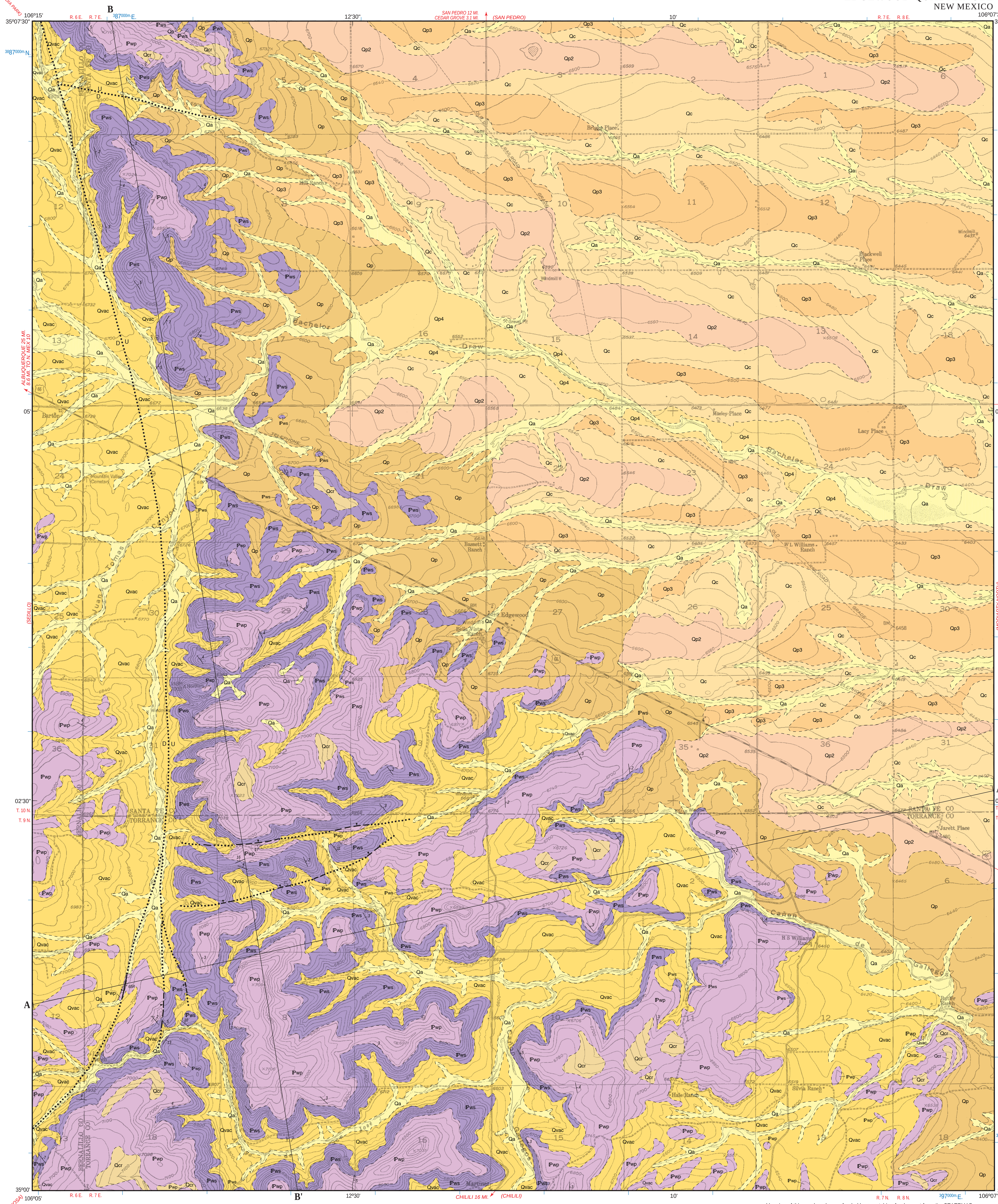
EDGEWOOD QUADRANGLE
NEW MEXICO



Base mapped, edited, and published by the Geological Survey. Control by USGS and USC&GS
Topography from aerial photographs by multiplex methods
Aerial photographs taken 1952. Field check 1954
Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, cental zone
Digital cartography by K. Glesener, M. M. Mansell, and D. J. McCraw

1:24,000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act, administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr. Peter A. Scholle, Director and State Geologist, Dr. Paul W. Bauer, Geologic Mapping Program Manager).

