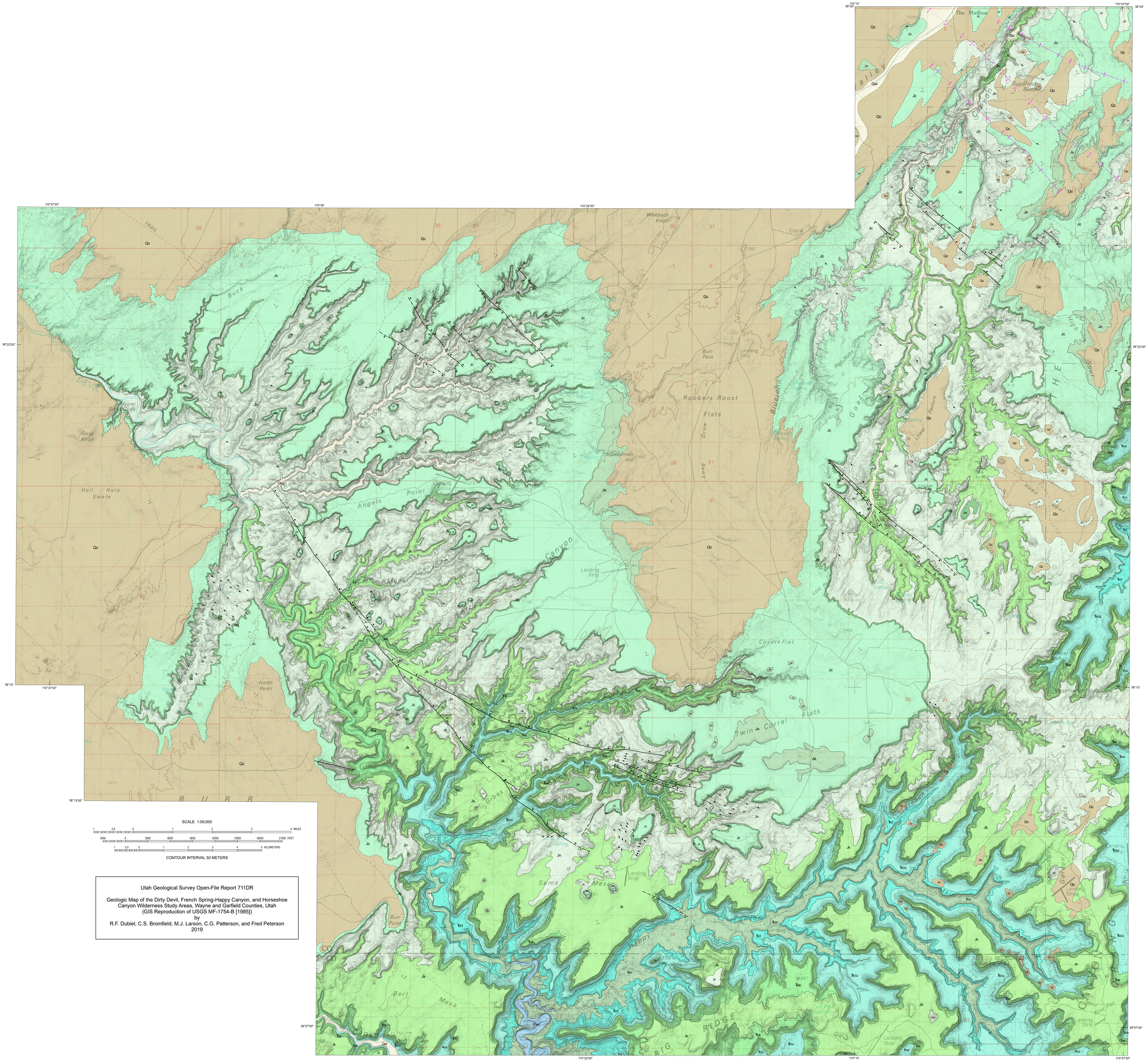


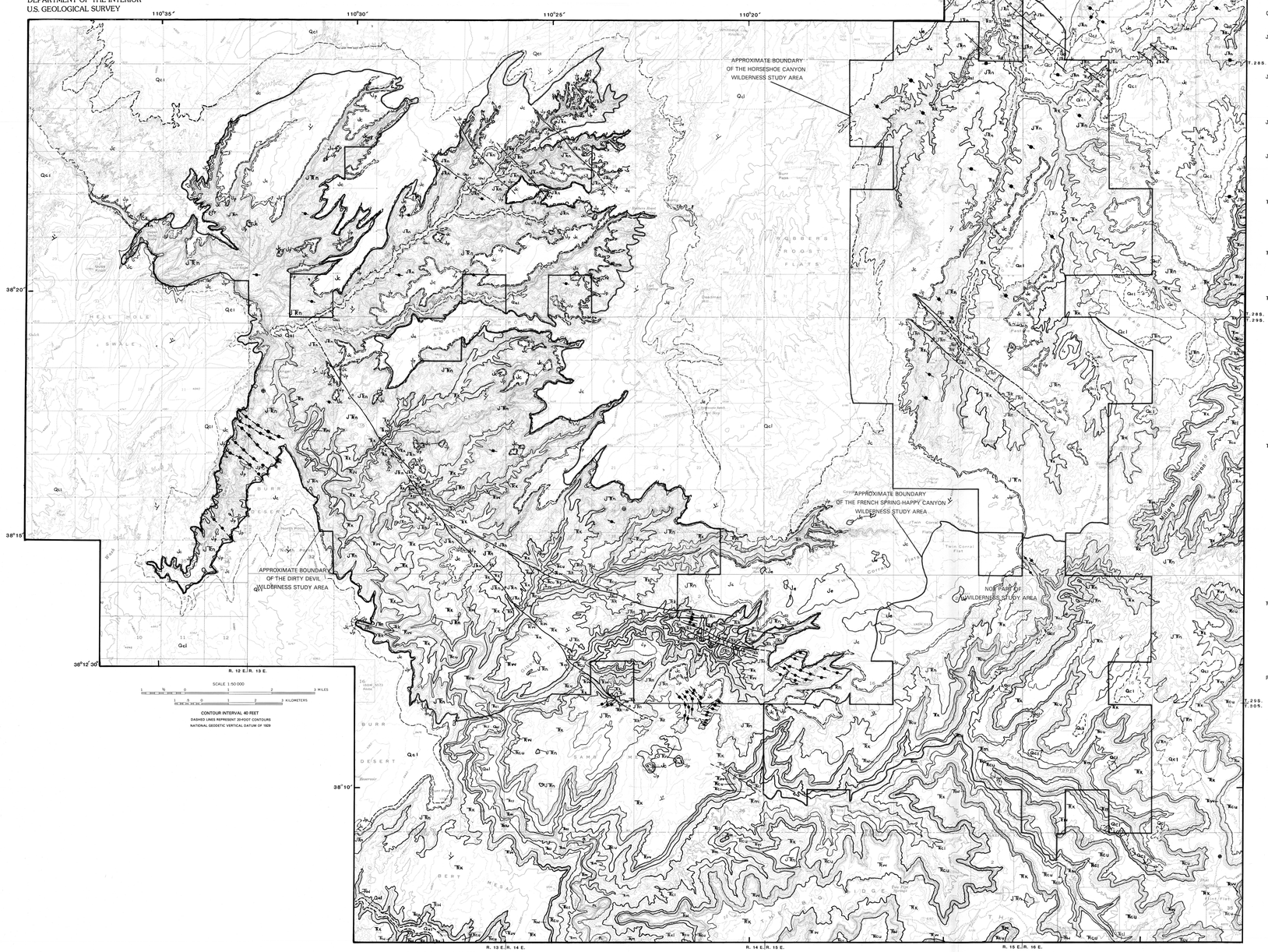
Utah Geological Survey Open-File Report 711DR

Geologic Map of the Dirty Devil, French Spring-Happy Canyon, and Horseshoe Canyon Wilderness Study Areas, Wayne and Garfield Counties, Utah
(GIS Reproduction of USGS MF-1754-B [1985])
by
R.F. Dubiel, C.S. Bromfield, M.J. Larson, C.G. Patterson, and Fred Peterson
2019

PREPARED IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

MISCELLANEOUS FIELD STUDIES
MAP MF-1754-B

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



Base from U.S. Geological Survey, 1:62,500
Bull Mountain, 1952; Fiddler Butte, 1953; Hanksville, 1963;
Orange Cliffs, 1953; Robbers Roost Canyon, 1963; The Spur,
1953

