

# Geology of the Ambrosia Lake Quadrangle, McKinley County, New Mexico

by  
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Bedrock geology consists of a gently east-dipping homocline of mostly Upper Cretaceous marine and terrestrial strata. Changes to the bedrock geology as mapped by Santos and Thaden (1966) west of San Mateo Mesa are very minor, and principally reflect cartographic errors that we corrected. Another principal difference is that we do not show the numerous small displacement faults mapped by Santos and Thaden (1966) that were based, presumably, on subsurface information. We only show faults that displace stratigraphic unit contacts enough to depict at this scale, or ones that are obvious at the surface. On San Mateo Mesa, our mapping reveals that the Satan Tongue of the Mancos Shale extends farther to the west than was shown previously, and that its pinch-out tapers to a wafer-thin wedge whose southwestern limit is just southwest of Elk Flat. In many areas, we mapped marker beds that correlate, locally, with some of the stratigraphic contacts recognized by Santos and Thaden (1966). Divisions between the A, B, and C map units of the Mancos Shale (Santos and Thaden, 1966) are shown on our map as marker beds.

## Unit Descriptions

### Quaternary

daf Disturbed and/or artificial fill

Qa Stream alluvium (Quaternary) – Gravel, sand, and silty sand in stream channels.

Qae Primarily stream alluvium subjected to eolian processes (Quaternary) – Sand, and silty sand occupying low-lying flat areas, often showing areas of deflation and eolian deposition on lee sides of bedrock hills and structures. Occasional gravel lag deposits.

Qaf Alluvial fan deposits (Quaternary) – Boulders, gravel, sand, and silty sand in alluvial fans debouching primarily from San Mateo Mesa.

Qes Primarily eolian silt and sand subjected to sheetwash (Quaternary) – Eolian silt and fine-grained sand on upland benches and slopes which have been subjected to sheetwash fluvial action.

**Qe** Eolian sand (Quaternary) – Fine- to medium-grained sand capping low mesas at the foot of San Mateo Mesa.

**Qt** Talus and landslide deposits (Quaternary) – Angular boulders and gravel occupying steep mesa-side slopes. Landslides are poorly sorted with a large fine-grained component and failure scarps are common.

**Qc** Colluvium (Quaternary) – Poorly sorted gravel, sand, and silty sand on slopes.

**Qta<sub>1-2</sub>** Stream terrace alluvium (Quaternary) – Gravel, sand, and silty sand adjacent to stream channels, which have incised >1 m into the alluvium. Two levels recognized.

## **Mesozoic Bedrock Units**

**Kmf** Menefee Formation (Upper Cretaceous) – Recessive unit of buff, mostly medium-grained arkosic sandstone with abundant shale, siltstone, coal, and coaly shale. Exposed only in the extreme northeast corner of the map area (at least 50m thick).

**Kms** Satan Tongue, Mancos Shale (Upper Cretaceous) – A somewhat recessive interval consisting of shale and siltstone with lesser medium- to thick-bedded, planar-laminated to low-angle cross-stratified, medium-grained, arkosic sandstone. Sandstone typically displays sole marks and is slightly darker brown than those in the enveloping Point Lookout Sandstone. Inoceramid molluscan fossils are present in many localities, but not consistently. Large portions of the unit in the north were mapped as Satan Tongue based on the discovery of the ammonite *Placenticerias cumminsi* and abundant clams at the south end of Elk Flat in a sequence laterally equivalent to what had previously been mapped as Satan farther northeast (Santos, 1966; Santos and Thaden, 1966). (0-35m thick)

**Kp** Point Lookout Sandstone (Upper Cretaceous) – Cliff-forming fine- to coarse-grained arkosic to subarkosic, and micaceous sandstone in amalgamated medium- to thick-bedded, typically cross-stratified sets. Most of the sandstone is medium-grained and moderately well-sorted. Sets are mostly tabular and wedge-shaped, with lesser troughs. Cross-strata range from planar to weakly asymptotic. Mud-chips and plant debris are common as are dark brown rusty concretions up to 30cm. The map unit is divided into an upper part (Kpu) and a lower Hosta Tongue (Kph) where the Satan Tongue of the Mancos Shale intervenes. The marine Hosta Tongue (Kph) also contains locally abundant inoceramid fossils. In the north a persistent marker bed mapped in the upper part (Kpu) corresponds to the upper contact of the Satan Tongue as mapped by Santos and Thaden (1966) and Santos (1966). Thickness of the entire unit (at least 150m); thickness of the upper part (100-120m); thickness of the Hosta Tongue (45-60m).