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STATEMAP quadrangles are available
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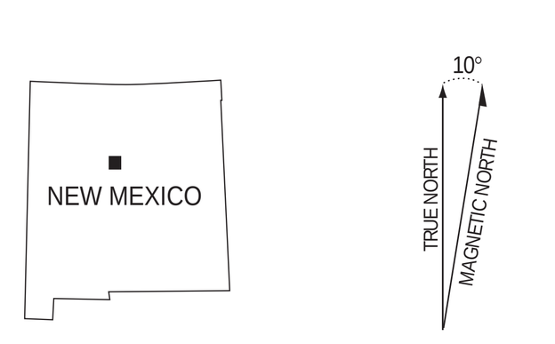

Geology of Edgewood quadrangle, Torrance and Santa Fe Counties, New Mexico

May 2000 (revised May 2003)

by

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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map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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.

Explanation of Map Symbols

A ├──┤ A' Location of geologic cross section.

Geologic contact. Dashed line indicates approximate location.

Normal fault showing dip direction, ball-and-bar on downthrown side. Solid where exposed, dashed where approximately known, dotted where concealed. "D" indicates downthrown side of concealed fault; "U" indicatesupthrown side. Tick indicates dip of fault plane.

Strike and dip of inclined bedding.

Description of Map Units

Quaternary

Qa **Valley-floor alluvium (Holocene)** — Predominantly silt, sand, and clay in modern drainage channels and underlying floodplains. Coarser grained materials occur in some areas. Unit is inset into unit *Qp* and older deposits of unit *Qvac*, and interfingers with younger deposits of units *Qvac* and *Qc* along drainage foot slopes. Includes unmapped bedrock exposures in scoured channel reaches. Unit is generally less than 3 m thick.

Qc **Colluvium mantling side slopes of drainages on the Estancia basin piedmont slope (Late Pleistocene (?) to Holocene)** — Derived from erosion of piedmont surface deposits and older, basin-fill deposits. Includes unmapped deposits of units *Qp 2-4* and older basin fill, and interfingers with valley-floor alluvium (*Qa*) along drainage foot slopes. Unit is estimated to be less than 5 m thick.

Qp **Middle and upper piedmont-slope alluvium and colluvium (Middle Pleistocene (?) to Holocene)** — Includes alluvial fan and coalescent alluvial fan complex along western uplands of the Estancia basin, and younger, inset alluvial fills. May also include contributions of eolian sediment. Predominantly silt and sand, with coarser grained beds dominated by sand and gravel present in the vicinity of uplands and along high-order drainages. Undivided unit (*Qp*) is mapped along the upper piedmont slope where it forms a relatively thin mantle (generally less than 10 m thick) over bedrock, and is depicted schematically on cross section A-A' to include surface deposits and underlying, older basin fill. Three surface units (*Qp2-4*) are differentiated on the map (unit *Qp1* is present north of the map area in the vicinity of South Mountain).

Qp4 **Piedmont alluvium, inset into unit *Qp3* and older basin-fill deposits (Late Pleistocene to Holocene(?))** — Predominantly sand and silt, with varying amounts of gravel and clay. Represented in the map area by deposits along Bachelor Draw. Estimated thickness is about 3 m.

Qp3 **Piedmont alluvium, inset into unit *Qp2* and older basin-fill deposits (Middle to late Pleistocene (?))** — Predominantly sand and silt, with varying amounts of gravel and clay. Unit comprises extensive deposits along major drainages. Estimated thickness is 3 m or more, although some areas mapped as *Qp3* may represent erosional surfaces with minimal accumulation of overlying fill.