GEOLOGIC MAP OF THE DIRTY DEVIL, FRENCH SPRING-HAPPY CANYON, AND HORSESHOE CANYON WILDERNESS STUDY AREAS, WAYNE AND GARFIELD COUNTIES, UTAH

By
R. F. Dubiel, C. S. Bromfield, M. J. Larson, C. G. Patterson, and Fred Peterson
1985

CORRELATION OF MAP UNITS

Qal, Qcl	Holocene	QUATERNARY
Unconformity		
Je	Middle Jurassic	JURASSIC
Jc		
Jp		
Unconformity		
JTRn		JURASSIC AND TRIASSIC(?)
TRk	Upper Triassic(?)	TRIASSIC(?)
TRw		
Unconformity		
TRcu	Upper Triassic	TRIASSIC
TRcl		
Unconformity		
TRm	Middle(?) and Lower Triassic	
Unconformity		
Pc	Lower Permian	PERMIAN

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Poorly sorted gravel, sand, silt, and clay deposited in stream courses

Qcl COLLUVIUM (HOLOCENE)--Boulders, gravel, sand, and mud in landslide deposits and in toreva blocks; also eolian sand and silt; thickness 0-100 ft or more

Je ENTRADA SANDSTONE (MIDDLE JURASSIC)--Reddish-orange to reddish-brown, very fine grained to fine-grained sandstone and silty sandstone; very thin to thick bedded; generally forms slopes; largely eolian and sabkha deposits; approximate thickness 300-700 ft

Jc CARMEL FORMATION (MIDDLE JURASSIC)--Yellowish-orange to moderate-reddish-brown, very fine grained to fine-grained sandstone and dark-reddish-brown mudstone; locally contains gray to greenish-gray limestone and coarsely crystalline, white gypsum; marine tidal flat and sabkha deposits; approximate thickness 100-625 ft

Jp PAGE SANDSTONE (MIDDLE JURASSIC)--Reddish-orange to moderate-reddish-brown, very fine grained to fine-grained, well-sorted sandstone; contains large-scale planar and trough crossbedding; eolian deposits; approximate thickness 15-70 ft

JTRn NAVAJO SANDSTONE (JURASSIC AND TRIASSIC)--Light-gray to light-orange, fine- to medium-grained, well-sorted sandstone; thickly crossbedded; locally contains minor lenses of mudstone and cherty limestone or dolomite; forms cliffs; eolian and minor playa deposits; approximate thickness 500-820 ft

TRk KAYENTA FORMATION (UPPER TRIASSIC)--Reddish-orange to reddish-brown, fine- to medium-grained, crossbedded sandstone and laminated sandy siltstone; interbedded with minor limestone and mudstone; forms ledges and steep slopes; largely fluvial deposits; locally includes lacustrine, sabkha, and eolian deposits; approximate thickness 240-330 ft

TRw WINGATE SANDSTONE (UPPER TRIASSIC)--Reddish-pink to reddish-orange, very fine grained to fine-grained, crossbedded sandstone; forms cliffs; eolian deposits; approximate thickness 280-380 ft

TRcu CHINLE FORMATION (UPPER TRIASSIC)--Divided into two parts, each containing several members:

Upper part, undivided--Comprises Church Rock, Owl Rock, and Petrified Forest Members:

Church Rock Member consists of reddish-brown to reddish-orange siltstone; irregularly ripple laminated to thick bedded; interbedded with cross-stratified, fine- to coarse-grained sandstone. Locally contains thin- to thick-bedded conglomerate and arkosic sandstone. Fluvial and lacustrine deposits. Approximate thickness 80-200 ft.

Owl Rock Member consists of pale-red to pale-reddish-brown siltstone and mudstone; thin to medium bedded; interbedded with pale-red to light-greenish-gray, thin- to medium-bedded, cherty limestone; locally contains limestone breccia. Lacustrine deposits. Approximate thickness 120-200 ft.