**Kcg** Gibson Coal Member, Crevasse Canyon Formation (Upper Cretaceous) - Recessive interval consisting of dark gray to purplish-gray shale, carbonaceous

mudstone, siltstone, and multiple <1m thick coal beds. Sparse, discontinuous, arkosic, medium-grained sandstone beds up to 5m thick are also present. A 2-3m thick, buff, medium-grained sandstone that grades up into an oyster coquina is present locally at or near the top of the unit. This bed is similar to the Stray Sandstone (Kcs), a probable transgressive lag sequence that caps the Dilco Coal member (Kci). A probable hadrosaur (dinosaur) skeleton occurs in the upper part of the unit about 15m below the oyster bed. (75-90m thick).

**Kcd Dalton Sandstone, Crevasse Canyon Formation (Upper Cretaceous) -** Cliff-forming sandstone unit consisting of amalgamated medium- to thick-bedded, plane-bedded to massive, fine- to coarse-grained and granule quartzose (<5% feldspar) sandstone with sparse granitic lithic grains. Sparse ripple cross-lamination zones form bounding surfaces of some thick-bedded units. Rusty weathering intraclastic pebbles and pebble rich intervals also define the bounding surface of some beds. (25-40m thick)

**Kmm Mulatto Tongue Mancos Shale (Upper Cretaceous) -** Dominantly olive-gray shale with lesser siltstone beds and laminae, the Mulatto also contains up to 20% thin- to medium-bedded fine- to coarse-grained subarkosic sandstone. At least two sandstone-rich intervals up to 20m thick are present along with several mollusk bearing micritic limestone beds. Shark teeth are abundant in some of the shale-rich sequences. (115-125m thick)

**Kcs Stray sandstone, Crevasse Canyon Formation (Upper Cretaceous) -** Informal unit of local usage that, where present, defines the top of the Dilco Coal Member. The Stray consists of a coarsening-upward sequence of tabular-planar cross-stratified, medium- to thick-bedded quartzose sandstone (<10% feldspar) that culminates in a granule sandstone to pebble conglomerate with abundant oyster shell fragments. (0-15m thick)

**Kci Dilco Coal Member, Crevasse Canyon Formation (Upper Cretaceous) -** Recessive unit characterized by sequences of thin- to medium-bedded, mostly tabular, brownish sandstone beds with >40% shale, siltstone, and laminated coaly shale interbeds. Sandstone beds contain abundant mud-chips, wood chips, and carbonaceous debris. (45-65m thick)

**Kg Upper Gallup Sandstone (Upper Cretaceous) -** Cliff-forming sandstone consisting of amalgamated medium- to thick-bedded, cross-stratified, fine- to medium-grained, subarkose, with abundant white mica up to 1.5mm. Cross-stratification in the upper part, especially, is wedge to trough-shaped with asymptotic laminae that are locally high-angle (>25°) and suggestive of eolian deposition. The unit is locally divided into upper and lower parts separated by a thin- to medium-bedded recessive marker bed. Cross-stratification in the lower part is typically more tabular-planar to wedge-planar, and lower angle (<15°), suggestive of marine, shore-face deposition. Inoceramid fossils are present locally in the lower part. (50-70m thick)

**Kgl** Lower Gallup Sandstone (Upper Cretaceous) - An Amalgamated, medium- to thick-bedded, wedge-planar to tabular-planar cross-stratified, fine- to medium-grained moderately well-sorted, calcareous, subarkosic sandstone occurs within the main body of the Mancos Shale (Km) about 50m below the base of the Upper Gallup Sandstone. (5-20m thick)

**Km** Mancos Shale, main body (Lower to Upper Cretaceous) – Shale, siltstone and minor thin- to medium-bedded, fine- to medium-grained calcareous arkosic sandstone. Sparse, thin, ripple cross-laminated limestone (calcarenite) beds are also locally present. The shale is commonly gypsiferous. Molluscan shell fragments are locally abundant. (220-250m thick)

**Kd** Dakota Sandstone (Lower to Upper Cretaceous) – Medium- to thick-bedded quartzose sandstone, typically strongly cemented and laced with quartz veinlets. The sandstone occurs in amalgamated, typically tabular-planar to tabular-weakly asymptotic cross-stratified sets (45-55m thick)

## **References**

Santos, E. S., and Thaden, R. E., 1966, Geologic Map of the Ambrosia Lake quadrangle, McKinley County, New Mexico: USGS GQ-515, one sheet 1:24,000 scale.

Santos, E. S., 1966, Geologic Map of the San Lucas Dam quadrangle, New Mexico: USGS GQ-516, one sheet 1:24,000 scale.