Qp2 **Piedmont alluvium underlying highest interfluvial summits in map area (Middle to late Pleistocene (?))** — Predominantly sand and silt, with varying amounts of gravel and clay. Unit has been extensively incised in vicinity of major drainages, and is underlain by older basin-fill deposits.

Qvac **Upland-valley alluvium and colluvium (Middle Pleistocene (?) to Holocene)** — Predominantly silt, sand, and gravel grading into relatively coarse-grained colluvium along valley backslopes. Along high-order drainages unit consists of eroded older deposits and younger inset fills. Includes unmapped bedrock exposures along valley backslopes. Thickness ranges from a few meters or less in upland valleys and over bedrock highs, to an estimated 10 m or more along trunk drainages.

Qcr **Alluvium, colluvium, and residuum on valley backslopes and interfluvial summits in bedrock uplands (Middle Pleistocene (?) to Holocene)**—Predominantly silt, clay, and sand. Derived from weathering of the Madera Group (residuum on relatively flat-laying areas), and from downslope transport of weathering products. Mapped where accumulations cover extensive areas and are sufficiently thick to support large areas of grass cover. Also includes areas of unmapped bedrock exposure. Unit ranges from less than one to several meters in thickness.

Pennsylvanian

Wild Cow Formation (Upper Pennsylvanian) — Approximately 115 m (~380 ft) of the lower part of the Wild Cow Formation is exposed across the map area. Outcrops are largely restricted to limestone ledges and resistant sandstone beds; exposures of fine-grained siliciclastic intervals are generally limited to roadcuts and the walls of arroyos.

IPwp **Pine Shadow Member** — Approximately 40 m (~130 ft) of the lower part of the member is exposed in the map area, where it consists of 2 to 3 siliciclastic intervals, several meters thick, and intervening intervals, up to a few meters in thickness, dominated by ledge-forming limestone beds. Siliciclastic intervals are generally poorly exposed and contain thin interbeds of tabular- and nodular-weathering limestone and calcareous shale. A one- to several-meter-thick sandstone to silty sandstone commonly crops out approximately 12 m (~40 ft) above the base of the member in the map area. Exposed blocks of sandstone from this interval are generally red to yellow, are composed of fine- to coarse-grained sand and pebbly sand, and are quartzose to arkosic. Ledge-forming limestone intervals typically consist of mudstones and wackestones, although coarse skeletal fragments are abundant in some beds. Fusulinids are abundant in the lower few meters of the map unit. Total thickness of the Pine Shadow is approximately 60 to 90 m (200 to 300 ft) thick on adjoining quadrangles to the west and southwest.

IPws **Sol se Mete Member** — Approximately 75 m (~250 ft) of the upper part of the member is exposed in the map area. The upper 5 to 10 m (~15 to 30 ft) of the unit is dominated by thick beds of ledge-forming limestone. Underlying deposits consist of yellow, gray, and red shale with discontinuous siltstone and sandstone interbeds, and limestone beds that range from less than one to a few meters in thickness. Limestone beds are typically mudstones and wackestones, although brachiopods, crinoid stems, and other bioclasts are abundant in some intervals. Two limestone intervals containing abundant *Triticites*, one near the top of the Sol se Mete and another approximately 30 m (~100 ft) below the top of the unit can be traced laterally in the northern part of the map area. Total thickness of the Sol se Mete is assumed to be 90 m (~300 ft) on the cross sections.

IPm **Los Moyos Limestone (Middle Pennsylvanian) (cross sections only)** — On adjoining quadrangles to the west and southwest, the Los Moyos Formation is characterized by several meter-thick intervals of thin- to thick-bedded limestone and thin shale and calcareous shale interbeds, separated by one to several meter-thick intervals containing relatively abundant, fine-grained siliciclastic sediment. The formation also contains relatively minor sandstone and pebbly sandstone interbeds. Limestones commonly contain abundant chert. Overall the Los Moyos Formation contains a higher proportion of limestone relative to siliciclastic sediments than in the overlying Wild Cow Formation. Assumed to be 180 m (~600 ft) thick on the cross sections.

