EXPLANATION

QUATERNARY

Qd

Dune sand

Wind-deposited sand and silt.

Qts

Talus and slump

Chiefly talus but includes some slump; extensive along west side of Comb Ridge.

Qal

Alluvium

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

Qu

Undifferentiated landslide deposits, slump, and talus
(includes some alluvium)

Upper Jurassic — JURASSIC

Jms

Salt Wash member of Morrison formation

Buff, gray, and yellow sandstone lenses interbedded with gray, blue, and red mudstone. Sandstone is chiefly medium- to coarse-grained quartz grains with a few pebbles of mudstone. Fluvial crossbedding is common. Lenses of the sandstone commonly fill scours and irregularities in the top of the underlying Bluff sandstone.

UNCONFORMITY

Jb

Bluff sandstone

Light-gray massive to thick-bedded, commonly cross-laminated, medium- to coarse-grained quartz sandstone. The basal part is thin bedded and intertongues with and grades into rocks of the underlying Summerville formation. Commonly forms a cliff or series of resistant ledges above the less resistant Summerville. Ranges in thickness from about 140 feet to a wedge edge at the northern boundary of this quadrangle.

Js

Summerville formation

Interbedded, thin-bedded red, brown, and gray sandstone, siltstone, and mudstone, with some interbedded red, green, and gray clay shale. Much of the sandstone and siltstone contains abundant carbonate. Some of the thicker sandstone is continuous and widespread. The contact with the underlying Entrada sandstone is even and sharp. About 150 feet thick.

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 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." The contact with the underlying Carmel formation is apparently conformable, locally marked by thin gray-green clay shales. Commonly about 160 feet thick.

Upper and Middle Jurassic

Jc

Carmel formation

Divisible into four units in the southern half of this quadrangle, units 1 and 3 grade into the remaining two units northward at about the middle of the quadrangle. The uppermost unit (unit 4) is a gray to brown massive to thick-bedded cross-laminated fine- to medium-grained sandstone; commonly weathers into blocky cliff or ledge. Below it is unit 3, a series of red, gray, and buff interbedded, thin-bedded sandstone, siltstone, and clay shale, locally gypsiferous; generally weathers to steep slope between overlying and underlying sandstone ledges. Unit 2 is a tan to gray, massive to thick-bedded, cross-laminated at low angles, fine- to medium-grained sandstone; commonly weathering to a low rounded ledge or series of ledges. The lowermost unit (unit 1) is a light-gray to brown thick- to thin-bedded, generally even-bedded, fine- to medium-grained sandstone with some thin interbedded pink mudstone locally; it is relatively thin and commonly weathers into a recess or steep slope between the overlying sandstone unit and the underlying Navajo sandstone. The contact with the underlying Navajo is uneven. The Carmel is generally about 115 feet thick, but may be thicker locally.

Jn

Navajo sandstone

Predominantly gray to white fine-grained quartz sandstone; massive with sweeping large-scale cross-laminations; locally weathers to tan or buff. Along the east flank of Comb Ridge it weathers to an irregularly rounded hummocky surface, but where deep canyons have cut into it, particularly in the northern part of the quadrangle, steep rounded cliffs are formed. It appears to intertongue with the underlying Kayenta formation. Generally about 300 feet thick.

Glen Canyon group — JURASSIC(?)

Jk

Kayenta formation

Gray to white, purple, red, and buff thick- and thin-bedded lenticular interbedded sandstone and siltstone with some limestone; generally eroded back from the crest of Comb Ridge forming a succession of benches between the underlying Wingate sandstone and the overlying Navajo sandstone. The Kayenta intertongues with, and locally may be gradational with, the underlying Wingate sandstone; the contact is commonly well exposed. Ranges in thickness from about 130 feet in the southern part of the quadrangle to about 230 feet in the north.

Upper Triassic — TRIASSIC

Rw

Wingate sandstone

Red and buff, commonly massive but locally thick-bedded, cross-laminated fine- to medium-grained quartz sandstone; generally weathers to a steep blocky cliff along the west flank of Comb Ridge, but in the northern part of the quadrangle, where parallel truncation planes are more abundant, the upper part weathers back in a series of ledges. Locally intertongues with the underlying Chinle formation. About 260 feet thick.

