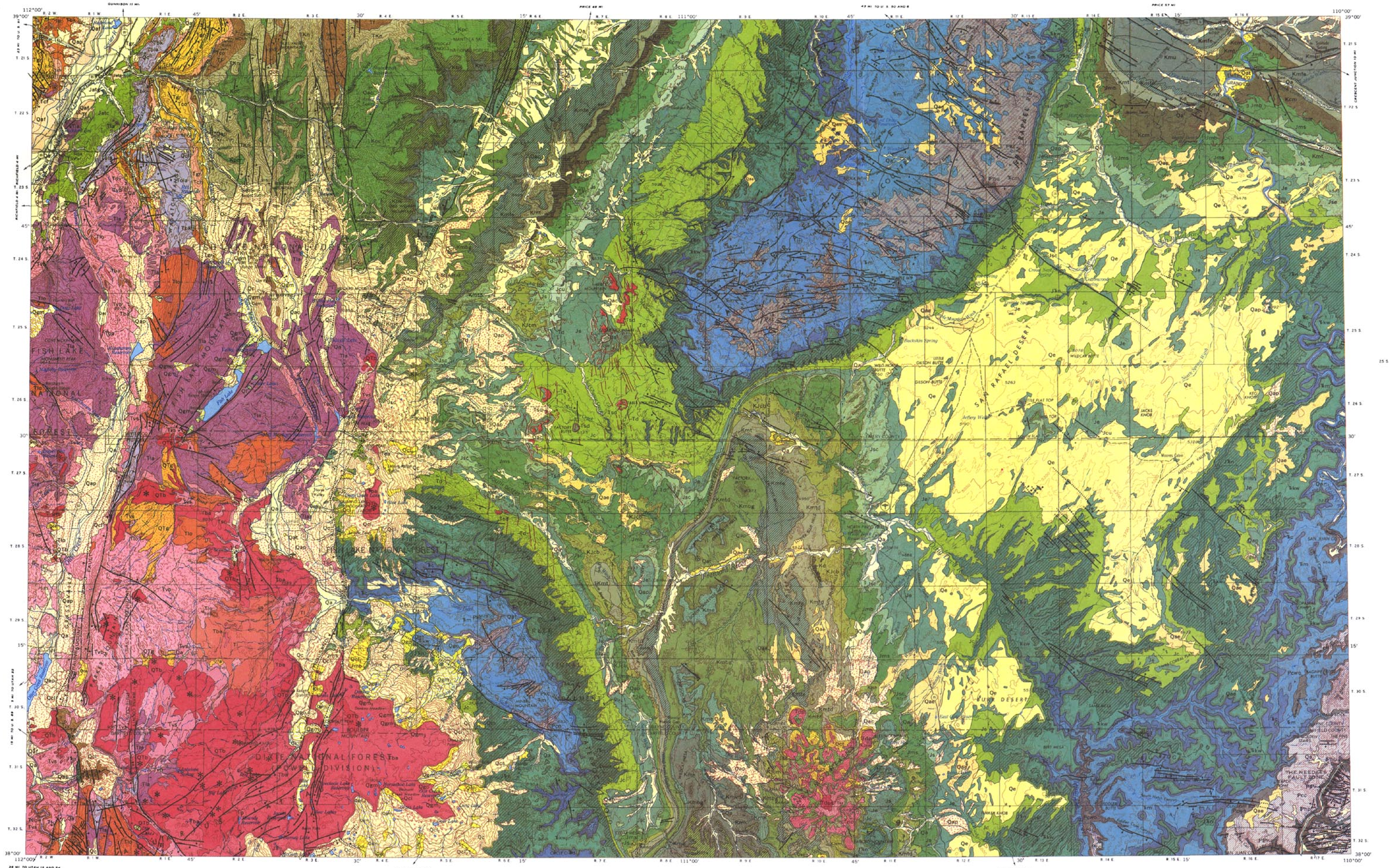
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I–591–A



