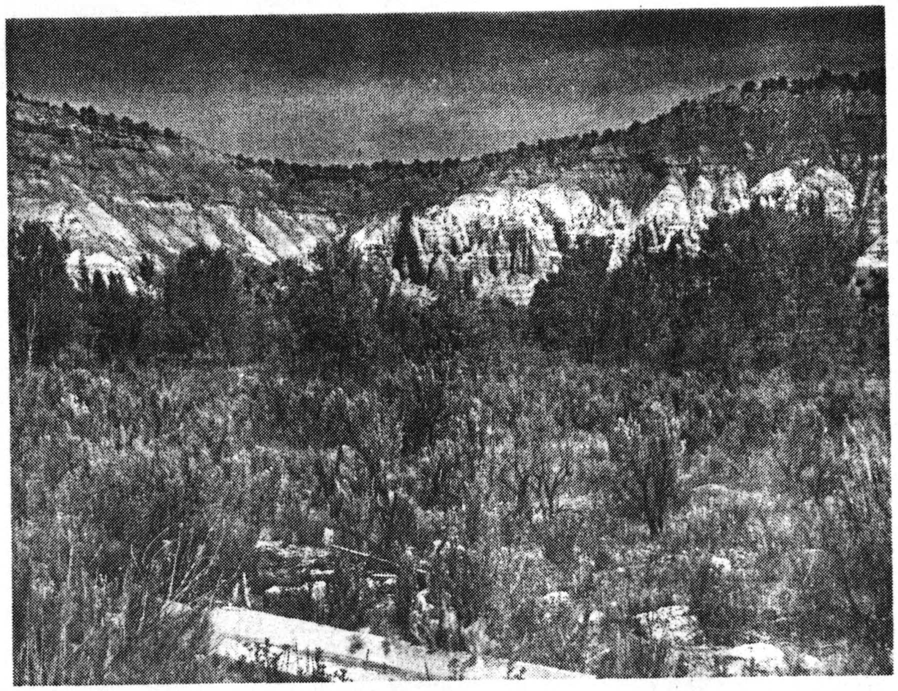


Figure 4B

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geology Mapped in

Med

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1966

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

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

GN MN
0°39' 11 MILS
15½° 276 MILS
UTM GRID AND 1966 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTAH
QUADRANGLE LOCATION

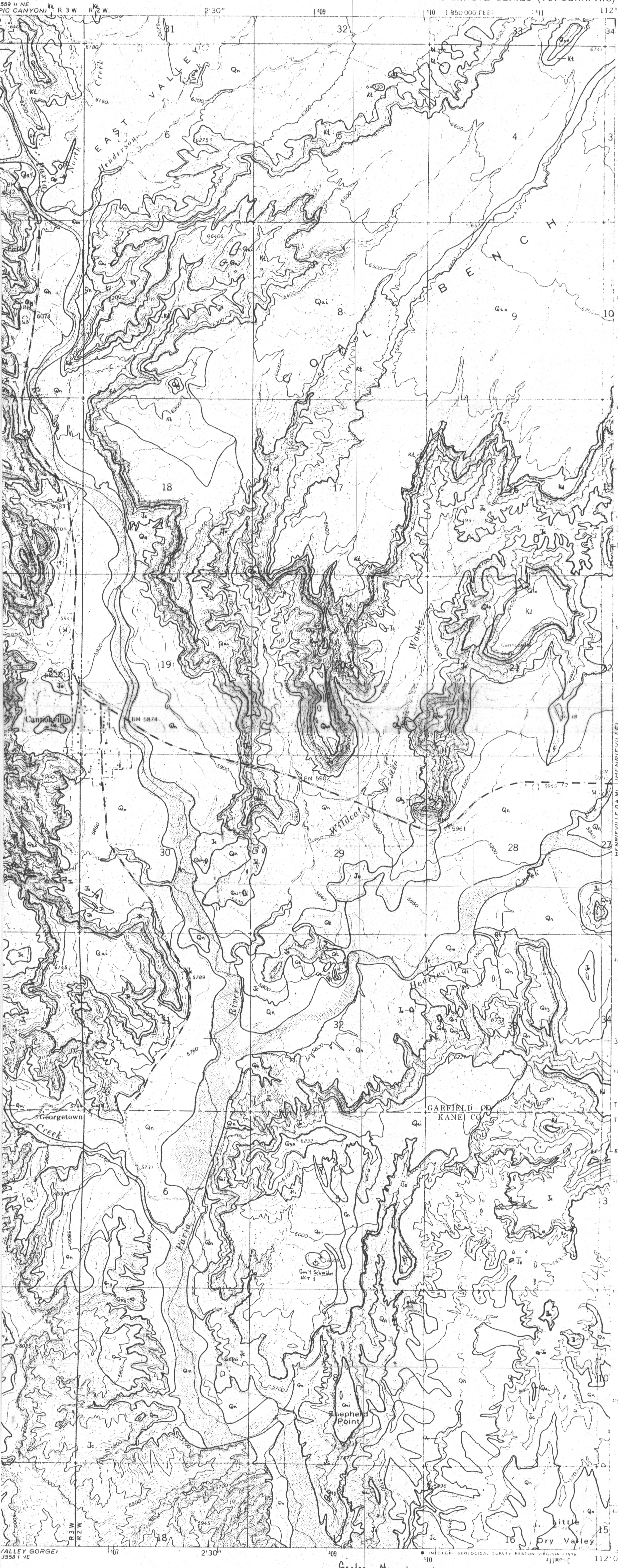
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

