

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



CORRELATION OF MAP UNITS

Qal	Qc	Qg	Qe	Qoa	} QUATERNARY
UNCONFORMITY					} CRETACEOUS
Kd					
UNCONFORMITY					} JURASSIC
Kbc					
Jmb					
Jmr					
Jt					
Jc					
UNCONFORMITY					} TRIASSIC
Rcp					
Rcps					
UNCONFORMITY					} PERMIAN
Pc					
Ip m					

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Unconsolidated deposits of clay, silt, sand, gravel, and locally, evaporite; deposited in modern perennial and ephemeral stream valleys and on flood plains

Qc COLLUVIAL DEPOSITS (HOLOCENE)--Talus and slope wash deposits composed of material derived from the adjacent cliff

Qg RESIDUAL GRAVEL DEPOSITS (HOLOCENE AND PLEISTOCENE)--Lag gravel, composed of Paleozoic and Mesozoic rock fragments with cobbles of Precambrian rock; found along stretches of Salitral Creek and the Rio Puerco

Qe TALUS, LANDSLIDE DEPOSITS, SLUMP BLOCKS AND COLLUVIUM (HOLOCENE AND PLEISTOCENE)--Generally fan-shaped deposits consisting of large angular rocks and blocks derived from Triassic, Jurassic, and Cretaceous formations

Qoa OLDER ALLUVIUM (HOLOCENE AND PLEISTOCENE)--Red-brown to orange, partially consolidated clay, silt, sand, and very minor lag gravel; forms blanket deposits on surfaces, topographically above the modern valley floor, which have been interpreted as dissected pediments and old piedmont alluvial plains

Qb BANDELER TUFF, UNDIVIDED (PLEISTOCENE)--Gray to tan, orange weathering, nonwelded to densely welded ash consisting of rhyolitic tuff and pumice. The ash is characterized by bipyramidal quartz, chatoyant sanidine, and sparse to abundant inclusion of lithic fragments. Thickness incomplete, as much as 78 m exposed. Basal contact sharp and unconformable

Kd DAKOTA SANDSTONE (UPPER CRETACEOUS)--Three descriptive units not mapped separately: Upper unit--yellow-tan, well-sorted, fine-grained sandstone which is parallel bedded or crossbedded with thin sets of tabular planar cross-stratification; Middle unit--thin, yellowish-tan, fine- to very fine-grained moderately well-sorted, flat-bedded, burrowed sandstone interbedded with black carbonaceous shale and siltstone. The burrows, which are parallel to bedding surfaces, appear to be those of the trace fossil Planolites illustrated by Grant and Owen (1974, fig. 11); Lower unit--buff to rusty tan, medium- to fine-grained, moderately well-sorted, silicified, quartzose, locally carbonaceous sandstone; usually overlies less than 2 m of silicified friable pebble conglomerate; contains minor light gray, kaolinitic mudstone lenses; this unit unconformably overlies the Burro Canyon(?) formation. Thickness incomplete; top removed by erosion; as much as 77 m of Dakota Sandstone exposed

Kbc BURRO CANYON(?) FORMATION (LOWER CRETACEOUS)--White to tan, pebble conglomerate, conglomeratic sandstone, sandstone, and locally, interbedded red mudstone; pebbles in conglomerate are primarily cherty limestone, which contains abundant crinoid fragments, and chert. The sandstones are medium to fine grained, poor to well sorted, trough crossbedded, and contain abundant kaolinite. A thin gray tuffaceous quartzite (<2 m) is locally present at the top. Basal contact is sharp and may be disconformable. Thickness 16-47 m, thinning to the south as a result of pre-Dakota erosion

Jmb BRUSHY BASIN SHALE MEMBER--Gray-green and orange claystone interbedded with drab olive-tan to rusty-tan, coarse- to fine-grained feldspathic sandstone and gray, dense, siliceous siltstone. Sandstone is dominant in the lower part of the member and may include equivalents of the Westwater Canyon Member. Claystone is dominant in the upper part of the member. Clay mineralogy shows a change from dominantly members of the smectite group (montmorillonite group) at the base of the member to kaolinite and mixed-layer illite at the top. The hard, dense siltstones are present only in the upper one-third of the member. Basal contact sharp; intertonguing with the underlying Recapture Member was not observed. Thickness 63-133 m