Base by U.S. Geological Survey, 1958–61

Geology compiled in 1963–67

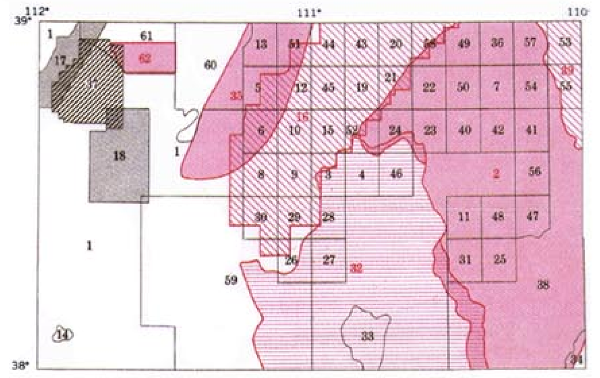
SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL

1970 MAGNETIC DECLINATION FOR THIS SHEET VARIES FROM 15°30' EASTERLY FOR THE CENTER OF THE WEST EDGE TO 15°00' EASTERLY FOR THE CENTER OF THE EAST EDGE



INDEX SHOWING SOURCES OF GEOLOGIC DATA

Older geologic maps, most of which are on planimetric bases, are indicated in red. Geology from these maps modified and adjusted to modern topographic bases by the authors where more recent geologic maps on modern topographic bases are not available.

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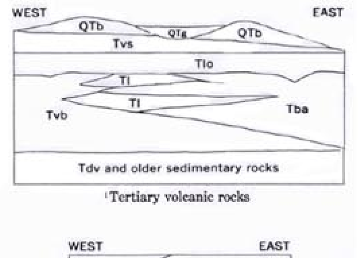
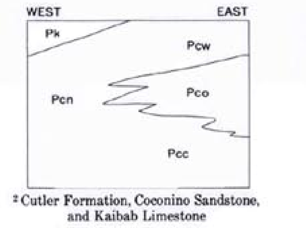
INDEX MAP SHOWING AREA OF SALINA QUADRANGLE AND OTHER PUBLISHED QUADRANGLES



[1]Tertiary volcanic rocks



[2]Cutler Formation, Coconino Sandstone, and Kaibab Limestone

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GEOLOGY OF THE SALINA QUADRANGLE, UTAH

Compiled by
Paul L. Williams and Robert J. Hackman

1971

EXPLANATION

QUATERNARY

Holocene

Qa | Qaf | Qe | Qae | Qac

Alluvium and eolian deposits

Qa, *alluvial deposits; chiefly gravel, sand, and silt of Holocene age on flood plains of streams*
Qaf, *alluvial fan gravels; mostly poorly sorted deposits of sand and gravel where side streams emerge onto flat valley floors*
Qe, *eolian deposits; includes loess and well-sorted sand in barchan dunes of the San Rafael Desert*
Qae, *alluvium and eolian deposits undifferentiated; mostly windblown silt and sand on mesa tops, benches, and in broad valleys; reworked in part by running water*
Qac, *alluvium and colluvial deposits undifferentiated*

Pleistocene

Qap | Qat

Gravels

Qap, *pediment gravels; generally thin blanket deposits of coarse well-rounded gravel mantling benches in and adjacent to mountainous areas*
Qat, *terrace gravels; deposits of sand and gravel on benches along major streams*

Qc | Qcs | Qct

Colluvial deposits

Qc, *undifferentiated; includes talus, slope wash, and landslide deposits. Above 7,000 feet elevation, consists of well-weathered and eroded till and landslide deposits of pre-Bull Lake age*
Qcs, *slope wash; generally fine-grained poorly sorted debris*
Qct, *talus; coarse angular block rubble*

Qcl | Qcl_2 | Qcl_1

Landslide debris

Qcl, *landslide deposits; undifferentiated as to age; consist of unsorted rock debris*
Qcl_2, *of Pinedale age*
Qcl_1, *of Bull Lake age*

Qgo | Qgm | Qgm_3 | Qgm_2 | Qgm_1

Glacial deposits

Qgo, *glacial outwash; sand and gravel; generally well bedded and well rounded*
Qgm, *glacial till; unsorted unstratified deposits occurring in moraines; undifferentiated as to age*
Qgm_3, *of late Pinedale age*
Qgm_2, *of early Pinedale age*
Qgm_1, *of Bull Lake age*

