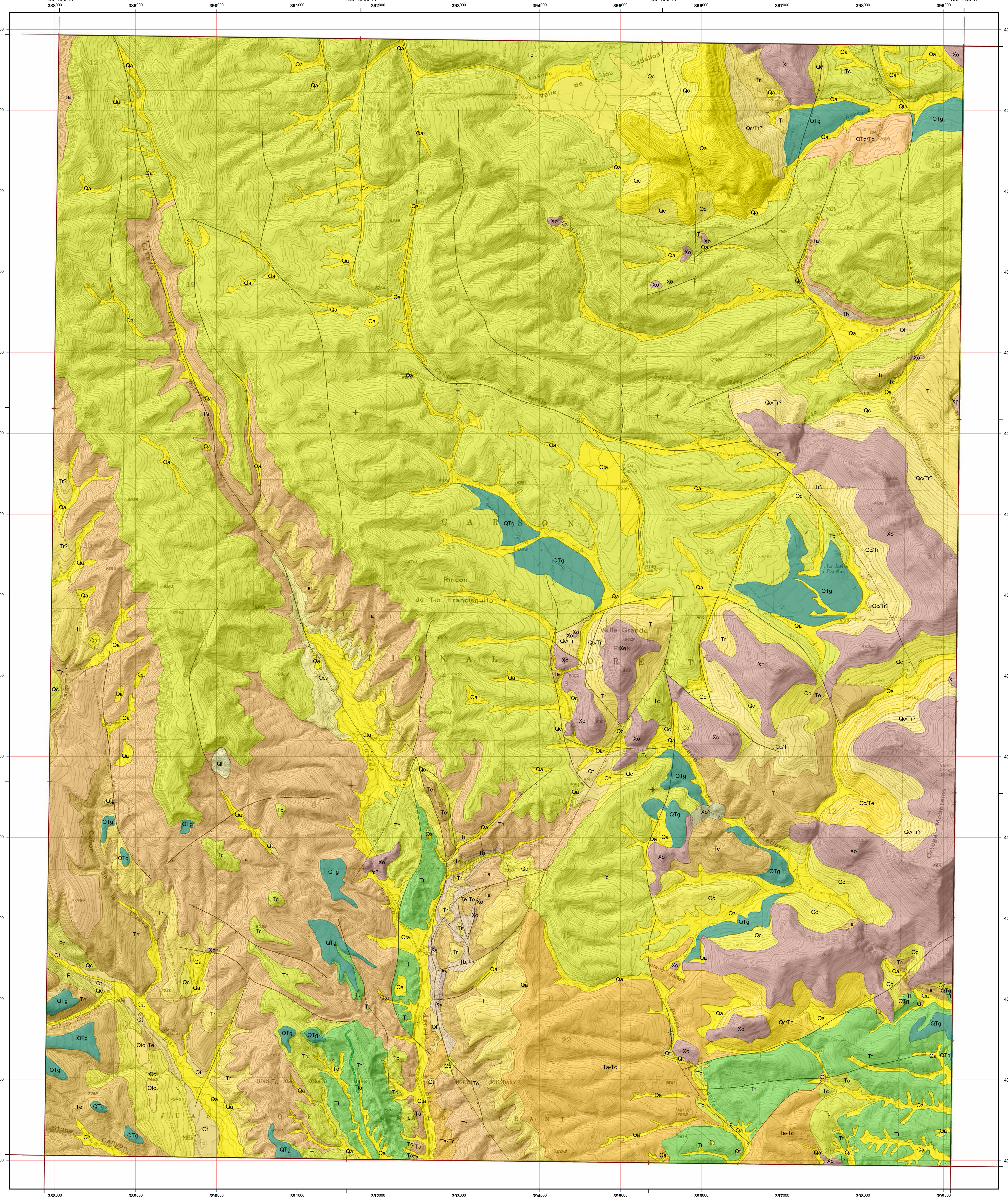
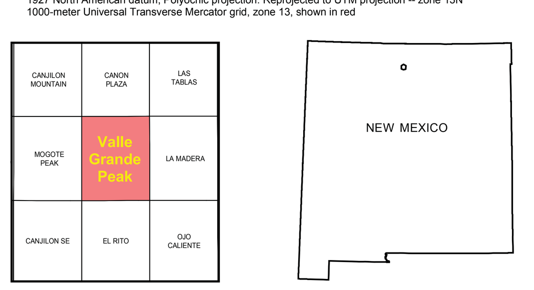


