

EXPLANATION

Qd

Dunes

Chiefly wind-deposited silt and sand.

Qal

Alluvium

Chiefly stream-deposited silt, sand, and gravel, but including some wind-deposited sand and silt.

Qls

Landslide and slump

Extensively developed from rocks in the lower Chinle and Moss Back member along the east side of Milk Ranch Point and in the Cream Pots area.

UNCONFORMITY

Jms

Salt Wash member of the Morrison formation.

Buff, gray, and yellowish medium- to coarse-grained sandstone interbedded with gray, blue, and red mudstone. Fluvial crossbedding is common in sandstone; basal sandstone lenses commonly fill scours and other irregularities in the top of the underlying Summerville formation, but may also intertongue, as similar lenses of channeling sand occur in the upper part of the unit mapped as Summerville.

UNCONFORMITY (?)

Js

Summerville formation

Thin-bedded red, brown, and gray sandstone, siltstone, and mudstone, with some red, green, and gray variegated clay shale. Much of the sandstone and siltstone contains abundant carbonate. The contact with the underlying Entrada sandstone is very even and sharp. Thickness is variable, generally about 200 feet.

Je

Entrada sandstone

Commonly divisible into three units in this area. The upper unit is a red to pink, locally mottled white to gray fine-grained massive to thick-bedded cross-laminated sandstone; contains some sparsely disseminated coarse well-rounded quartz grains; commonly weathers into a low rounded ledge or "slick rim." The middle unit intertongues with and is gradational into both the upper and lower units. It is a dark-red massive very fine grained sandstone and/or siltstone containing a few sparsely disseminated coarse quartz sand grains; commonly weathers into a low slope. The lower unit is a brown to gray massive to thick-bedded cross-laminated poorly sorted coarse- to fine-grained sandstone; commonly weathers into a low rounded ledge or "slick rim." In the southern part of this quadrangle the contact with the underlying Carmel formation is apparently conformable and is locally marked by thin gray-green clay shales; to the north and east it is generally a surface that truncates the sweeping cross-lamination in underlying rocks of the Navajo and Carmel formations. The Entrada is about 160 feet thick.

Jc

Carmel formation

Divisible into two sandstone units in the southern part of the quadrangle, which, to the north and east grade laterally into the undifferentiated Navajo and Carmel formations. The sandstones are gray to brown, massive to thick bedded, cross-laminated, fine to medium grained, and very similar lithologically. Both units change facies northward to finer grained larger scale cross-laminated sandstone separated from each other by apparently persistent but locally poorly defined bedding surfaces. Along the east side of Allen Canyon, the Carmel and Navajo contact is an apparently persistent, but locally poorly defined, bedding surface between very similar lithologic types; and west of Allen Canyon the upper parts of some apparently anomalously thick exposures of rocks mapped as Navajo may contain rocks equivalent to the Carmel. The Carmel, where distinguishable from the Navajo, is generally about 120 feet thick and appears to thin to the north.

Jn

Navajo sandstone

Predominantly gray to white, locally weathering tan or buff, large-scale cross-laminated fine-grained quartz sandstone; forms steep rounded cliffs where cut by deep canyons and an irregularly rounded hummocky surface where higher strata have been removed. In some exposures along the west side of Allen Canyon the upper part of this map unit may contain rocks equivalent to the Carmel formation. The Navajo appears to intertongue with the underlying Kayenta formation. Where overlain by mappable Carmel, the Navajo sandstone is about 300 feet thick.

Jk

Kayenta formation

Gray to white, purple, red, and buff thick- and thin-bedded lenticular fine- to coarse-grained sandstone and sandy siltstone with some limestone; generally forms a succession of benches between the underlying Wingate sandstone and the overlying Navajo sandstone. The Kayenta formation intertongues with, and may be gradational into the underlying Wingate sandstone; commonly the contact is expressed as a topographic bench. The thickness of the Kayenta is quite variable, but is generally about 250 feet in this quadrangle.

Jw

Wingate sandstone

Red and buff massive to thick-bedded cross-laminated medium- to fine-grained quartz sandstone; generally weathers to steep cliff, but where parallel bedding planes are more abundant and/or where higher strata have been removed, it weathers to a series of ledges. Locally the Wingate intertongues with the underlying Chinle formation. The Wingate sandstone is about 280 feet thick.

Rcu

Rcm

Rcl

Rcls

Chinle formation

Upper Chinle, Rcu, red, gray, and brown generally thin even-bedded locally shaly fine- to very fine grained sandstone, siltstone, and claystone, with a few thin unfossiliferous limestone beds, and a prominent maroon thick-bedded sandstone at the top; generally forms a steep slope below the cliff formed of the Wingate sandstone, except for the top zone of sandstone which crops out as blocky ledges; appears to lie conformably on the Moss Back member and may intertongue with it; approximately 600 feet thick, with variations possibly in excess of 100 feet. Moss Back member, Rcm, gray to brown lenticular thick- and thin-bedded crossbedded fine- to coarse-grained sandstone and conglomeratic sandstone; forms

QUATERNARY

Upper Triassic

Lower and Middle(?) Triassic

JURASSIC

JURASSIC AND JURASSIC(?)