Ql

Lake deposits

Includes fine-grained lake beds and boulder pavements flooring lakes at higher elevations

Pliocene

QTg

Gravels [1]

Unconsolidated to partly consolidated gravel with minor sand beds. In part formed by damming behind basalt flows

✱ QTb

Olivine basalt [1]

Gray to black thin flows of olivine basalt. Phenocrysts are olivine, pigeonite, and bytownite in a fine-grained groundmass of plagioclase, pyroxene, olivine, and magnetite-ilmenite. 0 to 300 feet thick
✱, *basalt volcanoes; cinder cones surrounding necks of diabase*

TERTIARY

Miocene(?)

Tvs

Volcanic sediments [1]

Conglomerate, sandstone, and siltstone consisting dominantly of volcanic material. Generally well bedded. 0 to 200 feet thick. Partly equivalent to the Sevier River Formation

Tlo | Tl

Latite [1]

Flows and ash-flow tuffs of latite composition
Tlo, *tuff of Osiris; gray, purplish-gray, and red-brown densely welded vitric-crystal ashflow tuff. Phenocrysts make up about 20 percent of the rock: 15 percent andesine, 4 percent sanidine, and 1 percent biotite. Weathers to huge rounded boulders. 0 to 200 feet thick; great local variations exist, due to deposition on a rough topographic surface. In part equivalent to the upper part of the Dry Hollow Formation*
Tl, *dark-gray and purplish, in part banded, aphanitic to crystal-poor latite flows and densely welded ash-flow tuffs. Phenocrysts are andesine and (or) sanidine. 0 to 500 feet thick. In part intercalated with basaltic andesite flows* (Tba). *Largely equivalent to the Isom Formation*

Tola

Tuff of Osiris, latite, and basaltic andesite flows undifferentiated

Tla

Latite and basaltic andesite flows undifferentiated

Oligocene

Tba

Basaltic andesite [1]

Dark-gray, brown, and red, in part vesicular, generally massive flows and flow-breccias. Characterized by phenocrysts of dark-green augite and conspicuous equant labradorite crystals as large as 1 inch. 0 to about 700 feet thick. Equivalent to the lower part of the Dry Hollow Formation

Tvb

Andesite breccias [1]

Gray, pink, and pale-green coarsely bedded to massive mudflow breccias, with clasts of pebble to boulder size in which dark-green hornblende phenocrysts are conspicuous. Includes minor intercalated beds of fluvial sandstone and conglomerate, and minor flows and flow-breccias of gray andesite; near the base, a thin latitic crystal ash-flow tuff is equivalent to part of the Oligocene Needles Range Formation. North of Burrville, the breccias are younger and are related in origin to the basaltic andesite flows (Tba). *2,500 feet thick at Grass Valley; thinning eastward to 0 feet near Loa. The breccias are equivalent in part to the Bullion Canyon Volcanics*

INTRUSIVE IGNEOUS ROCKS
Age uncertain

Tss

Irregular bodies of diorite porphyry intruded into shattered sedimentary rocks in the Henry Mountains

Tdps | Tdp | Tdd

Diorite porphyry

Consists of oligoclase, hornblende, and magnetite in a fine-grained groundmass of quartz, orthoclase, and albite-oligoclase. Occurs in the Henry Mountains
Tdps, *stocks*
Tdp, *laccoliths, bysmaliths, and sills*
Tdd, *dikes*

Td

Diabase

Dikes, 5 to 10 feet thick, consisting chiefly of augite, biotite, labradorite, anorthoclase, olivine, thomsonite, basaltic hornblende, and analcite

Tsd

Syenite and diabase

Composite sills of syenite and diabase, ranging in thickness from a few inches to 100 feet. The diabase is similar to that in the associated dikes (Td); *the syenite consists of anorthoclase, labradorite, basaltic hornblende, analcite, and thomsonite*

Eocene

Tdv

Dipping Vat Formation of McGookey (1960) [1]

White evenly bedded tuffaceous sandstone; minor interbedded white clay and silty limestone. Forms a prominent cliff. About 200 feet thick