Base map from U.S. Geological Survey 1953, from photographs taken 1947, field checked in 1953, edited in 1953.
1927 North American datum, Polyocnic projection. Reprojected to UTM projection -- zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in red



QUADRANGLE LOCATION

Magnetic Declination
April, 2007
9º 40' East
At Map Center

1:24,000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

This draft geologic map is preliminary and will undergo revision. It was produced from either scans of hand-drafted originals or from digitally drafted original maps and figures using a wide variety of software, and is currently in cartographic production. It is being distributed in this draft form as part of the bureau's Open-file map series (OFGM), due to high demand for current geologic map data in these areas where STATEMAP quadrangles are located, and it is the bureau's policy to disseminate geologic data to the public as soon as possible.

After this map has undergone scientific peer review, editing, and final cartographic production adhering to bureau map standards, it will be released in our Geologic Map (GM) series. This final version will receive a new GM number and will supercede this preliminary open-file geologic map.

DRAFT

New Mexico Bureau of Geology and Mineral Resources
Open-file Map Series
OF-GM 180

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. J. Michael Timmons, *Geologic Mapping Program Manager*).

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This and other STATEMAP quadrangles are (or soon will be) available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html

Geologic map of the Valle Grande Peak quadrangle, Rio Arriba County, New Mexico.

May 2008

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.

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.

Unit Descriptions

Qal – Alluvium. Late Pleistocene to Holocene. Alluvial deposits in modern drainage bottoms and elevated basins. Deposits include conglomerates, sands, and silts. They are typically beige to light gray and consist mostly of fine to medium-grained sands with lesser amounts of silt and conglomerates. Composition of clasts varies depending on source areas. Holocene terrace deposits less than 2 meters above drainage bottoms are also included. Maximum thickness is estimated to be less than 5 meters.

Qt – Holocene terrace deposits. Late Pleistocene to Holocene. Terrace deposits adjacent to modern creek bottoms, though more than 2 meters above the drainage bottom. Most are fill terrace deposits of sand, silt and gravel < 10 m above modern drainages. These deposits include sand, gravel, and conglomerate. Thickness less than 5 meters.

Qc – Colluvium. Late Pleistocene to Holocene. Poorly sorted talus, debris, and other rock fragments derived from local metamorphic and sedimentary rocks. Often occurs as wedge-shaped hillslope deposits. Poorly consolidated units, including the Ritito and Abiquiu Formations, are typically expressed at the surface as colluvial clasts and often obscure contacts between units. Also, cobble and boulder alluvial facies of the generally well consolidated El Rito Formation produce significant colluvium. Although pervasive throughout the quadrangle, colluvium was seldom mapped. Maximum thickness is approximately 5 meters.

Qca – Colluvium and alluvium. Late Pleistocene to Holocene. Mapped only in a few valley sides and bottoms where colluvial and alluvial facies are intermixed. Sandy alluvial beds with minor gravel and muddy beds preserved as terrace-like features on top sandstone benches and capping Tertiary units. Thickness ranges from 0.5 to almost 2 meters.

Ql Landslide. Pleistocene to Holocene. Unsorted, chaotic debris emplaced during a single detachment event from a steep slope or cliff, generally containing a sediment matrix. Can also occur as a block detachment along the flanks of a steep hillslope. Fan-shaped deposits occur where debris spread out on valley floor. Thickness can exceed 20 meters.