Jmr RECAPTURE SHALE MEMBER--Two descriptive units not mapped separately: Upper unit--interbedded light- to dark-reddish-brown, fine- to very fine-grained, moderately well-sorted sandstone and claystone; lower contact gradational. Thickness 84-106 m; Lower unit--grayish-white, light-yellow to buff, and reddish-brown, fine- to very fine-grained sandstone interbedded with gray to reddish-brown shale and gray limestone. Lower contact sharp and conformable. May (in part?) be equivalent to Summerville Formation (Ridgley, 1977). Thickness 3-17 m

Jt TODILTO LIMESTONE (MIDDLE JURASSIC)--Light- to dark-gray interbedded thin-bedded limestone and calcareous shale; massive gray limestone breccia; and gray to white gypsum. Contact with the underlying Entrada Sandstone is sharp to gradational. Thickness 0-10 m for interbedded limestone and shale, and limestone breccia; 0-32 m for gypsum

Jc ENTRADA SANDSTONE (MIDDLE JURASSIC)--White, yellow, or reddish-orange, medium- to fine-grained, moderately well-sorted, calcareous sandstone, that is characterized by large-scale wedge-planar and trough cross-stratification. Contact with the underlying Chinle Formation is unconformable. Thickness 36-78 m

Rcp PETRIFIED FOREST MEMBER--Poorly exposed, reddish-brown, pale purple (mauve), and minor grayish-green claystone interbedded and intertonguing with reddish-brown to gray, fine- to coarse-grained sandstone and siltstone; minor lenses of grayish-green limestone pebble conglomerate. Crops out as color banded badland-type topography. As much as 197 m thick

Rcps POLEO SANDSTONE LENTIL AND SALITRAL SHALE TONGUE, UNDIVIDED--White, gray, yellowish-tan or orange, fine- to coarse-grained, quartzose to micaceous sandstone interbedded with dark-reddish-brown and grayish-green shale; sandstones are thin bedded, slabby or massive and are locally, carbonaceous. Contact with the underlying Cutler Formation is unconformable. Type locality for the Poleo Sandstone Lentil is Mesa Poleo and for the Salitral Shale Tongue is along the southwest rim of Mesa Montosa. Thickness as much as 94 m, but usually less than 64 m

Pc CUTLER FORMATION (PERMIAN)--Interbedded orange and dark-reddish-brown mudstone, limy siltstone, sandstone, and arkose; lenticular grayish-green, fine- to coarse-grained sandstone and arkosic sandstone; minor pebble conglomerate; contact with the underlying Madera Limestone is gradational. Section incomplete; top and base not exposed in same area. As much as 328 m thick

Ip m MADERA LIMESTONE (PENNSYLVANIAN)--Gray to white, fine- to medium-crystalline, fossiliferous limestone; lenticular gray to tan arkosic sandy limestone; pink arkose; reddish-brown and minor light-gray shale; limestone is dominant in the lower part of the formation and arkosic rocks predominate in the upper part. Section incomplete; base not exposed. As much as 500 m thick

CONTACT--Dashed where approximately located
 FAULT--Dashed where approximately located; dotted where concealed. U, upthrown side; D, downthrown side
 PROBABLE FAULT--U, upthrown side, D, downthrown side
 MONOCLINE--Axial trace of monoclinial flexure showing direction of plunge of axis; arrows indicate direction of dip; longer arrow indicates flatter dip
 STRIKE AND DIP OF BEDS
 KAOLINITE PROSPECT

References
 Grant, K., and Owen, D. E., 1974, The Dakota Sandstone (Cretaceous) of the southern part of the Chama Basin, New Mexico--A preliminary report on the stratigraphy, paleontology, and sedimentology, in Siemers, C. T., ed., New Mexico Geological Society 25th Field Conference Guidebook of Ghost Ranch central-northern New Mexico, p. 239-249.
 Ridgley, J. L., 1977, Stratigraphy and depositional environments of Jurassic-Cretaceous sedimentary rocks in the southwest part of the Chama Basin, New Mexico, in New Mexico Geological Society Guidebook 28th Field Conference, San Juan Basin III, p. 153-158.



PRELIMINARY GEOLOGIC MAP OF THE ARROYO DEL AGUA QUADRANGLE, RIO ARRIBA COUNTY, NEW MEXICO

By
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