Upper Triassic — TRIASSIC

Rcu / Rcm / Rcl / Rclm

Chinle formation

Upper Chinle, Rcu, red, gray, and brown, generally thin-bedded, even-bedded, locally shaly, fine- to very fine grained sandstone, siltstone, and claystone with a few thin unfossiliferous limestone beds and a prominent zone of maroon thick-bedded sandstone at the top; generally forms a steep slope below the cliff formed of the Wingate sandstone, except for the top sandstone which crops out as blocky ledges; intertongues with the Moss Back member and with the undifferentiated Moss Back and lower Chinle; it is about 650 feet thick at the head of Comb Wash, but may vary in thickness appreciably to the south. Moss Back member, cm, gray to brown, thick- and thin-bedded, crossbedded lenticular fine- to coarse-grained sandstone and conglomeratic sandstone; forms the continuous blocky ledge capping Milk Ranch Point and the northern part of the hogback east of Milk Ranch Point. Its contact with the underlying lower Chinle appears generally gradational and intertonguing, but is locally marked by shallow scours. Where distinguishable from underlying rocks the Moss Back is about 90 feet thick. Lower Chinle, Rcl, chiefly blue, gray, and red massive lenticular mudstone with variable amounts of disseminated medium and fine sand grains, interbedded with and grading into thin lenses of brown thin-bedded flaggy sandstone and lenses of sandstone and conglomeratic sandstone; generally expressed as a slope or bench below the overlying Moss Back, except for a prominent ledge on Milk Ranch Point formed of a sandy zone 30 to 60 feet above the contact with the underlying Moenkopi formation. The contact with the underlying Moenkopi is an erosion surface; the lower Chinle is quite variable in thickness and averages about 100 feet. Undifferentiated lower Chinle, Rclm, brown and gray sandstone and conglomeratic sandstone similar to the Moss Back member, interbedded with lenses of greenish-gray to blue-gray coarse-grained argillaceous sandstone and mudstone in the basal half. The uppermost sandstone beds are equivalent to the Moss Back, but are not differentiated from the rest of the unit. Sandstone lenses at the top of the unit intertongue with and pinch out southward into the upper Chinle. The upper half commonly forms a blocky ledge capping the west flank of the hogback at the head of Comb Wash and a dip slope on the east flank; the lower half forms a steep slope on the east flank below the ledge; south of the hogback a few patches crop out as low ledges through the talus and slump. The undifferentiated lower Chinle is about 150 feet thick at the head of Comb Wash but thins to the south. There are no known uranium deposits in this map area.

UNCONFORMITY

Lower and Middle(?) Triassic

Rm

Moenkopi formation

Red, brown, and buff thin- and thick-bedded, discontinuous very fine to medium-grained sandstone and sandy siltstone, commonly shaly to flaggy. Thick-bedded discontinuous sandstone beds more common in the middle of the formation. Generally forms a steep slope with discontinuous ledges between the overlying lower Chinle and underlying Hoskinnini tongue of the Cutler formation. The contact with the underlying Hoskinnini appears conformable. About 240 feet thick.

Pch / Pco / Pcc

Cutler formation

Hoskinnini tongue, Pch, red to buff, locally bleached, massive and thick-bedded cross-laminated medium- to fine-grained silty sandstone containing sparsely disseminated coarse well-rounded frosted sand grains. Commonly forms a blocky or rounded ledge between overlying Moenkopi formation and underlying Organ Rock tongue; about 80 feet thick. The contact with the underlying Organ Rock appears conformable. Organ Rock tongue, Pco, predominantly red even-bedded very fine grained sandstone or sandy siltstone with some gray cross-laminated fine- to medium-grained sandstone lenses interbedded near the base; generally in the form of a uniform slope below the Hoskinnini; about 250 feet thick, but may vary as much as 50 feet locally. The contact with the underlying Cedar Mesa sandstone member is intertonguing and gradational. 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; forms the large mesa in the western half of the area and the dip slope on the western side of Comb Wash; in the deep canyons dissecting the mesa it forms massive and ledgy vertical cliffs. It is about 1,100 feet thick in the upper part of Arch Canyon, but probably thins southward possibly as much as 150 feet. The contact with the underlying Rico formation is conformable.

PERMIAN

PPr

Rico formation

Gray thin beds of limestone and limy sandstone, interbedded with red shaly calcareous siltstone, medium- and fine-grained calcareous sandstone, some thick-bedded cross-laminated medium- to fine-grained sandstone, locally gypsiferous, some irregularly bedded thin beds of chert and cherty limestone, and some gray shale; generally in the form of a ledgy steep slope below the cliff formed of the Cedar Mesa sandstone member of the Cutler formation in Mule and Arch Canyons. Marine fossils are sparse and generally poorly preserved. The base of this unit is not exposed.

PENNSYLVANIAN AND PERMIAN(?)

Contact

(Dashed where approximately located; short dashes where inferred)

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

5500

5600

Structure contours

Drawn on the base of the Moss Back member of the Chinle formation, the base of the Organ Rock tongue of the Cutler 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.