Qta Alluvium and terrace deposits. Pleistocene to Holocene. Holocene alluvium and terrace deposits undifferentiated along modern drainage bottoms. Thickness is less than 5 meters.

QTg High-level alluvium and terrace deposits. Late Pliocene to Pleistocene? Sand, silt, and conglomerate deposited on high-level surfaces more than 15 meters above modern drainages. In the southwestern portion of the quadrangle, these include strath terrace deposits that correlate to the Qt2 terrace mapped in the Canjilon SE quadrangle (Kempter et al., 2007), and to the highest terrace in the El Rito quadrangle currently mapped by Koning et al., (in progress). Guaje tephra from the Toledo Caldera eruption at ~1.6 Ma deposited on the El Rito high terrace suggests a minimum age for these deposits and surfaces in the Valle Grande Peak quadrangle. Older alluvial deposits along the southern portion of Borracho Canyon, west of Vallecitos, are also included in this unit. Actual thickness of sediment can vary from 1 to 15 meters.

Ttp Tesuque Formation - Coarse-grained Plaza lithosome deposits (middle Miocene to upper Oligocene) – Slightly tuffaceous, pebbly sand and sandy pebbles in thick channel-fills possessing very thin to medium, lenticular to planar beds and laminations. Local planar cross-stratification 25 cm-thick. Gravel are matrix- to clast-supported, subrounded, poorly sorted, and consist of very fine to very coarse pebbles and minor cobbles and boulders. Clasts consist of purplish gray, porphyritic dacite (possible rhyodacite or andesites may also be present); light gray, white, and pinkish white dacites that often are weathered and have 10-15% mafic phenocrysts and less than 15% plagioclase phenocrysts; 1-20% quartzite; and less than 10% rhyolite and welded tuffs. Channel-fill sand is brown to light gray (10YR 5/4-7/2; 10YR 6/2-3), very fine to very coarse-grained but mostly medium- to very coarse-grained, and poorly sorted. Medium to very coarse sand is subrounded to subangular and composed of volcanic grains with 10-25% quartz and plagioclase. Very fine to medium sand consists of subangular plagioclase and quartz, 7-15% mafic grains, and 1-5% volcanic grains. Channel-fill sand may include 0-2% clay and silt and1-5% tuff. Unit includes minor beds of pink to reddish yellow (7.5YR 7/3-4 and 6/6) very fine- to medium-grained sand and clayey-silty very fine- to medium-grained sand beds that are medium to thick, tabular, and internally massive to planar-laminated; these beds may include minor (1-20%), scattered medium to very coarse, subrounded, dacite(?) sand grains (and locally up o 2% volcanic pebbles). This relatively fine sand is subangular to subrounded, moderately to poorly sorted, and consists of quartz and plagioclase with 15-25% potassium feldspar or orange-stained quartz, 3-5% mafic grains, and 1-5% volcanic grains. The fine sand beds are well consolidated and perhaps weakly cemented. Well consolidated and weakly to moderately cemented by calcium carbonate and calcium carbonate. Imbrication and channel-margin data indicate west to southwest paleoflow directions. The term "Plaza lithosome" is slightly modified from the Plaza petrosome of Ingersoll et al. (1990), and may in the future be proposed as a member of the Tesuque Formation. Volcanic clasts in the Plaza petrosome returned K/Ar ages of 21-23 m.y. (Ekas et al., 1985; Ingersoll et al., 1990), so this unit probably postdates 20 Ma. The heterolithic upper unit of the Plaza lithosome (Koning et al., 2008) is not found on this quadrangle, so what is preserved is probably the lower to middle parts of the Plaza lithosome. These particular strata appear to pre-date the Pojoaque white ash zone (13.2-14.0 Ma; Koning et al., 2007), as discussed in Koning (2008). Thickness of 80-90 m present in the southeastern part of the quadrangle, but that does not represent the complete thickness of the unit.

