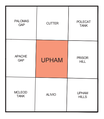
Base map from U.S. Geological Survey 1970, from photographs taken 1965, field checked in 1970, edited in 1993.
1927 North American datum, UTM projection – zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in blue



QUADRANGLE LOCATION

1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geologic Map of the Upham 7.5-Minute Quadrangle, Sierra County, New Mexico.

June 1995

by
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New Mexico Bureau of Geology and Mineral Resources
Open-file Geologic Map 205

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This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http//geoinfo.nmt.edu

Map Symbols

- Geologic contact—solid where exposed or well-known, dashed where approximately known, queried where uncertain.
- Fault—solid where exposed, dashed where approximately known, dotted where concealed. Queried where uncertain. Bar-and-ball on down-thrown side, fault point indicating dip direction and value.
- Anticline hinge—showing direction of plunge. Solid where accurate, dashed where inferred, dotted where buried.
- Syncline hinge—showing direction of plunge. Solid where accurate, dashed where inferred, dotted where buried.
- Estimated strike and dip of bedding, dip value unknown
- Strike and dip of bedding
- Overturned bedding
- Horizontal bedding
- Vertical bedding
- A—A' Location of geologic cross section.

COMMENTS TO MAP USERS

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

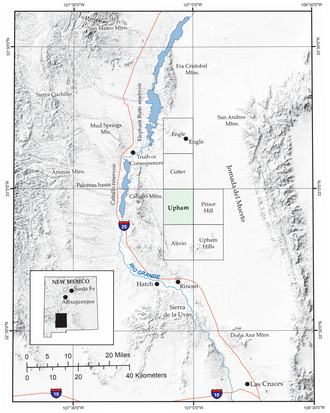
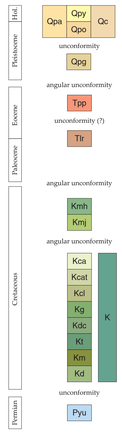


Figure 1—Location of the Upham quadrangle and surrounding quadrangle locations.

Correlation Diagram



Map Unit Descriptions

Quaternary

Qpy — **Younger piedmont-slope alluvium**—Sand, gravel, silt, and clay of modern, shallowly incised drainageways, and thin sand and gravel veneers mantling broad pediments. As much as 20ft (6m) thick.

Qpo — **Older piedmont-slope alluvium**—Gravel and gravelly sand deposits of alluvial fans that are intermediate in geomorphic position between higher Palomas (**Qpg**) fans and lower (**Qpy**) arroyo alluvium. Upper part of **Qpo** deposits are cemented by pedogenic carbonate that represents stage II to stage IV carbonate accumulation. As much as 25ft (7m) thick.

Qpa — **Qpy** and **Qpo**, undifferentiated.

Qc — **Slope colluvium**—Generally correlative with **Qpy** but some may be as old as **Qpo**. As much as 3ft (1m) thick.

Qpg — **Palomas Formation, piedmont-slope deposits**—Boulder to cobble conglomerate, gravel, and sandy-gravel of both high-level alluvial fans and erosion surface veneers. Upper beds are generally indurated by stage IV caliche. Unit forms relatively undissected alluvial fans as well as mesa-capping erosional remnants of fans or pediment veneers. As much as 20ft (6m) thick.

Tertiary

Tpp — **Palm Park Formation**—Only lower few feet (10m) of gray to purplish-gray, tuffaceous, soft, volcaniclastic sandstone is exposed in the southeastern part of the Upham quadrangle. Unit may be as much as 1,800ft (550m) thick in adjacent quadrangles to the south and east.

Tlr — **Love Ranch Formation**—Fining upward sequence of red, gray, and purple conglomerate, conglomeratic sandstone, sandstone, and mudstone representing alluvial-fan and fluvial deposits in the Laramide Love Ranch basin. The formation documents progressive erosional unroofing of Cretaceous intermediate - and silicic - composition volcanic rocks, Mesozoic, and Paleozoic sedimentary rocks, and Precambrian granite from the Laramide Rio Grande uplift. At least one intraformational unconformity probably exists near the middle of the formation. In the Upham quadrangle the formation is approximately 2,600ft (796m) thick, but this does not include uppermost beds which are exposed to the east in the Prisor Hill quadrangle. Total thickness probably exceeds 3,000ft (914m).

Cretaceous

Km, Kt, Kdc, Kg and Kcl, undifferentiated.

Kmh — **McRae Formation, Hall Lake Member**—Purple to gray shale and mudstone with interbedded volcaniclastic sandstone and conglomeratic sandstone in lower half. Medial tongue of volcanic cobble to boulder comglomerate, and upper section of purple to gray volcaniclastic sandstone, conglomeratic sandstone, and mudstone containing corspicuous granitic detritus. Fluvial in origin, the formation also contains scattered dinosaur bone fragments. Zero to approximately 600ft (183m) thick in the Upham quadrangle, thinning, and pinching out to the southwest.