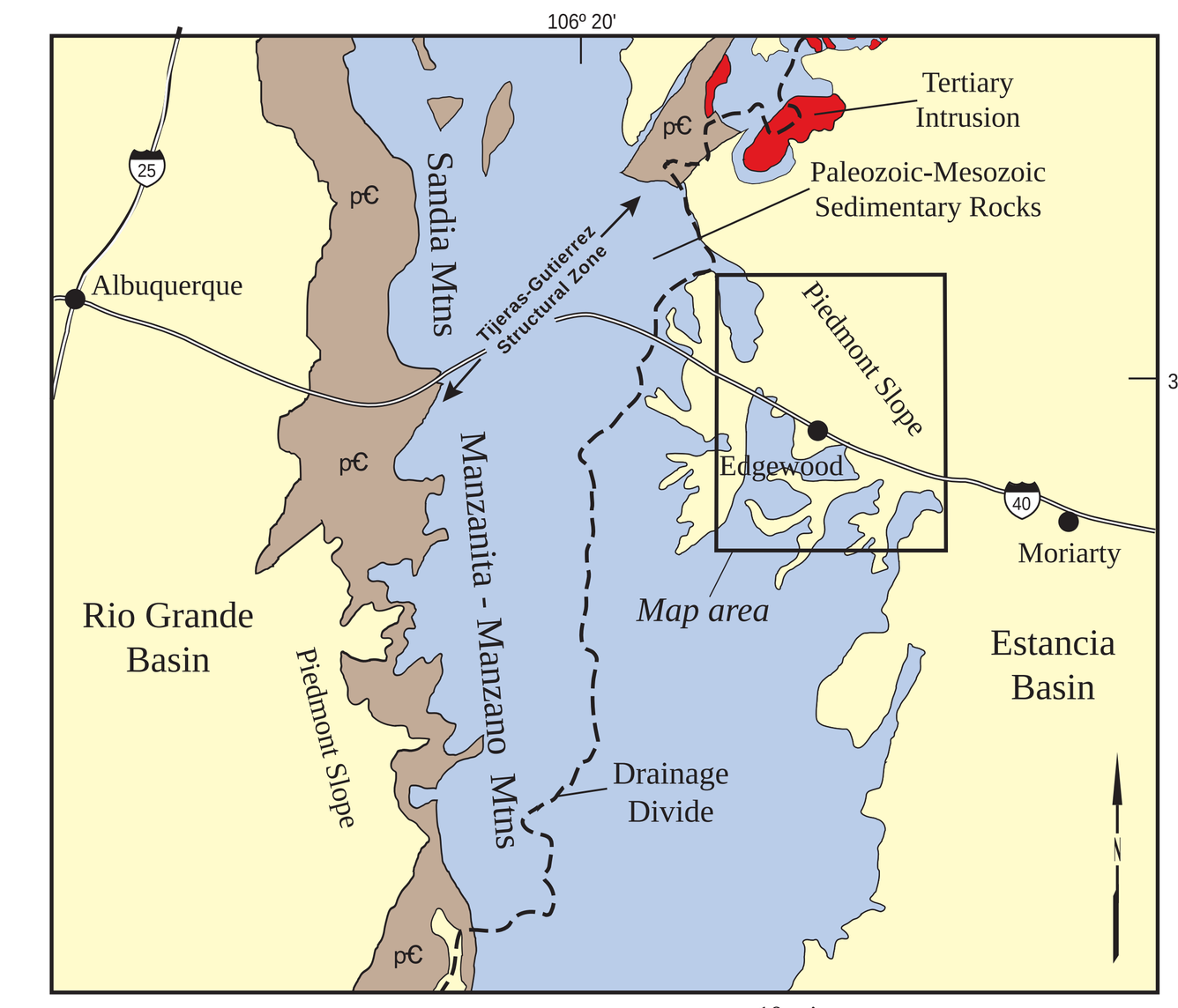
IPs **Sandia Formation (Middle Pennsylvanian) (cross sections only)** — On adjoining quadrangles to the west and southwest, the Sandia Formation consists of sandstone, shale, and pebbly sandstone, with thin interbeds of limestone and calcareous shale in some areas. The thickness of the Sandia Formation is variable, with an average thickness of about 45 m in the Sandia Mountains (Kelley and Northrop, 1975) and ranging up to about 90 m in the Manzano Mountains (Myers, 1988). Pre-Sandia Formation (Mississippian (?)) sedimentary rocks in the map area, if present, are included in the Sandia Formation in the accompanying cross sections, with an assumed, overall thickness of the combined Sandia Formation plus pre-Sandia strata of 45 m (~150 ft).