Tbk

Bald Knoll Formation of Gilliland (1951)

Pale-gray, white, and reddish-orange, in part bentonitic, lacustrine shale; thin beds of silty limestone and micaceous sandstone. About 1,000 feet thick

Tch

Crazy Hollow Formation of Spieker (1949)

Red and orange sandstone, siltstone, and shale; light-gray sandstone; salt-and-pepper sandstone; local broad thick lenses of conglomeratic sandstone; entirely fluvial. About 1,000 feet thick

Tsc

Sandstone, siltstone, and conglomerate

May include rocks as old as the Flagstaff Limestone and as young as the tuff of Osiris; in part interbedded with basaltic andesite

Tgr

Green River Formation

Upper part consists of white to cream-colored fine-grained partly oolitic limestone, locally much replaced by silica; minor grayish-green and brown shale; 680 to 730 feet thick. Lower part consists of grayish-green shale with white silicified limestone beds, and a thin basal sandstone; 100 to 430 feet thick. Of lacustrine origin

Eocene(?)

Tco

Colton Formation

Reddish-brown, gray, and purplish shale; gray and red siltstone; yellow sandstone; minor bentonite and limestone. Probably of lacustrine origin. 530 feet thick

Paleocene

Tf

Flagstaff Limestone

White cherty dense lacustrine limestone with minor interbedded gray and greenish-gray shale. Near its western limit, consists of red calcareous siltstone, argillaceous limestone, and fluvial conglomeratic sandstone. 10 to 300 feet thick. In Antimony Canyon, rocks mapped as the Flagstaff are about 1,500 feet thick, and include gray, green, and buff shale, boulder conglomerate, white, gray, and buff sandstone, and red sandstone and sandy shale; these rocks may be in part equivalent to units older and (or) younger than the Flagstaff

Tcf

Colton and Flagstaff Formations undivided

CRETACEOUS

Upper Cretaceous

TKn

North Horn Formation

Pale-red, reddish-brown, purple, gray, and cream-colored shale and mudstone with minor intercalated buff and gray sandstone, limestone, and conglomerate. Lacustrine and fluvial in origin. Contains mammal remains of Paleocene age in the upper part and dinosaur bones of Late Cretaceous age in the lower part. About 1,200 feet thick

Mesaverde Group

Kpc

Price River Formation and Castlegate Sandstone

Price River Formation; gray, buff, and brown thin-bedded to massive fine- to coarse-grained partly conglomeratic fluvial sandstone, with rare thin beds of gray sandy carbonaceous shale. 700 feet thick
Castlegate Sandstone; massive cliff-forming sandstone. 150 feet thick

UNCONFORMITY

Kbs

Blackhawk Formation and Star Point Sandstone

Blackhawk Formation; buff, gray, and white massive to thin-bedded fine- to medium-grained sandstone of marginal marine origin with minor gray and green carbonaceous shale. Contains thick, minable coal beds in the lower half. About 700 feet thick
Star Point Sandstone; dark-gray, buff, and white massive to thin-bedded fine- to medium-grained sandstone of beach and near-shore origin with interbedded dark-gray fissile shales of marine origin that are tongues of the upper part of the Mancos Shale. 350 feet thick

Kmv

Mesaverde Formation

Pale-yellow thick-bedded sandstone and thin interbedded dark-gray shale west of the Henry Mountains. Of marginal marine origin. More than 300 feet thick