Petrified Forest Member consists of variegated bentonitic claystone; thin to thick bedded; interbedded with minor amounts of clayey siltstone and fine- to medium-grained clayey sandstone. Fluvial and lacustrine deposits. Approximate thickness 50-200 ft

TRcl Lower part, undivided--Comprises Moss Back, Monitor Butte, and Shinarump Members:

Moss Back Member consists of yellowish-gray to pale-orange, thin- to thick-bedded, structureless to cross-stratified, fine- to medium-grained sandstone; locally contains lenses of pale-green claystone and siltstone and lenses of chert- and limestone-pebble conglomerate. Fluvial deposits. Thickness ranges from 0 to 165 ft; averages about 65 ft

Monitor Butte Member consists of variegated to predominantly greenish-gray, micaceous, bentonitic mudstone; also contains fine-grained, grayish-green sandstone; locally contains limestone-pebble conglomerate. Fluvial, deltaic, and lacustrine deposits. Thickness ranges from 0 to 255 ft

Shinarump Member consists of gray to yellowish-gray, medium- to thick-bedded, cross-stratified, fine-grained to conglomeratic sandstone; contains minor gray to red mudstone; locally contains uranium and copper. Fluvial deposits. Thickness ranges from 0 to 50 ft; averages about 30 ft

TRm MOENKOPI FORMATION (MIDDLE? AND LOWER TRIASSIC)--Pale-red to reddish-brown, thin- to thick-bedded, very fine grained to fine-grained, crossbedded sandstone; also contains pale- to medium-brown, thin-bedded silty mudstone and limestone; locally contains pale- to medium-brown, coarse-grained, lenticular conglomerate at base. Marine, tidal flat, and lagoonal deposits. Approximate thickness 300-600 ft

Pc CUTLER FORMATION (LOWER PERMIAN)--Only the White Rim Sandstone Member is exposed in map area

White Rim Sandstone Member--Light-gray to white, very fine grained to fine-grained sandstone; laminated to very thin bedded, crossbedded. Forms cliffs. Thins eastward and pinches out depositionally near Colorado River. Marginal marine and eolian deposits. Approximate thickness 35-230 ft

CONTACT--Dashed where approximately located

NORMAL FAULT--Showing dip and displacement where known; U, upthrown side; D, downthrown side; dashed where approximately located; dotted where concealed

ANTICLINE--Showing approximate location of crestline

SYNCLINE--Showing approximate location of trough line

STRIKE AND DIP OF BEDS

Horizontal

Inclined

STRIKE AND DIP OF VERTICAL JOINT

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This map presents the results of a geologic survey of the Dirty Devil (UT-050-236A), French Spring-Happy Canyon (UT-050-236B), and Horseshoe Canyon (UT-050-237) Wilderness Study Areas, Wayne and Garfield Counties, Utah.

INTRODUCTION

The Dirty Devil, French Spring-Happy Canyon and Horseshoe Canyon Wilderness Study Areas, hereafter called "the study areas," together contain 124,800 acres of scenic canyons and plateaus in Wayne and Garfield Counties, Utah. The study areas are centered approximately 45 mi south of Green River, Utah, and about 20 mi east of Hanksville, Utah. Access to these remote areas is limited to dirt roads originating at Green River, Utah, and to Utah State Highway 24 about 20 mi north of Hanksville, Utah.

The Dirty Devil Wilderness Study Area covers nearly 61,000 acres; it encompasses a portion of the Dirty Devil River and includes prominent side canyons, such as Robbers Roost, that depict the rugged beauty of this area. The French Spring-Happy Canyon Wilderness Study Area lies just east of the southern part of the Dirty Devil Wilderness Study Area and contains 25,000 acres. French Spring Canyon and Happy Canyon are two large tributaries that flow to the Dirty Devil River.

The Horseshoe Canyon Wilderness Study Area occupies 38,800 acres and extends from the southern boundary of the Horseshoe Canyon Detached Unit of Canyonlands National Park southward to the northern boundary of the French Spring-Happy Canyon Wilderness Study Area. The Horseshoe Canyon Wilderness Study Area is bordered on the east by the Glen Canyon National Recreation Area; this study area encloses the headwaters of Horseshoe Canyon, which drains north to the Green River. Included in the Horseshoe Canyon Wilderness Study Area is a detached portion that lies north of the Horseshoe Canyon Detached Unit of Canyonlands National Park and south of the Emery County line.