Tta **Tesuque Formation -** Tuffaceous sand and pebbly sand similar to Abiquiu Formation but interbedded in lithosome P of the (lower Miocene) **–** White to light gray, very fine- to very coarse-grained sand and pebbly sand. Pebbles are very fine to very coarse, subrounded, poorly sorted, and consist of probable dacite (as in lithosome P) and subordinate quartzite; minor cobbles in this unit are of quartzite. Veery minor pebbles of weathered, biotite-bearing tuff. Sand is mostly subangular to subrounded, moderately to poorly sorted, and consists of quartz and plagioclase with 3-5% biotite (and other mafics) and 3-8% subrounded volcanic grains; estimate 1-15% tuff. Biotite grains are subhedral and fresh-looking. Moderately consolidated and non-cemented. Unit is interbedded in the lower lithosome P of the Tesuque Formation, and probably 18-20 Ma. Approximately 6 meters thick.

Tlpc Cordito member, Los Pinos Formation. Oligocene to Lower Miocene. Beige to light brown to orange gravelly sandstone and conglomerate. Gravel horizons are typically clast supported and poorly sorted, with planar and trough cross-stratification. Cementation is highly variable, ranging from poorly consolidated to well consolidated. Where consolidated, this unit can be well exposed, exhibiting bedding features and providing resistant surfaces for many eastward-tilted mesas in the quadrangle (Figure 3). Where unconsolidated, this unit is exposed primarily as hillslope colluvium. Volcanic clasts in this unit include crystal-poor, flow-banded rhyolite lava, crystal-rich rhyolite lava, Amalia Tuff, other volcanic tuffs, and dacite lava. Though variable throughout the section, a typical clast count yielded 40% quartzite, 12% schist, 5% quartz vein, 25% crystal-poor rhyolite, 5% crystal-rich rhyolite lava, and 12% dacite lava. The relatively abundant gray rhyolite and welded tuffs serve to distinguish this unit from the overlying Plaza lithosome of the Tesuque Formation. Paleocurrent indicators from this unit suggest transport in a westerly to southwesterly direction. Field mapping reveals this unit is gradational with the underlying Abiquiu Formation, which contains a more tuffaceous matrix. Dating of individual volcanic clasts by Ingersoll et al (1990) give K-Ar ages of 24-28 Ma, providing a general estimate for the age of this unit. Thickness is greatest in the northern portion of the quadrangle, estimated at approximately 100 meters.

Ta Abiquiu Formation. Oligocene to Upper Miocene. White to beige fine-grained tuffaceous sandstones with interbedded shales and fluvial conglomerates that contain pebbles or cobbles of volcanic rocks and Proterozoic Ortega quartzite. The distinctive presence of 25.1 Ma Amalia Tuff clasts and other Ar^{40}/Ar^{39} age data indicate that the deposition of this unit was nearly coincident with major ignimbrite eruptions in the Latir field between 24-25.2 Ma (Smith et al., 2002). Though variable, a typical clast count from this unit yielded 30% Proterozoic rocks, 6% crystal-rich rhyolite lava, 12% volcanic tuff, and 52% crystal-poor rhyolite lava. Gravels and conglomeratic lenses increase towards the top of the unit, grading into the overlying Cordito Member of the Los Pinos Formation (Figure 4). The lower part of the unit consists of broadly lenticular and planar reworked tephra deposits with abundant volcanic ash (Figure 5). Occasional boulder conglomerates (boulders up to 0.8 meters across) are interbedded with the sandstones, but are less than 2 meters thick. Boulders of quartzite, Amalia Tuff, and rhyolite lava are common. Crystals of quartz, feldspar and biotite are often well preserved in the tuffaceous sandstone. Gravel lenses also occur, with poorly sorted angular volcaniclasts less than 1 cm across with very little matrix. Paleocurrent data imply a southwesterly flow for these deposits. Field evidence suggests the Abiquiu Formation thins to the north as the overlying Cordito Member thickens. Maximum thickness is approximately 75 meters.