Proterozoic

Xu **Proterozoic crystalline rocks, undifferentiated (cross sections only).**

Geologic Discussion

The Edgewood 7.5-minute quadrangle is located approximately 40 km east of Albuquerque, NM along the eastern side of the Manzanita Mountains (see location map). The town of Edgewood, which lies along Interstate Highway 40, is located on the quadrangle. About half of the map area is underlain at relatively shallow depths by sedimentary rocks consisting of limestone, shale, and sandstone of the Pennsylvanian Madera Group. Bedrock uplands are generally covered by stands of pinyon and juniper and thin to moderately deep, well-drained soils form an extensive cover over many upland areas shown as bedrock on the map. The northeastern part of the quadrangle is underlain by up to several tens of meters of valley- and basin-fill alluvium of the Estancia basin, and is dominated by grass cover. No perennial streams flow through the map area and water for stock and domestic use is dependent on groundwater supplies. Average annual precipitation for the area is on the order of 12 inches (~30cm.).



Map showing location of Edgewood quadrangle, generalized geology, and physiographic features. Surface drainage to the east is into the topographically closed Estancia basin.

Availability of groundwater from wells in the Madera Group aquifer system is generally thought to depend on fractures and dissolution channels in limestone units (Titus, 1980), although siliciclastic intervals may contribute to the yield of some wells. Evidence for subsurface dissolution of limestone in the area includes sinkholes at the surface and the Edgewood caverns (accessible through the casing of a dry borehole) north of the town of Edgewood. Because of the interbedded lithologies of the Madera Group and resulting heterogeneity with respect to groundwater flow, confined or semi-confined aquifer systems and local, perched aquifers may exist. Compared to areas immediately underlain by bedrock on the Edgewood quadrangle, the shallow aquifer system to the east of the map area, along the axis of the Estancia basin, consists of unconsolidated sediments of the Estancia basin-fill. Wells in the basin-fill aquifer system are capable of yielding 100s of gallons per minute and yield sufficient groundwater for extensive agricultural activity toward the axis of the basin. The Edgewood quadrangle is located along the transition from upland areas dependent on the Madera Group aquifer system, to areas that utilize the basin-fill aquifer system of the Estancia basin to the east.

Quaternary Map Units

Unconsolidated surface deposits in the map area consist of upland-valley alluvium and colluvium, and piedmont alluvium and colluvium derived from weathering of shale, limestone, and sandstone of the Pennsylvanian Madera Group. Sediment transport is toward the east and the western piedmont of the topographically closed Estancia basin. Map units consist of valley-floor alluvium associated with modern drainages (*Qa*), upland valley alluvium and colluvium (*Qvac*), alluvium, colluvium, and residuum on valley backslopes and bedrock uplands (*Qcr*), and piedmont alluvium and colluvium (*Qp* and *Qc*). Downcutting and overall basinward shifts in deposition on the Estancia basin piedmont have resulted in a stepped sequence of surface deposits that are generalized on the map to include an older unit that caps the highest interfluvial summits (Qp2), and younger inset fills (Qp3, Qp4, and Qa).