Kmk | Kme | Kmu | Kmbf | Kmbg | Kmfe | Kmt

Mancos Shale

Dark-gray to black soft fissile fossiliferous marine shale with thin beds of bentonite and limestone, and yellow, brown, and white fine-grained sandstone. Total thickness 3,200 to 4,900 feet; thickens from east to west
Kmu, *upper part undifferentiated; in northeastern part of area*
Kmk, *Masuk Member; dark-gray to black carbonaceous and sandy shale, interbedded with pale-yellow sandstone and shaly sandstone. 600 to 800 feet thick*
Kme, *Emery Sandstone Member; pale-yellow thin- to thick-bedded lenticular sandstone and minor interbedded carbonaceous shale and impure coal. 250 to 800 feet thick; thickens westward*
Kmbf, *Blue Gate Shale and Ferron Sandstone Members undivided*
Kmbg, *Blue Gate Shale Member; dark-gray to black carbonaceous marine shale with minor thin pale-yellow sandstone beds. 1,400 to 2,000 feet thick*
Kmfe, *Ferron Sandstone Member; pale-yellow thin- to thick-bedded lenticular sandstone and interbedded carbonaceous shale and coal. 50 to 750 feet thick; thickens from east to west*
Kmt, *Tununk Shale Member; dark-gray to black carbonaceous shale interbedded with thin beds of pale-yellow sandstone. 250 to 650 feet thick; thickens from east to west*

Kin

Indianola Group

Gray to buff fluvial and marine sandstone and conglomerate; gray shale with thin beds of limestone, bentonite, and sandstone; fossiliferous. Forms small outcrops in Salina Canyon. Near-shore facies of Mancos age. In the map area, consists of three formations, in descending order: Funk Valley Formation, buff, brown, and white thin-bedded to massive marine sandstone and interbedded shale, 600 feet thick; Allen Valley Shale, gray evenly bedded marine shale with thin layers of bentonite, gray limestone, and fine-grained sandstone, 850 feet thick; Sanpete Formation, brown, buff, and gray fine- to coarse-grained marine and nonmarine sandstone with interbedded shale and conglomerate, 1,350 feet thick

Kmtd

Tununk Shale Member of Mancos Shale and Dakota Sandstone

Kd

Dakota Sandstone

Light-yellow and yellowish-brown friable to quartzitic coarse-grained crossbedded fluvial sandstone, conglomeratic sandstone, and conglomerate, with minor interbedded carbonaceous shale and impure coal. Plant impressions are common. 0 to 125 feet thick; commonly occurs as discontinuous lenses

Lower Cretaceous

UNCONFORMITY

Kcm

Cedar Mountain Formation

Shale member; light-gray, grayish-green, and purple lacustrine shale and mudstone, with minor sandstone lenses and limestone beds. Chert and limestone nodules, and siliceous detrital pebbles and cobbles, possibly gastroliths, are common. 0 to 250 feet thick. Equivalent to the Burro Canyon Formation of southwestern Colorado and southeastern Utah
Buckhorn Conglomerate Member; dark-brown irregularly bedded ledge-forming fluvial conglomerate, with minor lenses of conglomeratic sandstone. Pebbles average slightly more than 1 inch in diameter and are mostly black chert, with minor clasts of limestone, sandstone, and shale, and sparse pebbles of igneous rock. Maximum thickness is 100 feet in the north-central part of the area; thins southward to 0 feet

KJcm

Cedar Mountain and Morrison Formations

KJcb

Cedar Mountain Formation and Brushy Basin Member of Morrison Formation

JURASSIC

Upper Jurassic

Jm | Jmb | Jms

Morrison Formation

Variegated fluvial and lacustrine mudstone, siltstone, and sandstone; local thin limestone beds. 0 to 750 feet thick
Jmb, *Brushy Basin Shale Member; light-red, purple, and grayish-green bentonitic lacustrine mudstone; minor limestone lenses and concretions; minor white, gray, and buff crossbedded sandstone lenses; minor but distinctive conglomerate lenses containing multicolored chert pebbles. 0 to 400 feet thick, increasing from west to northeast*
Jms, *Salt Wash Sandstone Member; light-gray, tan, and white fluvial, thickly crossbedded fine- to coarse-grained lenticular sandstone containing scattered pebbles and thin conglomerate beds; contains interbeds of variegated sandy mudstone. Northeast of the Henry Mountains as much as 50 feet of massive gypsum occurs at the base. 0 to 400 feet thick, increasing from west to southeast*

UNCONFORMITY

San Rafael Group

Js

Summerville Formation

Reddish-brown even-bedded, thin-bedded siltstone, sandstone, and mudstone; minor gypsum as thin beds and veinlets; probably of tidal flat origin. 100 to 300 feet thick

Jcu

Curtis Formation

Greenish-gray and brown fine- to coarse-grained thin- to thick-bedded glauconitic marine sandstone and siltstone with minor greenish-gray to red shale and local thin lenses of conglomerate. 0 to 240 feet thick