Kmj — **McRae Formation, Jose Creek Member**—Brown to dark-gray boulder conglomerate in channel-form lenses. Clasts are angular to sub-rounded, intermediate-composition volcanic and hypabyssal rocks ranging in size from 0.2 to 1m in diameter. Debris flow in origin. In Upham quad the unit is only exposed discontinuously in the hangingwall of the Yoast Draw fault. 20 ft (6m) thick or less.

Kca — **Crevasse Canyon Formation, Ash Canyon Member**—Predominantly tan, medium-grained, cross-bedded lithofeldspathic sandstone interbedded with lesser amounts of olive gray mudstone. Chert-pebble conglomerate lenses within sandstone beds are present locally, especially near the top of the unit. Local petrified wood. Approximately 1,200ft (365m) thick.

Kcat — **Crevasse Canyon Formation**—Tongues of Ash Canyon sandstone and conglomeratic sandstone within **Kcl**, each 30-50ft (9-15m) thick.

Kcl — **Crevasse Canyon Formation, lower member**—Crevasse Canyon Formation - Brown to tan to greenish-brown, fine- to medium-grained, lithofeldspathic sandstone in channel shaped and lenticular beds, intercalated with olive-gray shale and mudstone. At least 830ft (153m) thick.

Kg — **Gallup Sandstone**—Massive to cross-bedded cream to gray marine sandstone and minor marine shale, gradational downward into D-Cross Tongue of Mancos (**Kdc**). Approximately 110ft (33m) thick.

Kdc — **D-Cross tongue of Mancos Shale**—Dark gray, fissile marine shale with thin interbeds of fossiliferous sandstone. 60ft (18m) thick.

Kl — **Tres Hermanos Formation, Lower Atarque Member**—Consists of brown and greenish-brown fossiliferous, burrowed marine sandstone, followed upward by fluvial, brown sandstone, and olive-green mudstone of the Carthage Member, and capped by marine, brown, fossiliferous, burrowed sandstone of the Fite Ranch Member. Total thickness is approximately 328 to 348ft (100-106m).

Km — **Mancos Shale**—Not exposed or not identified in Upham quadrangle. In adjacent parts of Apache Gap quadrangle the Mancos consists of thin-bedded to fissile, fine, marine siltstone and shale with at least 5 ash beds, each 2 to 5in (6 to 12cm) thick. Total thickness is approximately 394ft (120m).

Kd — **Dakota Sandstone**—Lower yellow-brown, cross-bedded, fluvial, quartzose sandstone overlain by marine shale and marine, cross-bedded, quartzose sandstone gradational upward into Mancos Shale. Approximately 144 ft (44 m) thick.

Permian

Pyu — **Upper Yeso Formation (sandstone-limestone member)**—Only upper 50ft (15m) exposed in southwest corner of Upham quadrangle, consisting of medium- to light-gray limestone. Total thickness of Yeso, including both upper and lower parts and all four members described in McLeod Tank and Alivio quadrangles, is approximately 1,300ft (390m).

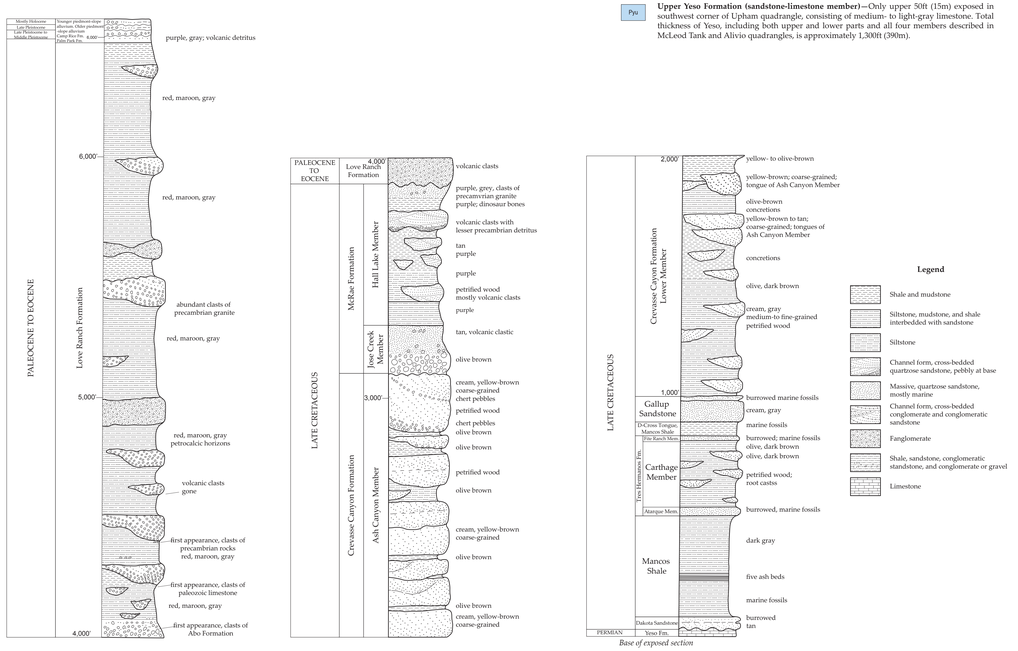


Figure 2—Composite stratigraphic column of the Cutter and Upham quadrangles.