Unconsolidated deposits in upland valleys are generally on the order of 10 m. thick or less, but may be 20 m. thick or more in places, especially in the large N–S-trending valley on the western edge of the map. Unconsolidated deposits in the Estancia basin to the east of the map area reach a maximum thickness of ~120 m. (New Mexico State Engineer, 1967). Maximum thickness of unconsolidated deposits along the Estancia basin piedmont within the map area is on the order of 30 to 40 m, based on well-driller's logs for the area. These piedmont-slope deposits include the surface deposits shown on the map, and underlying, older deposits that are referred to here as the Estancia basin fill.

Absolute ages for Quaternary map units on the Edgewood quadrangle are not available. Relative ages for piedmont surface deposits are indicated by inset relationships. Older surface deposits on the piedmont contain well-developed, pedogenic accumulations of carbonate (stage II to stage III carbonate development), suggesting late and perhaps middle Pleistocene ages for units *Qp2* and *Qp3*. Little is known regarding the age of older basin-fill deposits that are covered by the surface deposits shown on the map. These older deposits may range in age from Pliocene to late Miocene (Smith, 1957). Geologic events leading to topographic closure of the Estancia basin, and the timing of basin closure, are also speculative.

Bedrock Map Units

Surface exposures of bedrock in the map area belong to the Madera Group. The Middle to Upper Pennsylvanian (Desmoinesian-Virgilian) Madera Group includes marine and marginal-marine carbonate and siliciclastic sediments consisting of interbedded limestone, shale, sandstone, and minor conglomeratic sandstone. The thickness of the Madera Group in the vicinity of the Sandia and Manzano Mountains ranges from about 400 m (Kelley and Northrop, 1975) to perhaps 580 m or more (Read, *et al.*, 1944, measured section 14), and has traditionally been divided (*e.g.*, Read, *et al.*, 1944; Kelley and Northrop, 1975) into a lower unit containing a large proportion of limestone ("lower gray limestone"), and an upper unit containing a large proportion of siliciclastic sediments ("upper arkosic limestone"). The Madera Group gradationally overlies rocks of the Middle Pennsylvanian (Atokan) Sandia Formation, which is also marine to marginal-marine in origin and is dominated by siliciclastic sediments. The Sandia Formation generally overlies Proterozoic crystalline rocks in the area, although a thin (up to 20 m. thick) sequence of limestone and shale deposited during the Mississippian (?) occurs between the Sandia Formation and Proterozoic crystalline rocks at several localities in the Sandia and Manzano Mountains (Kelley and Northrop, 1975). The Madera Group is gradationally overlain by the Bursum Formation (Virgilian-Wolfcampian), which, in the Manzano Mountains, consists of interbedded siliciclastic sediments with a few thin limestone interbeds. The Bursum Formation was probably deposited as the last of the Pennsylvanian seas withdrew from the area, and is overlain by continental redbeds of the Permian Abo Formation.

Subdivision of the Madera Group in the Manzano Mountains was formalized by Myers (1973), who elevated the Madera to group status and designated two formations within the Madera – the Los Moyos limestone and the overlying Wild Cow Formation (Myers also included the Bursum Formation in the Madera Group). The Los Moyos limestone and Wild Cow Formation generally correspond to the earlier concept of lower gray limestone and upper arkosic limestone members of the Madera "Formation." As noted by Myers (1973), the Los Moyos and Wild Cow Formations are likely equivalent to the Gray Mesa and Atrasado Members, respectively, of the Madera "Formation" as defined by Kelley and Wood (1946) in the vicinity of the Lucero uplift. Recent recommendations to simplify the stratigraphic nomenclature of Pennsylvanian rocks in New Mexico (Kues, 2001) suggest that the formation names Los Moyos and Wild Cow may eventually be abandoned in favor of the names Gray Mesa and Atrasado, which have precedence.

