Geology by D. A. Phoenix assisted by D. W. Peterson, 1956

Base from U. S. Geological Survey topographic quadrangles

GEOLOGIC MAP AND SECTIONS OF THE LEES FERRY AREA, COCONINO COUNTY, ARIZONA (SOUTH HALF)

SCALE 1:24 000

1 MILE ½ 0 1 MILE

CONTOUR INTERVALS 40 AND 80 FEET
DATUM IS MEAN SEA LEVEL

Quaternary deposits not shown

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—61202

EXPLANATION

QUATERNARY — *Pleistocene(?) and Recent*

- **Qs** — Wind deposits. *Light-tan windblown sand and silt derived mostly from the San Rafael or Glen Canyon group*
- **Qa$_1$** **Qa$_2$** — Fluvial deposits. *Qa$_1$, in canyons; stream-washed sand and gravel derived mostly from distant sources. Qa$_2$, on plateaus; sand and silt transported from place to place by seasonal runoff locally stabilized by plants derived from local sources*
- **Qt** — Talus deposits. *Broken blocks and angular fragments of rock at base of cliffs; forms cones*
- **Qls** — Landslide deposits. *Jumbled blocks and fragments of sandstone cemented more or less by clay-rich silty sand, "torrey-blocks" of the Glen Canyon group, all mostly covering mudstone of the Chinle formation*
- **Qa$_3$** — Alluvial fan deposits. *Sand and partly rounded fragments of Triassic and Jurassic rocks in fan-shaped deposits; bouldery near source, sand partly windblown near toe*
- **Qg** — Terrace gravel. *Stream-washed sand and gravel on terraces bordering streams and on plateaus locally*

UNCONFORMITY

CRETACEOUS — *Upper Cretaceous*

- **Kd** — Dakota sandstone. *Pink to pale-brown crossbedded sandstone and conglomerate overlain by yellow-green to light-brown ripple-marked siltstone; coal-bearing*

UNCONFORMITY

JURASSIC — *Upper Jurassic*

- **Je** — Entrada sandstone. *Pale-gray massive crossbedded medium- to fine-grained sandstone*

Middle and Upper Jurassic — San Rafael group

- **Jc** **Jcj** — Carmel formation. *Red-brown to gray-green mudstone; red sandstone interstratified with siltstone; slump-deformed red-brown siltstone and pale-brown sandstone. Jcj, Judd Hollow tongue, at base; dark-brown sandstone and siltstone. Identifiable only where Carmel formation intertongues with Navajo sandstone*

JURASSIC(?) — Glen Canyon group

- **Jnt** **Jn** — Navajo sandstone. *Gray to red-brown massive crossbedded coarse- to fine-grained sandstone with lenses of dark-brown chert locally. Jnt, Thousand Pockets tongue, at top; pale-yellow massive medium- to fine-grained sandstone. Identifiable only where Navajo sandstone intertongues with Carmel formation*
- **Jk** — Kayenta formation. *Pale-red-brown massive even-bedded medium- to fine-grained sandstone*

TRIASSIC(?) — Glen Canyon group

- **Trms** **Trmd** — Moenave formation. *Trms, Springdale sandstone member; darkly stained broadly lenticular massive strata of medium- to fine-grained sandstone. Trmd, Dinosaur Canyon sandstone member, red-orange thin- to thick-bedded fine-grained sandstone and siltstone*

UNCONFORMITY

TRIASSIC — *Upper Triassic*

- **Trcu** **Trcss** **Trcs** — Chinle formation. *Trcu, Owl Rock and Petrified Forest members undifferentiated; Owl Rock is interbedded cherty limestone, limestone conglomerate, sandstone and mudstone; underlies Petrified Forest that is variegated bentonitic clay and mudstone. Trcss, sandstone and shale member; light-colored arkosic sandstone separated by mudstone. Trcs, Shinarump member; pale-brown crossbedded conglomerate sandstone*

TRIASSIC — *Lower and Middle(?) Triassic*

- **Trmu** **Trml** — Moenkopi formation. *Trmu, upper unit; dark-reddish-brown limy siltstone and mudstone with thin-bedded ripple-marked limestone. Trml, lower unit; pale-reddish-brown thin-bedded shaly siltstone and mudstone*

UNCONFORMITY

PERMIAN — Kaibab limestone

- **Pk** — Kaibab limestone. *Pale-gray massive to thick-bedded sandy and cherty dolomitic limestone*
- **Pt** — Toroweap formation. *Pale-gray cherty limestone and grayish-yellow quartzitic sandstone separated locally by thin beds of reddish mudstone*
- **Pc** — Coconino sandstone. *White to pale-grayish-yellow massive crossbedded quartzitic sandstone*
- **Ph** — Hermit shale. *Reddish-brown thin-bedded shaly mudstone and siltstone*

PENNSYLVANIAN AND PERMIAN — Supai formation

- **PPs** — *Reddish- to yellow-gray massive- to thick-bedded limestone, siltstone, and crossbedded sandstone*

Supai formation

Contact — *Dashed where approximately located; dotted where concealed*

Fault, showing dip — *Dashed where approximately located; dotted where concealed; queried where inferred or indefinite. U, upthrown side; D, downthrown side; figure indicates vertical displacement, in feet*

Vertical fault, showing vertical displacement in feet — *Dashed where approximately located; dotted where concealed; queried where inferred or indefinite. U, upthrown side; D, downthrown side*

Vertical fault — *Dashed where approximately located; dotted where concealed; queried where doubtful. U, upthrown side; D, downthrown side*

Anticline — *Showing trace of axial plane and bearing and plunge of axis; dashed where approximately located*

Syncline — *Showing trace of axial plane and bearing and plunge of axis; dashed where approximately located*

Asymmetric anticline — *Showing trace of axial plane and bearing and plunge of axis. Dashed where approximately located. Short arrow indicates steeper limb*

Asymmetric syncline — *Showing trace of axial plane and bearing and plunge of axis. Dashed where approximately located. Short arrow indicates steeper limb*

Anticlinal bend of monocline — *Showing trace of axial plane and bearing and plunge of axis. Dashed where approximately located. Short arrow indicates steeper limb*

Strike and dip of beds

Approximate strike and dip of beds

Strike and dip of joint

Strike of vertical joint

Structure contours — *Drawn on base of Navajo sandstone; dashed where approximately located; short dashes indicate projection above surface. Contour interval 200 feet. Datum is mean sea level. Contours deleted in areas of landslide blocks*

Prevailing trend of sedimentary structures in Entrada sandstone, Navajo sandstone, and the Shinarump member of the Chinle formation — *Barb denotes direction of deposition*

Edge of channel of Triassic age — *Edge of channel cut in top of Moenkopi formation, as seen on exposed cliff faces. Hachures point toward center of channel*

Carbonate rock — *Reefs and linear bodies of sheared and crushed Navajo sandstone cemented by iron and manganese oxides and carbonate minerals. Dashed where approximately located; dotted where concealed; queried where doubtful*

Adit

Prospect

APPROXIMATE MEAN DECLINATION, 1957

Paria Plateau · Vermillion Cliffs · Marble Canyon of the Colorado River

Echo Cliffs