GEOLOGIC MAP OF THE CANNONVILLE QUADRANGLE, KANE AND GARFIELD COUNTIES, UTA

By

RICHARD HEREFORD

CANNONVILLE QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)



Geology Mapped in 1982, 1985

1:24 000

0 — 1 MILE

3000 4000 5000 6000 7000 FEET

0 — 1 KILOMETER

...TERVAL 20 FEET
...VERTICAL DATUM OF 1929

UTAH
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Medium-duty — Light-duty

Unimproved dirt

State Route

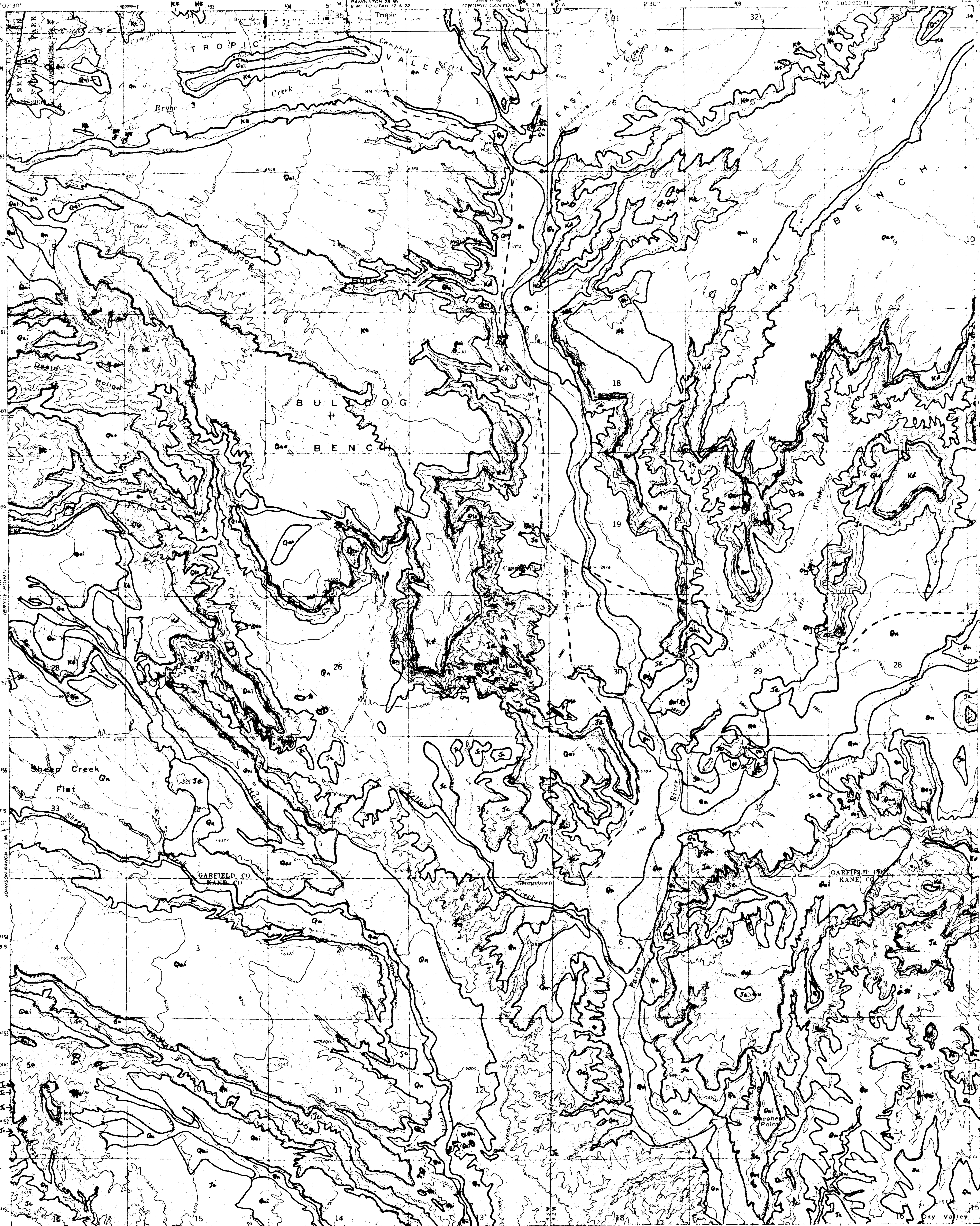
...TIONAL MAP ACCURACY STANDARDS
...VER, COLORADO 80225, OR RESTON, VIRGINIA 22092
...PS AND SYMBOLS IS AVAILABLE ON REQUEST

CANNONVILLE, UTAH
N3730—W11200/7.5
1966
AMS 3559 II SE—SERIES V897

...ANGLE, KANE AND GARFIELD COUNTIES, UTAH
by
... HEREFORD

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANNONVILLE QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1966

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

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1966 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ROAD CLASSIFICATION
Medium-duty — Light-duty
Unimproved dirt
State Route

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

CANNONVILLE, UTAH
N3730—W11200/7.5
1966
AMS 3559 II SE—SERIES V897

INTERIM GEOLOGIC MAP OF THE CANNONVILLE QUADRANGLE, KANE AND GARFIELD COUNTIES, UTAH

by Richard Hereford

Utah Geological Survey Open-File Report 142 1988

See accompanying text for map explanation