Tb Basalt lava. Oligocene. Weathered green to dark gray to black, olivine-bearing basalt. Only two exposures of this unit were found in the quadrangle and it is not known if they represent separate flows. Near Arroyo Seco springs, a phenocryst-poor basalt flow lies at the contact between the Ritito and Abiquiu Formations. This pervasively altered flow outcrops as greenish clay with residual cores of dark gray basalt that can be flow banded and vesicular (Figure 6). A red paleosol is typical at the top of the flow. The second exposure of basalt in the quadrangle occurs in the northeastern corner of the quadrangle along Cañada del Agua. This vesicular, flow-banded basalt is also phenocryst poor but not as pervasively altered. No rock unit could be found underlying this flow, so the stratigraphic position of this flow is uncertain. It may occur within the Abiquiu Formation and not at its base. Most likely these two flows correlate to the Hinsdale basalt and were emplaced sometime between 22-27 Ma. (Lipman and Mehnert, 1975 and 1979); Baldridge et al., 1980) A similar basalt flow near Ojo Caliente yielded an age of ~22 Ma (Baldridge et al., 1980). Maximum thickness of exposed basalt is ~20 meters.

Tr Ritito Formation. Oligocene. Gray piedmont alluvial fan deposits, commonly conglomeratic and mildly arkosic. Sandy matrix can be light brown, brown, to reddish brown. This unit is poorly consolidated throughout the quadrangle, exposed primarily as colluvial float on hillslopes. The poorly bedded nature of the deposit is suggestive of a depositional environment of braided streams and debris flows. Clasts in the conglomerate are typically subrounded to rounded (up to 0.7 meters across), consisting of Proterozoic Ortega quartzite, schists, metagranite, and a variety of metavolcanic rocks. Although quartzite is the dominant clast, the remaining metamorphic clasts typically make up 20 to 40% of the deposit. Locally, dacite lava clasts occur in the deposit, but were not observed to exceed 5% of the clast total. In the upper part of the deposit there is commonly a tuffaceous matrix, similar to the overlying Abiquiu Formation. Previously classified as the Lower Abiquiu Formation (references), Maldonado and Miggins (2007) have referred to this unit as the conglomerate of Arroyo del Cobre. The age of this unit is not well constrained at this point in time. Basalt flows that overly the Ritito Formation in the Las Tablas quadrangle suggest an age of > 27 Ma (Koning et al, 2006). Maximum thickness of this unit is 50 meters.

Te El Rito Formation. Eocene. Red-stained quartzite conglomerate. Sub angular to very well rounded cobbles and boulders of quartzite. Remarkable boulder conglomerate facies with boulders up to 2 meters across are exposed in prominant cliffs along El Rito and Arroyo Seco canyons (Figures 7 and 8). At the base of these cliff exposures the basal contact of the conglomerate with underlying Proterozoic rocks is exposed (Figure 9).

Clasts are dominantly quartzite (typically ~90%), but can also include other Proterozoic rocks, in particular metavolcanics of the Vadito Group. The bluish-gray quartzite clasts are stained red on their outer surfaces. Although this unit is typically well consolidated, poorly consolidated exposures also occur. The age of these sediments is regarded to be Eocene (Logsdon, 1981; Smith et al., 1961) and the unit is thought to have been deposited in a syn-orogenic basin between Laramide highlands in the Sierra Nacimiento to the west and the Tusas Mountains to the northeast. Near the top of the unit lenticular red sandstones can be interbedded with the conglomerate. Maximum thickness is approximately 100 meters.

Pc Cutler Group, Arroyo del Agua Formation (?). Early Permian. Orange to red siltstone, sandstone and minor intraformational and extraformational conglomerate. Sandstone beds are arkosic and trough crossbedded. This unit underlies El Rito Formation conglomerates in the El Rito Creek canyon in the southwest corner of the quadrangle. Only the sandstone beds are exposed, tilting to the northwest and in angular unconformity with the overlying El Rito Formation. A second possible outcrop of this unit is exposed at the base of the Potrero canyon falls, where a red, arkosic sandstone overlies the Ortega quartzite. Maximum thickness of this unit in the quadrangle is ~70 meters.