JURASSIC(?)

TRIASSIC

the continuous blocky ledge capping Milk Ranch Point and East Point, and supports a prominent hogback ridge east of East Point; top is in the form of a smooth alabby dip slope on the east side of Milk Ranch Point; contact with the underlying lower Chinle appears, at least in part, gradational and/or intertonguing, but is locally marked by shallow scours; although generally not well exposed it commonly is expressed topographically; generally about 100 feet thick. Lower Chinle, Rcl, chiefly blue, gray, and red massive lenticular argillaceous mudstone with variable amounts of disseminated medium and fine sand grains, interbedded with and grading into some thin lenses of brown thin-bedded flaggy sandstone and lenses of sandstone and conglomeratic sandstone lithologically very similar to those of the Moss Back member; generally expressed as a slope or bench below the overlying Moss Back; contact with the underlying Moenkopi formation is a slightly irregular erosion of the surface; contact with the locally underlying lower sandstone/Chinle is gradational and intertonguing; varies from 95 feet to about 150 feet in thickness. Sandstone lenses of the lower Chinle, Rcls, lying directly on the Moenkopi; may be correlative, in part, with sandstone mapped as the Shinarump member in the Deer Flat and White Canyon areas to the west of Elk Ridge; only known outcrops are shown; light-gray to brown crossbedded discontinuous lenticular medium-, coarse-, and fine-grained sandstone and conglomeratic sandstone (chiefly pebbles but locally cobbles) with interbedded lenses of mudstone and muddy sandstone similar to those of the lower Chinle; basal parts commonly fill scours in the top of the underlying Moenkopi; where present, these sands rarely exceed 20 feet in thickness, sandstone at this horizon contains important uranium ore deposits in the quadrangle to the north, and on Elk Ridge to the west.

UNCONFORMITY

Rm

Moenkopi formation

Red, brown, and buff thin and thick even-bedded discontinuous very fine to medium-grained sandstone and sandy siltstone; commonly shaly to flaggy, with thick-bedded discontinuous sandstone more common in the middle third of the formation than in the upper and lower thirds; generally forms a steep slope with discontinuous ledges between the overlying lower Chinle and the underlying Hoskinnini tongue of the Cutler formation. The contact with the underlying Hoskinnini appears conformable and gradational. The Moenkopi is generally about 240 feet thick, but may vary as much as 50 feet.

Pch

Pcc

Pcc

Cutler formation

Hoskinnini tongue, Pch, red to buff, locally bleached white to gray, massive and thick-bedded cross-laminated medium- to fine-grained silty sandstone containing generally sparsely disseminated coarse well-rounded frosted sand grains; commonly in the form of blocky or rounded ledge between overlying Moenkopi and underlying Organ Rock; contact with the underlying Organ Rock appears generally conformable; commonly about 85 feet thick. Organ Rock tongue, Pcc, predominantly red even-bedded very fine grained sandstone and/or sandy siltstone with some gray, cross-laminated fine- to medium-grained sandstone lenses interbedded near the base; generally forms a uniform slope below the Hoskinnini; contact with the underlying Cedar Mesa sandstone is intertonguing and gradational; about 250 feet thick, but may vary as much as 50 feet locally. Cedar Mesa sandstone member, Pcc, light-gray to tan thick-bedded to massive cross-laminated fine- to medium-grained sandstone beds separated by thin partings of red to gray siltstone and limy siltstone; the partly eroded top controls the form of the slope to the west of East Point, and in the deep canyons the sandstone forms massive and ledgy vertical cliffs; contact with the underlying Rico formation is conformable; generally about 1,000 feet thick.

FPr

Rico formation

Gray thin limestone and sandstone, interbedded with red shaly calcareous siltstone, medium- and fine-grained calcareous sandstone, thick-bedded cross-laminated medium- to fine-grained sandstone, and some irregularly bedded thin chert and cherty limestone; generally in the form of a ledgy steep slope below the cliff formed of the Cedar Mesa sandstone in the deep canyons. Marine fossils are rare and generally poorly preserved. The base of this unit is not exposed.

Contact

(Dashed where approximately located, short dashes where inferred)

U/D

Fault, showing approximate displacement in feet.

(Dashed where approximately located, dotted where concealed. U, upthrown side; D, downthrown side)

?-?-?-?-?-?-?-?

Doubtful or probable fault

(Showing inferred direction of displacement. U, upthrown side; D, downthrown side)

Anticlinal bend

(Showing trace of axial plane and direction of plunge of axis. Dashed where approximately located. Arrow barbed on side of steeper dip)

Synclinal bend

(Showing trace of axial plane and direction of plunge of axis. Dashed where approximately located. Arrow barbed on side of flatter dip)

Strike and dip of beds

8000

8100

Structure contours

Drawn on the base of the Moss Back member of the Chinle formation, the base of the Kayenta formation, and the base of the Entrada sandstone. Dashed where approximately located; short dashes indicate projection above surface. Contour interval 100 feet. Datum is mean sea level.

TRIASSIC

PERMIAN

PENNSYLVANIAN AND PERMIAN(?)

Upper Jurassic

Upper and Middle Jurassic

Glen Canyon Group

Upper Triassic