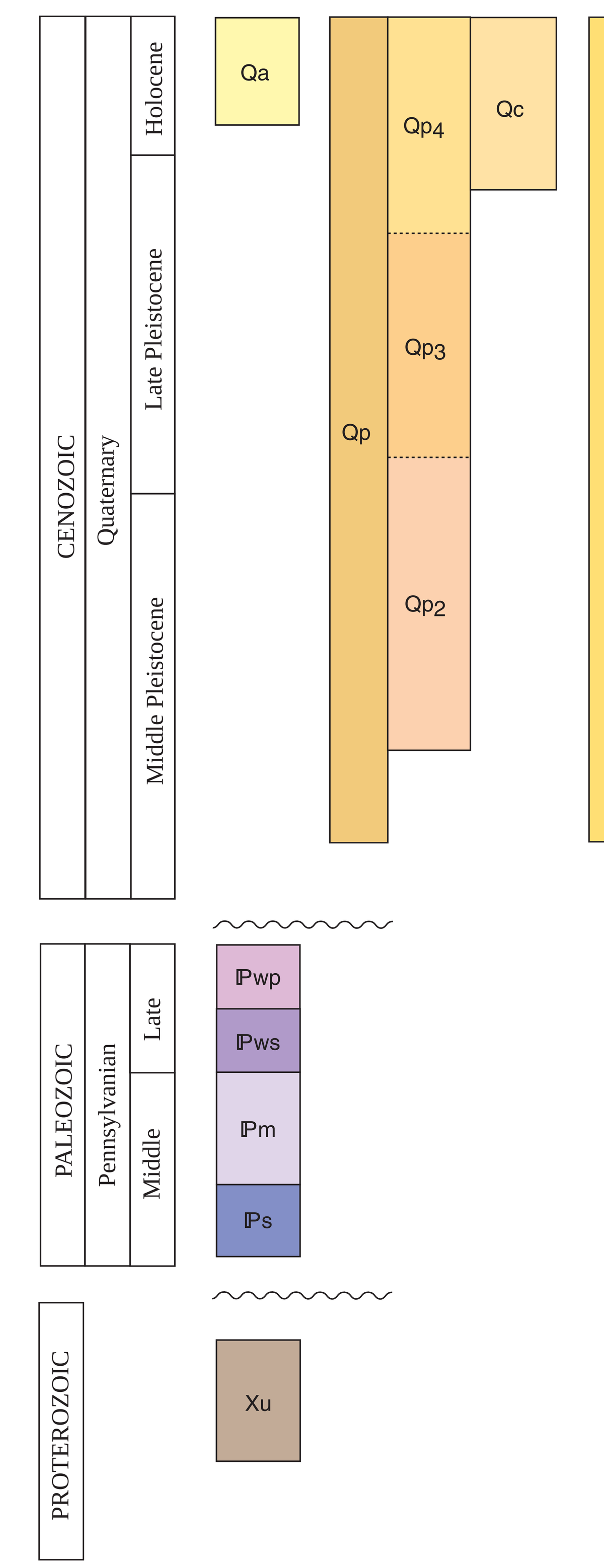
Myers (1988) concluded that most of the Los Moyos limestone lies within the fusulinid zone of Beedeina, indicating that the unit is correlative to Desmoinesian strata of the mid-continent. The overlying Wild Cow Formation lies within the zone of Triticites, and corresponds for the most part to Missourian and Virgilian strata of the mid-continent. The Wild Cow Formation was subdivided by Myers (1973) into three members. The three members in ascending order are the Sol se Mete, Pine Shadow, and La Casa. Each of the three members conceptually consists of a basal sequence containing an abundance of siliciclastic beds that grade upward into capping intervals dominated by carbonate-shelf limestones. Subdivision of the Madera Group on the geologic map and cross sections uses this nomenclature of Myers (1973). Surface exposures in the map area are probably limited to portions of the Sol se Mete and Pine Shadow Members of the Wild Cow Formation.