Xo Ortega quartzite. Proterozoic. Massive gray to bluish gray quartzite that often preserves original bedding structures (Figure 10). Medium to coarse-grained, vitreous cross-bedded quartzite consisting mostly of quartz with minor amounts of muscovite, kyanite, and layers of hematite. Some horizons are schistose and micaceous, with mica concentrated along bedding planes. Locally brecciated, especially near major faults and fold axes. Vein quartz common. The quartzite has been subjected to polyphase ductile deformation, multiple generations of folding and faulting, and lower greenschist to upper amphibolite grade metamorphism. This unit forms all of the high peaks and ridges of the Ortega Mountains, but also occurs as small exhumed mounds in several valley bottoms, where superposed streams have cut narrow slot canyons through the quartzite (Figure 11). Williams et al (1999) interpret the primary metamorphic age of the Ortega quartzite to be ~1.65 Ga. Maximum exposed thickness in the quadrangle is ~200 meters, although this unit is interpreted to be over a kilometer in thickness (Koning et al, 2007).

Xv Vadito Group Metavolcanic Schist. Proterozoic. White to light pink metarhyolite, consisting principally of fine-grained quartz, feldspar, muscovite, and opaques (Figure 12), with quartz and feldspar (?) porphyroblasts. This unit is only exposed along the uplifted eastern wall of Arroyo Seco canyon where it is overlain by the El Rito Formation conglomerate. Large blocks of the schist (up to 1 meter across) are incorporated into the basal El Rito conglomerate. This unit may correlate to the Cerro Colorado metarhyolite and the Arroyo Rancho metarhyolite (Bishop, 1997) found in the Ojo Caliente quadrangle, as well as to the Burned Mountain metarhyolite (Barker, 1958), and unit fs of Bingler (1965). The Cerro Colorado metarhyolite has been dated at ~1.70 Ga based on zircons (Bishop, 1997) and has been interpreted to have originally been ash flow tuffs (Just, 1937; Jahns, 1946; Treiman, 1977).