GEOLOGIC SETTING

The study areas are centrally located in the Colorado Plateau. The largest structural features characteristic of the region are monoclines, which trend generally northwest to southeast (Baker, 1935). The Monument upwarp and San Rafael swell are two such features. The southern parts of the study areas are on the gently dipping northwest flank of the Monument upwarp; to the northwest they are bordered by the steeply dipping east flank of the San Rafael swell. Superposed on the monoclines are smaller scale anticlines and synclines. This period of structural deformation occurred between the Late Cretaceous and early Tertiary (Baker, 1946).

Normal faults having minor displacement are common and transect the study areas in a northwest direction. Two major joint sets trend northwest and northeast throughout the region and are distinguishable in some formations. Hunt and others (1953) attribute the presence of joints to subsurface structures.

STRATIGRAPHY AND SEDIMENTARY HISTORY

Rocks exposed in the study areas are sedimentary and are of Early Permian (Wolfcampian) to Middle Jurassic (Callovian) age. The sedimentary strata have a combined total thickness of 2,600 ft and represent deposition in marine and continental environments.

The White Rim Sandstone Member of the Cutler Formation (Early Permian) represents the oldest rocks within the study areas. The White Rim Sandstone Member was deposited in a shallow-water marine environment during a major marine transgression into the region (Baars and Seager, 1970). Regionally, the White Rim thins east of the study areas onto the Monument upwarp; this thinning indicates growth of this uplift during the Early Permian (Baars, 1979). The Moenkopi Formation of Early Triassic age unconformably overlies the White Rim and was deposited during several transgressive and regressive marine cycles (Stewart and others, 1972). The upper part of the Moenkopi Formation was deposited during a regressive phase in Middle(?) Triassic time, and deposition was followed by a period of erosion, which produced a disconformable contact between the Moenkopi Formation and the overlying Chinle Formation of Late Triassic age. The irregularly eroded surface at the top of the Moenkopi Formation was filled in by valley- and channel-fill sandstone and conglomerate of the lower part of the Chinle Formation. Dubiel (1983) suggested that the lower part of the Chinle Formation was deposited in fluvial, deltaic, and lacustrine environments. Blakey and Gubitosa (1983) inferred that renewed uplift of salt structures northeast of the study areas exerted structural and sedimentary control over deposition of the upper part of the Chinle Formation; they also inferred fluvial and lacustrine environments for its deposition.

Throughout the study areas the Chinle Formation is unconformably overlain by the Wingate Sandstone of Late Triassic age. Poole and Williams (1972) and Stokes (1980) demonstrated that the Wingate Sandstone was deposited in an eolian environment by winds from the north and northwest. Eolian sedimentation, which persisted from Late Triassic(?) into Jurassic time throughout the region, deposited the Wingate and Navajo Sandstones of the Glen Canyon Group. A fluvial interval interrupted this eolian cycle when the Kayenta Formation was deposited. A brief period of erosion followed deposition of the Glen Canyon Group; the Middle Jurassic Page Sandstone and Carmel Formation were deposited upon the resulting widespread unconformity (Peterson and Pipiringos, 1979). The Page Sandstone was deposited in an eolian environment, whereas the Carmel Formation was deposited in marine, tidal flat, and sabkha environments marginal to the Middle Jurassic seaway that advanced into the region from the west and northwest (Blakey and others, 1983). Following regression of the Middle Jurassic seaway, widespread eolian and minor sabkha environments developed, which resulted in deposition of the Middle Jurassic Entrada Sandstone.

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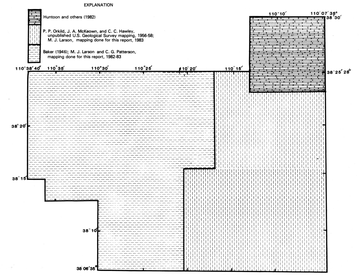

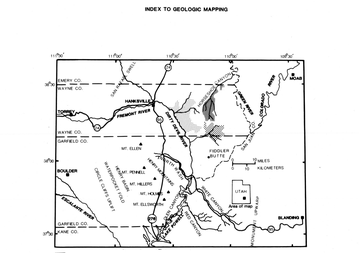

INDEX MAP SHOWING LOCATION OF THE DIRTY DEVIL, FRENCH SPRING-HAPPY CANYON, AND HORSESHOE CANYON WILDERNESS STUDY AREAS

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