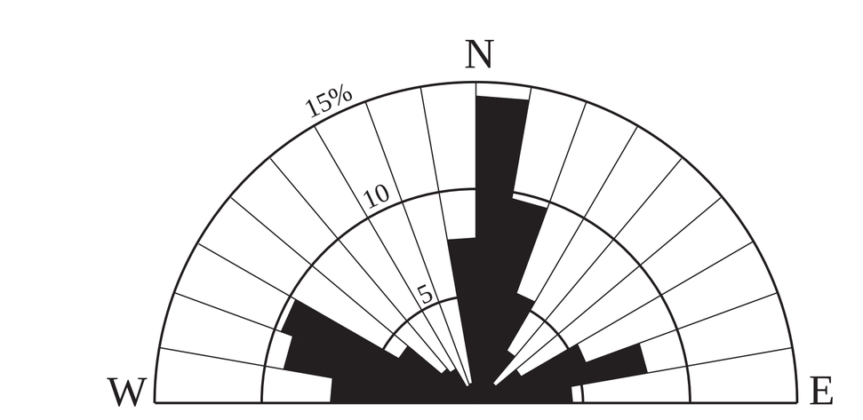
Structure

The Edgewood quadrangle lies several km to the east of the NE-SW trending Tijeras-Gutierrez structural zone, which exhibits a variety of structural features including faults and folds within Phanerozoic sedimentary rocks and surface exposures of Proterozoic basement. The region was subjected to compression during the latest Mesozoic–Paleogene Laramide orogeny, followed by Neogene extension that resulted in formation of the Rio Grande rift to the west (Karlstrom, et al., 1999). To the east of the Tijeras-Gutierrez structural zone in the vicinity of the Edgewood quadrangle, sedimentary rocks of the Madera Group occur near the surface and generally dip a few degrees toward the east. This eastward-dipping structural trend, as noted by Kelley and Northrop (1975), is disrupted by a N-S trending, down-to-the-west fault zone that cuts across the Edgewood quadrangle. This structure is expressed geomorphically by the large N-S trending valley on the western edge of the map and the ridge immediately to the east of this valley. Limited field evidence, including the geometry of the probable trace of the fault with respect to topography, and a single fault-plane exposure in the southwestern part of the map area, is consistent with reverse movement across the fault zone. Three approximately E-W trending faults are present just to the east of this N-S trending structure, one in the northern part of the map area and the other two just south of the Bernalillo - Torrance county line. Limited exposures of barite, fluorite, and calcite mineralization are present in the vicinity of the latter two E-W fault zones, and in Section 7, T. 9 N., R. 7 E. A zone of apparent hydrothermal alteration is present in the northwestern part of the map area in Sections 6 and 7, T. 10 N., R. 7 E. that is visible on aerial photographs as a linear, approximately N 15 W trending feature. Field evidence for vertical displacement across this feature was not found and it is not mapped as fault.

The overall eastward dip of the Madera Group in the map area is modified by what appear to be broad, low amplitude, roughly E-W trending folds. These undulations are expressed by latitudinal changes from NW striking to NE striking beds. Sub-vertical joint sets in exposed bedrock are common and orientations of joint traces (see rose diagram of joint orientations) are similar throughout the map area.

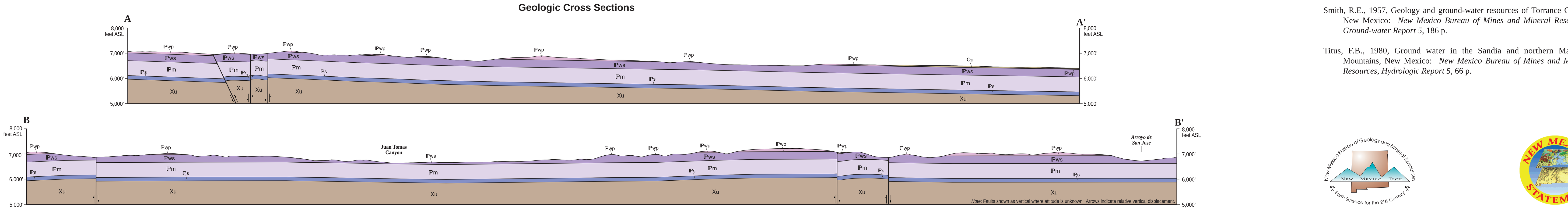
Correlation of Map Units





Rose diagram of joint orientation data, Edgewood quadrangle. N = 303.

Geologic Cross Sections



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