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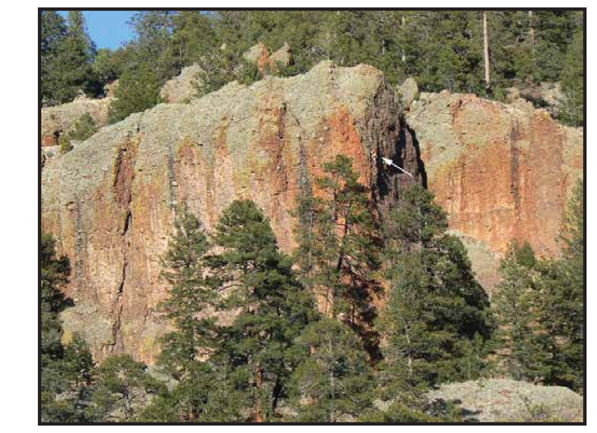
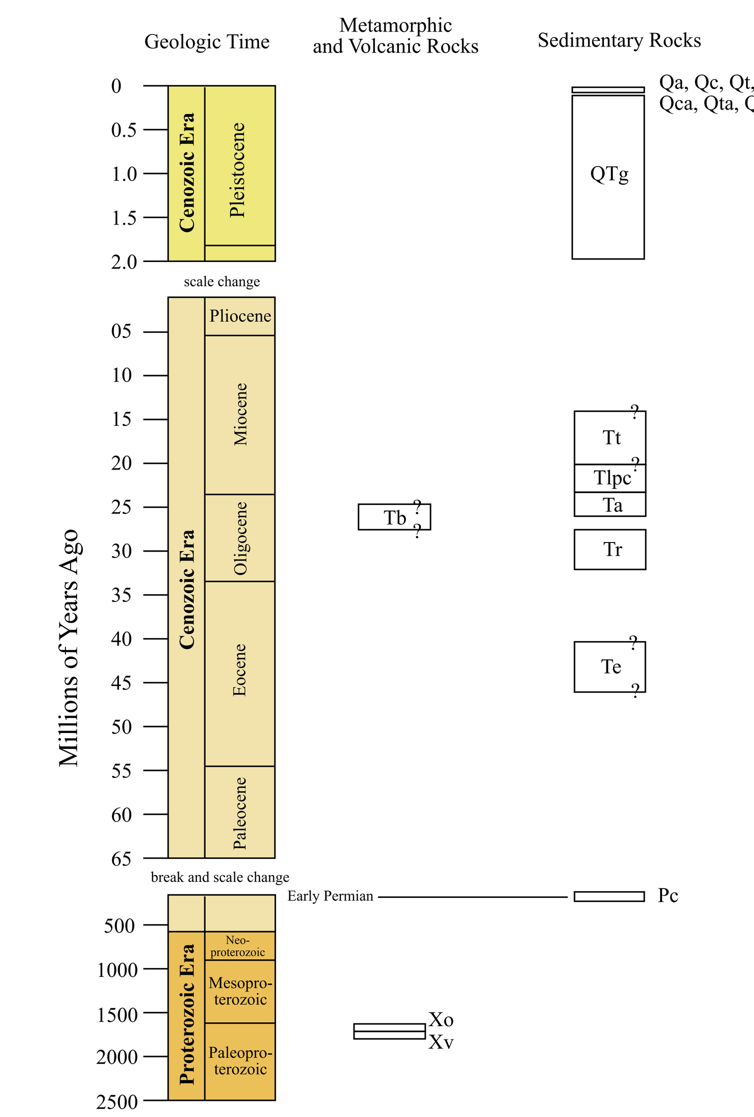
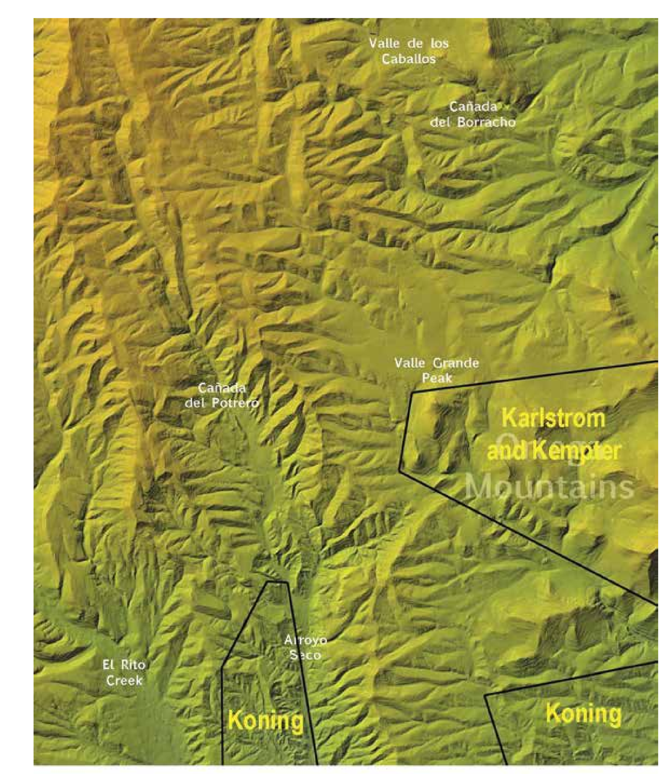


Red cliffs of El Rito Formation conglomerate in Arroyo Seco canyon.
Rock climber for scale (white arrow).





Field Mapping: Dan Koning mapped two areas in the southern portion of the quadrangle. Field data from both Karl Karlstrom and Kirt Kempter was compiled for the Ortega Mountain area. The remaining areas were mapped by Kirt Kempter.