Jsc

Summerville and Curtis Formations

Jse

Summerville and Entrada Formations

UNCONFORMITY

Je

Entrada Sandstone

Reddish-brown thin- to thick-bedded silty fine-grained sandstone of littoral origin, with light-reddish-brown to tan massive crossbedded eolian sandstone beds dominant in the eastern part of the area. 300 to 900 feet thick, increasing irregularly from east to west

Middle Jurassic

Jc

Carmel Formation

Yellow to light-orange fine-grained silty friable sandstone; green and red calcareous mudstone; gray fossiliferous limestone; and white to gray thin to thick beds of coarsely crystalline gypsum. Of marine origin. Limestone and gypsum content increases from east to west, as does total thickness from about 85 to about 900 feet

Jatg | Jatc

Arapien Shale

Jatg, *Twist Gulch Member; red siltstone and light-red to gray sandstone; bluish-gray shale; near top, 175 feet of olive-green shale with thin sandstone and grit layers. Of marine origin. 1,900 feet or more thick. Equivalent to the Summerville, Curtis, and Entrada Formations*
Jatc, *Twelvemile Canyon Member; brick-red silty locally salt-bearing shale; alternating beds of bluish-gray and red gypsiferous shale; bluish-gray calcareous shale with fossiliferous limestone beds; gray shale and thin-bedded limestone; thin to thick lenticular beds of gypsum. Of marine origin. At least 3,000 feet thick. Equivalent to the Carmel Formation*

UNCONFORMITY

JURASSIC–TRIASSIC(?)

Glen Canyon Group

JTRn

Navajo Sandstone

Light-orange, buff, and light-yellow thickly crossbedded fine-grained calcareous cliff-forming eolian sandstone; a few lenses of gray sandy limestone. 450 to 1,100 feet thick, increasing from east to west

Upper Triassic(?)

TRkw

Kayenta Formation and Wingate Sandstone

Kayenta Formation; irregularly interbedded fluvial red, reddish-brown, buff, gray, and lavender shale, siltstone, and fine- to coarse-grained sandstone, in part conglomeratic, with minor beds of limestone and shale-pellet conglomerate. 180 to 350 feet thick, increasing from northwest to southeast
Wingate Sandstone; reddish-brown, buff, and grayish-orange fine-grained thickly crossbedded calcareous eolian sandstone. Forms vertical cliffs with dark-brown desert varnish on weathered surfaces. 270 to 400 feet thick, increasing from west to east

TRk

Kayenta Formation

UNCONFORMITY

TRIASSIC

Upper Triassic

TRc

Chinle Formation

Consists of seven members, or lithologic equivalents of members, the rocks of which are mostly of fluvial and lacustrine origin. In descending order, they are:
Church Rock(?) Member; light-red, purplish, and brown siltstone and fine-grained sandstone, containing a persistent ledge of white to gray, black-weathering, calcareous sandstone
Owl Rock Member; light-red to reddish-brown massive mudstone and siltstone, with minor beds and lenses of sandstone and limestone
Petrified Forest Member; light-reddish-brown and reddish-orange siltstone and sandstone, with a persistent bed of sandstone and conglomeratic sandstone at the top
Moss Back Member; yellowish-gray fine- to medium-grained lenticular conglomeratic sandstone, with minor mudstone seams and pellets, limestone pebble conglomerate, and coaly material
Monitor Butte Member; greenish-gray and reddish-brown bentonitic mudstone with minor sandstone lenses
Shinarump Member; light-gray to yellow medium- to coarse-grained sandstone and conglomeratic sandstone, with minor mudstone lenses and plant remains
Temple Mountain Member; mottled purple, red, brown, and white massive siltstone with scattered coarse quartz grains, lenses of jasper and greenish carbonaceous mudstone
Distribution of members is as follows: San Rafael Swell area, Church Rock(?), Moss Back, Monitor Butte, and Temple Mountain Members; Orange Cliffs area, Church Rock(?), Owl Rock, Moss Back, and Monitor Butte Members; Capitol Reef area, Owl Rock, Petrified Forest, Monitor Butte, and Shinarump Members. Total thickness of Chinle Formation 215 to 550 feet, increasing from northeast to southwest

UNCONFORMITY

Lower and Middle(?) Triassic

TRm

Moenkopi Formation

Upper part; reddish-brown even-bedded fissile mudstone and siltstone, and fine-grained ripple-marked sandstone, with thin layers and veins of gypsum and anhydrite. In exposures in the northeastern part of the San Rafael Swell, the unit is bleached greenish gray, is petroliferous, and weathers yellowish brown. 200 to 775 feet thick
Middle part (Sinbad Limestone Member); yellowish-gray and tan thin- to medium-bedded oolitic dolomite and limestone, with minor amounts of siltstone and sandstone; locally petroliferous. 12 to 200 feet thick; absent in the canyon of the Green River
Lower part; light-reddish-brown, yellow, and green even-bedded siltstone and sandstone containing gypsum veinlets, with chert pebble conglomerate at the base. 20 to 140 feet thick
Of marine origin. Total thickness of the Moenkopi 360 to 1,000 feet or more, increasing from east to west

TRcm

Chinle and Moenkopi Formations

UNCONFORMITY

PERMIAN

Pk

Kaibab Limestone [2]

Light-gray to brown cherty fossiliferous silty marine limestone, in part oolitic; white calcareous siltstone; white thin beds of crossbedded fine-grained sandstone; some dolomite. 0 to 100 feet thick in the San Rafael Swell, thickening to 350 feet in the Capitol Reef area

Pcn

Coconino Sandstone [2]

Light-gray to buff friable to hard fine-grained thickly crossbedded eolian sandstone. Contains grit and considerable limestone in the lower 40 feet. 700 to 1,200 feet thick, increasing southward

Pkc

Kaibab Limestone and Coconino Sandstone

Pcwo | Pcc

Cutler Formation [2]

Pcwo, *White Rim Sandstone Member and Organ Rock Tongue undivided. The White Rim Sandstone Member* (Pcw[2]) *consists of white, gray, and buff medium- to fine-grained eolian sandstone, 0 to 230 feet thick; the Organ Rock Tongue* (Pco[2]) *consists of reddish-brown siltstone and thin-bedded fine-grained sandstone, 0 to 900 feet thick*
Pcc, *Cedar Mesa Sandstone Member; yellowish-gray, reddish-orange, and reddish-brown friable fine- to coarse-grained thickly crossbedded eolian sandstone, with minor beds of red sandy shale and gray cherty limestone. 750 feet thick*

PERMIAN–PENNSYLVANIAN

PPr

Rico Formation

Reddish-brown and greenish-gray fine- to coarse-grained crossbedded sandstone; gray and grayish-green thin- to thick-bedded cherty fossiliferous marine limestone; red and purple shale and siltstone. 600 feet thick at the east edge of the area, thinning westward to 0 feet

PENNSYLVANIAN — CARBONIFEROUS

Middle Pennsylvanian

Phu | Php

Hermosa Formation

Phu, *upper member; gray thin- to thick-bedded dense to coarsely crystalline cherty fossiliferous marine limestone, interbedded with gray and brown massive to thin-bedded sandstone, siltstone, and sparse beds of gray and red shale. 200 to 1,300 feet thick, increasing eastward*
Php, *Paradox Member; salt, gypsum, anhydrite, black shale, and gray sandstone and limestone. Of marine origin. Crops out only as small gypsum plugs. 0 to 2,500 feet thick, determined from drilled wells; thickness decreases from east to west*

Contact

Fault

Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side

Strike and dip of beds

Vertical beds

Horizontal beds

Approximate strike, and direction of dip of beds and volcanic flow tops

Determined from aerial photographs

Jcu
Jsc > Js

Limit of deposition of a formation, here the Curtis Formation

Collapse structures

Small vertical pipelike bodies of breccia, bounded by circular faults, in the San Rafael Swell. Contain altered and brecciated rocks of the Moenkopi, Chinle and Wingate Formations. In the Temple Mountain area, the rocks in the collapse structures are uranium bearing